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The determinants of financial literacy of the Portuguese population

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Abstract

Financial literacy is a topic of growing importance in the current times. It is an essential skill an individual can have towards the improvement of their financial stability and well-being.

The aim of this work is to identify the factors that explain the level of financial literacy of the Portuguese population and of specific demographic groups, as weel as the study of their evolution through the application of Clustering Analysis, Symbolic Data Analysis (SDA), and the Monitoring the Evolution of Clusters (MEC) framework to the national financial literacy surveys of the Portuguese population provided by Banco de Portugal.

The classification process computed financial variables for knowledge (FKS), behaviors (FBS), and attitudes (FAS) to determine the global financial literacy index (GFLI). These variables were then used in a hierarchical clustering analysis. Using SDA, we aggregated the surveys' data into symbolic objects by region, gender, and age group. An adapted hierarchical clustering algorithm was applied to each symbolic dataset (2015, 2020, and 2023). Finally, the MEC Framework tracked changes in the symbolic clusters over time.

The analysis of four financial variables showed that the Portuguese population scored low to moderate in financial literacy, mainly due to limited knowledge and poor financial behaviors and attitudes.

The clustering analysis revealed consistent patterns across the three years. Individuals from developed regions and higher education levels were clustered together, usually achieving the highest GFLI scores. In contrast, older individuals from less developed areas with lower education clustered due to often lacking basic knowledge. Those with moderate literacy levels understood key concepts but struggled to apply them. Common challenges across all clusters included calculating interest rates, reliance on credit, and difficulty in identifying reliable sources when subscribing to a financial product.

The symbolic clustering analysis confirmed persistent inequalities across the three demographic components, with women, younger, and older individuals in less developed areas scoring lowest. Higher literacy levels were found among groups with more education and financial resources, most often in developed areas.

The MEC Framework analysis showed persistent financial literacy gaps in Portugal from 2015 to 2023. Despite small improvements in behaviors and attitudes, these were often offset by the consistently weak knowledge scores.

Keywords: financial literacy, clustering analysis, symbolic data analysis, clusters monitoring

Resumo

A literacia financeira é um tema de crescente importância nos tempos atuais. É uma competência essencial que um indivíduo pode possuir para melhorar a sua estabilidade e bem-estar financeiros.

O objetivo deste trabalho é identificar os fatores que explicam o nível de literacia financeira da população portuguesa e de grupos demográficos específicos, bem como o estudo da sua evolução através da aplicação de técnicas de *clustering*, Análise Simbólica de Dados (SDA), e de Monitorização da Evolução de *Clusters* (MEC) aos dados dos inquéritos à literacia financeira da população portuguesa, disponibilizados pelo Banco de Portugal.

No processo de classificação calcularam-se as variáveis financeiras relativas ao conhecimento (FKS), comportamentos (FBS) e atitudes (FAS) para determinar o índice global de literacia financeira (GFLI). Estas variáveis foram utilizadas num *clustering* hierárquico. Através da SDA, os dados foram agregados por região, género e grupo etário. Um algoritmo de *clustering* hierárquico adaptado foi aplicado a cada conjunto de dados simbólicos (2015, 2020 e 2023). Finalmente, a estrutura MEC acompanhou as mudanças nos *clusters* simbólicos ao longo do tempo.

A análise das quatro variáveis financeiras mostrou que a população portuguesa obteve níveis baixos a moderados de literacia financeira, principalmente devido ao conhecimento limitado e a comportamentos e atitudes financeiras pouco adequados.

A análise de *clusters* revelou padrões consistentes ao longo dos três anos. Indivíduos de regiões desenvolvidas e com níveis de escolaridade mais elevados agruparam-se, alcançando geralmente as pontuações mais altas na GFLI. Em contraste, indivíduos mais velhos de áreas menos desenvolvidas e com menor escolaridade agruparam-se devido à sua baixa literacia financeira, geralmente sem conhecimentos básicos. Aqueles com níveis moderados de literacia entenderam os conceitos-chave, mas tinham dificuldades em aplicá-los. Os desafios comuns em todos os *clusters* corresponderam ao cálculo de taxas de juro, a dependência do crédito, e a dificuldade em identificar fontes fiáveis aquando da subscrição de um produto financeiro.

A análise de *clusters* simbólicos confirmou desigualdades persistentes nas três componentes demográficas, onde mulheres, jovens e idosos em áreas menos desenvolvidas obtiveram as pontuações de GFLI mais baixas. Os níveis mais elevados de literacia foram encontrados em grupos com um maior nível de educação e recursos financeiros, mais frequentes em regiões desenvolvidas.

A estrutura MEC revelou falhas na literacia financeira em Portugal de 2015 a 2023. Apesar das melhorias vistas nos comportamentos e atitudes, estas foram prejudicadas pelo baixo nível de conhecimentos.

Palavras-chave: literacia financeira, *clustering*, análise simbólica de dados, inquéritos, monotorização de *clusters*

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Glossary

AR - Autonomous Region
ASF - Autoridade de Supervisão de Seguros e Fundos de Pensões
CMVM - Comissão de Mercado de Valores Mobiliários
CNSF - Conselho Nacional de Supervisores Financeiros
FAS - Financial Attitude Score
FBS - Financial Behavior Score
FKS - Financial Knowledge Score
GFLI - Global Financial Literacy Score
INFE - International Network on Financial Education
MEC - Monitoring the Evolution of Clusters
OECD - Organization for Economic Cooperation and Development
PNFF - Plano Nacional de Formação Financeira
SDA - Symbolic Data Analysis

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Chapter 1

Introduction

Financial literacy is a fundamental life skill that allows individuals to make informed decisions about their personal finances. With the easy access to financial markets and the increasing complexity of financial products, this concept has been on the radar of several banking institutions and government entities, as the 2008 financial crisis showed the population's wide gap on this matter. This is evidenced by Lusardi and Mitchell (2014), who asserts the importance of a household having fundamental knowledge on how to make complex financial decisions to plan and generate wealth in today's age.

In the past decade, social media networks have become a powerful communication tool and influential in our daily life, especially among younger generations. In recent years, finance has become one of the most polarizing topics, with platforms such as Instagram or YouTube becoming a breeding ground for "get-rich-quick" schemes, where influencers and self-proclaimed experts promote investment platforms and strategies that often lack transparency, misleading younger generations into making financial decisions without understanding the risks involved. However, there are also content creators, often qualified professionals, dedicated to combating this misinformation by explaining concepts like budgeting and debt management to empower individuals to make informed financial decisions.

In 2011, the National Plan for Financial Literacy (PNFF) was created to address the knowledge gap of the Portuguese population about their personal finances. Several years later, the 2021-2025 strategic guidelines report from the National Council of Financial Supervisors (CNSF (2022)) highlights significant developments made specially for younger audiences such as the introduction of financial education classes in schools, a conjoined project with the Ministry of Education to foster awareness of financial issues among teachers and students.

Uncovering the factors that determine the level of financial literacy of the Portuguese population is the main objective of this work, along with the study of how it evolved over the years and the causes behind it. Additionally, this study also aims at uncovering the causes of the financial literacy level in specific groups of the population.

The main motivation behind this study is to provide useful information on the financial literacy level of the Portuguese population. This aims to support the creation of financial education policies and measures not only to the general population, but also for specific groups. In this dissertation, this will be achieved by applying data analysis techniques to data from the national financial literacy surveys published by CNSF.

This dissertation is structured in the following way. The first chapter is the Literature

Review, where I introduce the concept of financial literacy and how it is measured, discuss studies that have been made so far on the topic of finding the determinants of financial literacy, finishing with Portugal's landscape on financial literacy.

The Data and Software section contains the characterization of the samples and variables of the surveys, along with a brief descriptive analysis and software used in the data analysis.

The following chapter is the Methodology, and it consists of the explanation of the data analysis methods used in this dissertation, detailing how the classification process is going to be done, and an overview of the clustering and Symbolic Data Analysis techniques.

Next, the Data Analysis chapter outlines all the steps made during the study, while the Analysis of Results chapter discusses the key findings and how they fit into the scope of the assessment of the financial literacy in the Portuguese population.

Finally, the Conclusion summarizes the main findings from this dissertation, followed by suggestions and recommendations of possible next steps to continue this work.

Chapter 2

Literature Review

2.1 Financial Literacy Definition

One of the earliest definitions of financial literacy comes from Schagen (1997) who describes it as "the ability to make informed judgments and to take effective decisions regarding the use and management of money". Over the years, this definition has evolved along with the complexity of the financial markets and products made available to the general population.

Many authors have adjusted this definition to include the financial knowledge aspect, such as Lusardi and Mitchell (2014), two leading figures on the topic of financial literacy, who attribute it to "people's ability to process economic information and make informed decisions about financial planning, wealth accumulation, debt, and pensions". A more recent definition comes from OECD (2023), describing financial literacy as "a combination of awareness, knowledge, skill, attitude and behavior necessary to make sound financial decisions and ultimately achieve individual financial well being".

Emmons (2005) offers a more detailed and task-oriented description of the topic, defining it as an individual's ability "to keep track of their cash resources and all payment obligations, know how to open an account for saving and how to apply for a loan, and have a basic understanding of health and life insurance".

Despite researchers not being able to define or conceptualize in a concrete way financial literacy, all of these definitions show a clear emphasis on the need to understand financial concepts to make informed decisions, effectively manage financial situations, and achieve financial well-being.

Literature often uses financial literacy and other financially related terms interchangeably, such as financial knowledge, financial capability, or financial education. Table 2.1 presents the definitions of these related concepts.

Concept	Definition	Source
Financial Knowledge	"Awareness and appreciation of financial concepts, and procedures of financial dealings"	Clark, Lusardi, and Mitchell (2017)
Financial Capability	"An individual's ability to apply appropriate financial knowledge and perform desirable financial behaviors for achieving financial well-being"	Xiao, Chen, and Chen (2014)

Financial Education	"The process by which financial consumers/investors improve their understanding of financial products and concepts and, through information, instruction, and/or objective advice, develop the skills and confidence to become more aware of financial risks and opportunities to make informed choices, to know where to go for help, and to take other effective actions to improve their financial well-being."	OECD (2005)
Financial Behavior	"Any human behavior relevant to money management performed by consumers. Broadly speaking, financial behavior includes any behavior relating to managing, borrowing, saving/investing, insuring, or any money related behavior for improving consumer well-being."	Xiao and Kumar (2023)
Financial Well-being	"The extent to which individuals can meet all of their current commitments and needs comfortably and have the financial resilience to maintain this ability in the future"	Kempson and Poppe (2018)

Table 2.1: Concepts related to financial literacy.

While financial literacy can be defined as the ability to understand and effectively apply financial concepts in decision-making, financial knowledge represents the awareness and understanding of those financial concepts. Therefore, we can view financial knowledge as a component of financial literacy. Similarly, financial capability enhances financial literacy by emphasizing the importance of applying knowledge through financial behaviors in order to achieve financial well-being, thus integrating action with understanding. When looking at the definition of financial education, it differs from financial literacy as it refers to the process of acquiring financial knowledge and skills through instruction or advice. It provides individuals with the tools to make informed decisions. However, it does not guarantee that these tools will be applied effectively. Financial behavior, on the other hand, reflects the actions individuals take when managing their finances, such as saving, borrowing, or investing. Therefore, we can state that financial literacy can influence behavior, but the same cannot be said the other way around, since financial behavior can occur without an understanding of financial literacy. Lastly, financial well-being represents the result of effective financial management. By equipping individuals with the skills and knowledge to make decisions that enhance their financial health, financial literacy is a great and one of the many factors that influence financial well-being.

2.2 Measuring Financial Literacy

Assessing an individual's financial literacy level is essential to understand their ability to make informed decisions and effectively manage their personal finances. Researchers frequently use surveys to evaluate the population's knowledge on financial principles and to solve practical financial problems. The responses from these surveys allow governments to create policies directed towards improving the populations financial well-being.

Lusardi and Mitchell (2019) designed a set of three standard questions addressing three relevant financial concepts: interest rates, inflation, and risk diversification. These questions were created with four principles in mind: simplicity, to ensure that respondents from diverse educational and socioeconomic backgrounds could understand them; relevance, by focusing on concepts universally applicable to everyday financial decisions; brevity, limiting the number of questions to encourage participation; and capacity to differentiate, to identify the various levels of financial literacy among populations. These questions, shown in Table 2.2, became known as the "Big Three" and as a cornerstone of financial literacy assessment, widely used in various national and international surveys, such as the OECD/INFE financial literacy surveys, demonstrating their effectiveness and accessibility. They have significantly influenced financial literacy research by being considered a standardized measure, which enabled the comparison between not only demographic groups, but also between countries.

Question 1)	Suppose you had \$100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow? a) More than \$102 * b) Exactly \$102 c) Do not know d) Refuse to answer
Question 2)	Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account? a) More than today b) Exactly the same c) Less than today * d) Do not know e) Refuse to answer
Question 3)	Please tell me whether this statement is true or false. "Buying a single company's stock usually provides a safer return than a stock mutual fund." a) True b) False * c) Do not know d) Refuse to answer

Table 2.2: The "Big Three" Financial Literacy Questions.

The OECD (2023) designed a survey to measure and assess the financial literacy level of several countries. Its aim was to provide evidence of the effectiveness of current financial

literacy and financial education policies, programs, and objectives, as well as to assist in the implementation of new ones. Despite its many alterations since its first implementation in 2009, the overall financial literacy score is obtained by the sum of correct answers in each of the three main components. The first component corresponds to financial knowledge, aiming to assess the individual's ability to manage their financial situation. The second component is financial behaviors, which corresponds to the actions individuals take that impact their financial situation. The last component is financial attitudes, which relate to the individual's attitudes towards money and its ability to plan for the future.

Although effective, a main concern when using surveys is the fact that they are based on hypothetical situations without real economic consequences, meaning that the respondents do not have any incentive to answer the questions in a truthful way. One way to combat this is to introduce an elicitation component, such as the one seen in the experimental study conducted by Muñoz-Murillo, Álvarez-Franco, and Restrepo-Tobón (2020). They introduced the belief elicitation method, which allowed them to measure the degree of certainty the participants had in each question and study their cognitive abilities on financial literacy.

2.3 Determinants of Financial Literacy

In the past decade, several studies have been conducted on the topic of financial literacy. This section highlights the methodologies used and the conclusions drawn about the factors that determine the levels of financial literacy across diverse populations.

Potrich, Vieira, and Kirch (2015) conducted a survey centered on demographic variables that explained the level of financial literacy of individuals living in Rio Grande do Sul, Brazil. Using a survey based on OECD's three financial principles, the sample of 1400 respondents was analyzed using descriptive statistics and multivariate analysis techniques. They were able to identify that gender, educational level, individual income, and family income were the variables that revealed to be statistically significant, and that the vast majority of the respondents that were classified as low financial literacy level were women, while men with higher education levels, high income and no dependent family members, had higher financial literacy levels.

A dissertation from Vasconcelos (2023) on the determinants of financial literacy used descriptive statistics to reveal which demographic factors had the most influence over the financial literacy level of the Portuguese population. This work identified geographical location, gender, age, financial situation, and education level as the main determinants of financial literacy, and used descriptive statistics to find relations between these variables and the financial literacy level of the respondents from Portugal's 2020 financial literacy survey. This dissertation used methodologies like analysis of variance (ANOVA) and the t-Student test, concluding that financial situation and education level had a higher significance than the remaining determinants.

In 2017, the Bank of Japan conducted a survey on financial literacy covering 25000 individuals. Yoshino, Morgan, and Trinh (2017) used this data to conduct an analysis of the relation between financial literacy, saving behaviors and the determinants of financial literacy using an Ordinary Least Squares regression model. The results from this study were similar to others, concluding that the level of financial literacy was positively and significantly correlated with having received financial education, age, education level, and income. These results showed the impact of policies designed around financial education had on improving

financial literacy and incentivize saving habits.

The vast majority of researchers have centered around the demographic aspects of the population to explain the factors that determine the level of financial literacy. However, according to Muñoz-Murillo et al. (2020), "demographic factors often mask the ultimate determinants of financial literacy acquisition, such as risk aversion, time preferences, cognitive and behavioral biases, personality traits, cognitive, and non-cognitive abilities, among others". That being said, this work aims at looking past these aspects, and focus on the concrete financial areas and/or questions that most explain the obtained financial literacy level of the population and of specific groups of people.

2.4 Financial Literacy in Portugal

The first national financial literacy survey made in 2010 revealed a considerable gap in the population's knowledge about the topic. To address this issue, the PNFF was created by CNSF with the purpose of improving the level of financial literacy of the population through financial education projects that promote the adoption of financially conscious decisions. One of the key actions developed by this plan was the creation of comprehensive educational resources, such as the "Todos Contam" website, which contains several helpful resources for students, families, and even small businesses. Another important action that has been at the forefront of news cycles (NOTÍCIAS AO MINUTO (2021), OBSERVADOR (2024a), OBSERVADOR (2024b)), is the implementation of financial education classes in high schools. These measures aim at giving younger generations a knowledge basis on the topic of financial literacy, in order to create a more developed and financially aware society, which in turn favors the country's economic growth.

The most recent survey conducted in 2023 by the CNSF (2024) showed that both the average financial literacy and the average financial well-being indicators increased from the previous one conducted in 2020, earning the 13th place in the OECD ranking regarding their global financial literacy indicator. Looking individually at the previously mentioned components of the OECD rating, Portugal currently holds the 21st place on the financial knowledge component, the 11th in financial behavior, and the 7th in financial attitudes. These ratings show that the Portuguese population still needs to improve their financial knowledge and the way they act when presented with a financial situation, such as paying a bill or subscribe to a financial product. However, they have also become more aware of their actions towards spending money in the short term versus planning for the long term. These ratings revealed the product of the investment made by government agencies over the years to increase the population's level of financial literacy. Compared to other countries included in the survey, Portugal scored 63.4, putting it slightly above the average of 60.4 and above the OECD's average of 62.7.

Another point worth mentioning is the impact of social media in the financial literacy field. Social media has become the world's most common news and information source, especially for younger generations. Over the past few years Portugal has seen a surge of content creators in this space, whose content is directed to help people with tools to effectively manage their finances, such as *contas.em.dia*, *workol1c* and *moneylabpt*. On the other hand, the digital space has also been used to promote the so called pyramid-schemes which can cause serious harm to an individual's financial well-being. Therefore, it is imperative to have a financially literate population equipped with the tools to distinguish a scam from a real investment opportunity.

Chapter 3

Data and Software

3.1 Data Characterization

The data used for this study relates to the surveys conducted in 2015, 2020, and 2023 on the topic of financial literacy of the Portuguese population provided by CNSF. The surveys are depicted in Tables A.1, A.2 and A.3 of the Appendix, respectively. In this section, I will provide a description of the samples, the variables, and a descriptive analysis of each survey.

Looking at the data sets, the 2015 survey has a total of 321 variables, where 316 are categorical and the remaining five numerical. In the 2020 data set, the number of variables decreased to 292, with seven of them being numerical, while the other 285 were categorical. The most recent data set of 2023 is composed of 222 categorical variables and six numerical variables, totaling 228 variables.

Although data from 2010 being available, it will not be analyzed in this study since it was not built under the OECD/INFE guidelines for international comparison of financial literacy level, like the remaining ones. Also, the questions in this particular survey were significantly different from the other three, which would lead to inconsistent and inaccurate results.

3.1.1 Sample Description

The purpose of this section is to provide a brief description of the survey samples, namely the size of each sample, its error, when and how it was obtained, see Table 3.1.

Year	Sample Size	Margin of Error*	Date Obtained
2015	1100	2,95%	May and June 2015
2020	1502	2,53%	December 2019 and February 2020
2023	1510	2,52%	January and February 2023

* These values were obtained for a confidence level of 95%.

Table 3.1: Characterization of the surveys samples.

The surveys were conducted in face-to-face interviews throughout the country, with the target population being the population resident in Portugal aged 16 years or older. The survey respondents were selected using the random method to obtain a stratified sample according to the following criteria: gender, age, geographic location, employment situation, and education level.

3.1.2 Variables Description

This section provides a description of the relevant demographic variables that will be used in the aggregation process, and the questions that will be used to perform the calculation of the individual financial component scores mentioned in the previous section. Table 3.2 indicates the corresponding variables to those questions in the surveys data sets, along with the corresponding type of variable. The table containing all of the survey questions and variables associated is depicted in the table presented in Section B of the Appendix.

- REGION
- GENDER
- AGE
- Question 1. Five brothers are going to be given a gift of 1,000 euros in total to share between them. Now imagine that the brothers have to wait for one year to get their share of the 1,000 euros and inflation stays at 2 percent. in one year's time will they be able to buy: (followed by multiple choice options)
- Question 2. You lend 25 euros to a friend one evening and he gives you 25 euros back the next day. How much interest has he paid on this loan?
- Question 3. Suppose you put 100 Euros into a no fee and tax free savings account with a guaranteed interest rate of 2% per year. You don't make any further payments in this account and you don't withdraw any money. How much would be in the account at the end of the first year, once the interest payment is made?
- Question 4. How much would be in the account at the end of 5 years? (Considering that no fees or taxes are charged and that at the end of each year you leave the amount of interest in the same savings account)
- Question 5. I would like to know whether you think the following statement is true or false: High inflation means that the cost of living is increasing rapidly.
- Question 6. I would like to know whether you think the following statement is true or false: An investment with a high return is likely to be high risk.
- Question 7. I would like to know whether you think the following statement is true or false: It is usually possible to reduce the risk of investing in the stock market by buying a wide range of stocks and shares.
- Question 8. Who is responsible for making day-to-day decisions about money in your household?
- Question 9. Does your household have a budget? How frequently do you plan it? (2015) / Do you do any of the following for yourself or your household? (2020/2023)

  Despite the question from 2015 being different from the one asked in the 2020 and 2023 surveys, the OECD/INFE considers them equivalent as both convey the same intent, that is to know if the respondent is actively budgeting.

- Question 10. In the past 12 months have you been saving money in any of the following ways, whether or not you still have the money.
- Question 11. Sometimes people find that their income does not quite cover their living costs. How did you make ends meet the last time this happened?
- Question 12a. Please can you tell me whether you have heard of any of these financial products?
- Question 12b. Can you tell me whether you (personally or jointly) currently hold any of these types of products?
- Question 12c. In the last two years, which of the following financial products have you purchased? Answer even if you no longer have the products. Do not include products that were automatically renewed
- Question 13. Which of the following statements best describes how you made your choice?
- Question 14. Which sources of information do you feel most influenced your decision?
- Question 15. I keep a close personal watch on my financial affairs
- Question 16. I set long term financial goals and strive to achieve them
- Question 17. Before I buy something I carefully consider whether I can afford it
- Question 18. I pay my bills on time
- Question 19. I tend to live for today and let tomorrow take care of itself
- Question 20. I find it more satisfying to spend money than to save it for the long term
- Question 21. Money is there to be spent

Question	**2015 Variable**	**2020 Variable**	**2023 Variable**	**Type of Variable**
REGION	A1	A1	A1	Nominal Categorical
GENDER	A2	A2	A2	Nominal Categorical
AGE	A3	A3	A3	Numerical
1	F2.1	G2.1	D3	Nominal Categorical
2	F3.a	G3a	D4a	Numerical
3	F4.a	G4a	D5a	Numerical
4	F4.1	G4.1	D6	Nominal Categorical
5	F5.4	G5_3	D7.1	Nominal Categorical
6	F5.5	G5_4	D7.2	Nominal Categorical
7	F5.6	G5_5	D7.3	Nominal Categorical
8	A7	D2	B2	Nominal Categorical
9	C1	-	-	Nominal Categorical
	-	D3_1 to D3_8	B4_1 to B4_7	Binary

10	C5_1 to C5_9	D7_1 to D7_10	B5_1 to B5_11	Binary
11	C7.1_1 to C7.1_16	D11.1_1 to D11.1_18	B8_1 to B8_18	Binary
12a	D1.1_1 to D1.1_19	E1.1_1 to E1.1_20	C1.1_1 to C1.1_23	Binary
12b	D1.2_1 to D1.2_19	E1.2_1 to E1.2_20	C1.2_1 to C1.2_23	Binary
12c	D1.3_1 to D1.3_19	E1.3_1 to E1.3_20	C1.3_1 to C1.3_23	Binary
13	D2	E2	C2	Nominal Categorical
14	D3_1 to D3_13	E3_1 to E3_11	C3_1 to C3_10	Binary
15	C9.6	D13.5	B12.5	Nominal Categorical
16	C9.7	D13.8	B12.7	Nominal Categorical
17	C9.1	D14.3	B13.3	Nominal Categorical
18	C9.4	D14.5	B13.5	Nominal Categorical
19	C9.2	D15.1	B14.1	Nominal Categorical
20	C9.3	D13.1	B12.1	Nominal Categorical
21	C9.8	D13.3	B12.3	Nominal Categorical

Table 3.2: Correspondences between questions and variables used to calculate the financial literacy scores.

3.1.3 Descriptive Analysis

This section provides a descriptive analysis of the demographic variables mentioned above. The goal is to obtain an understanding of the main characteristics of the surveys respondents.

Region

In 2015, 34.8% of the respondents were from the North, 26.5% from Lisbon and Tejo Valley, and 22.4% from Centre. By 2020, the North remained the most represented region, with 36% of the interviews, followed by Lisbon and Tejo Valley at 25.7% and Centre at 22%. In 2023, the distribution was similar, with 34.8% of the interviews conducted in the North, 27% in Lisbon and Tejo Valley, and 22.1% in Centre. Overall, across the years, the North region had consistently the largest proportion of individuals, averaging around 35.2%, followed by Lisbon and Tejo Valley at approximately 26.4%, and Centre region around 22.2%. This stable distribution reflects a consistent regional representation over time.

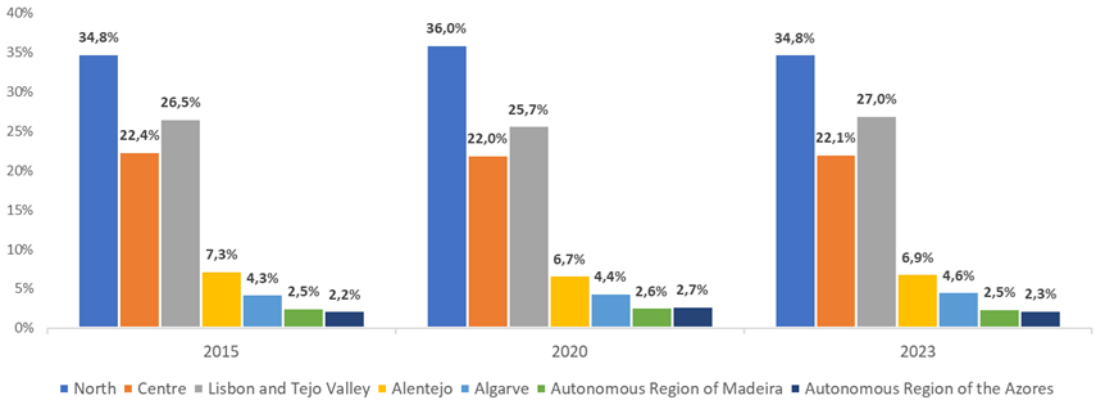


Figure 3.1: Distribution of the respondents region of each survey.

Gender

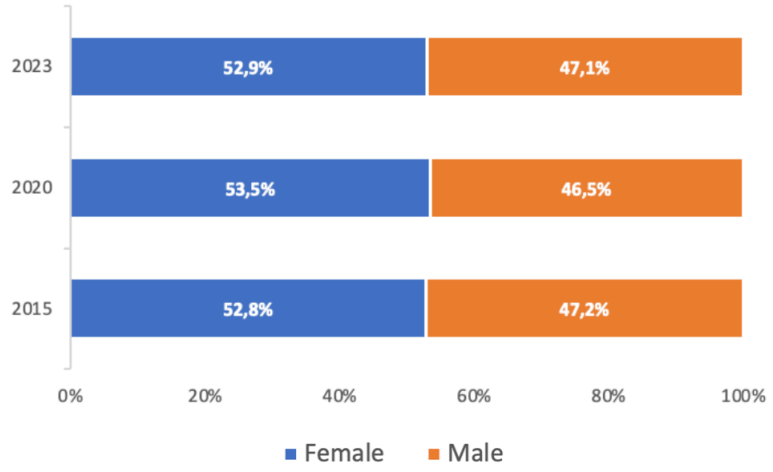


Figure 3.2: Distribution of the respondents region of each survey.

The percentage of female respondents in 2015 was 52.9%. By 2020, this proportion increased slightly to 53.5%. In 2023, the percentage of female respondents was 52.8%, indicating a consistent trend over the years on women representing the majority of the sample.

Age

Figure 4.3 shows that in the 2015 survey, half of the interviewees were aged between 25 and 54 years old, while the population aged 70 years and older represented 16,5% of the sample. By 2020, the age distribution showed a small shift, with 11.2% of respondents aged 16 to 24, 49.5% aged between 40 and 69, and 18.6% aged 70 or older. In the most recent survey of 2023, the respondents aged 16 to 24 remained steady at 11.1%, while nearly half (49.3%) were aged between 40 and 69. The elderly population saw an increase, reaching 20%. The average age of the respondents increased over the years. In 2015, the average age was 48, while in 2020 was 50, and 53 in the most recent survey of 2023.

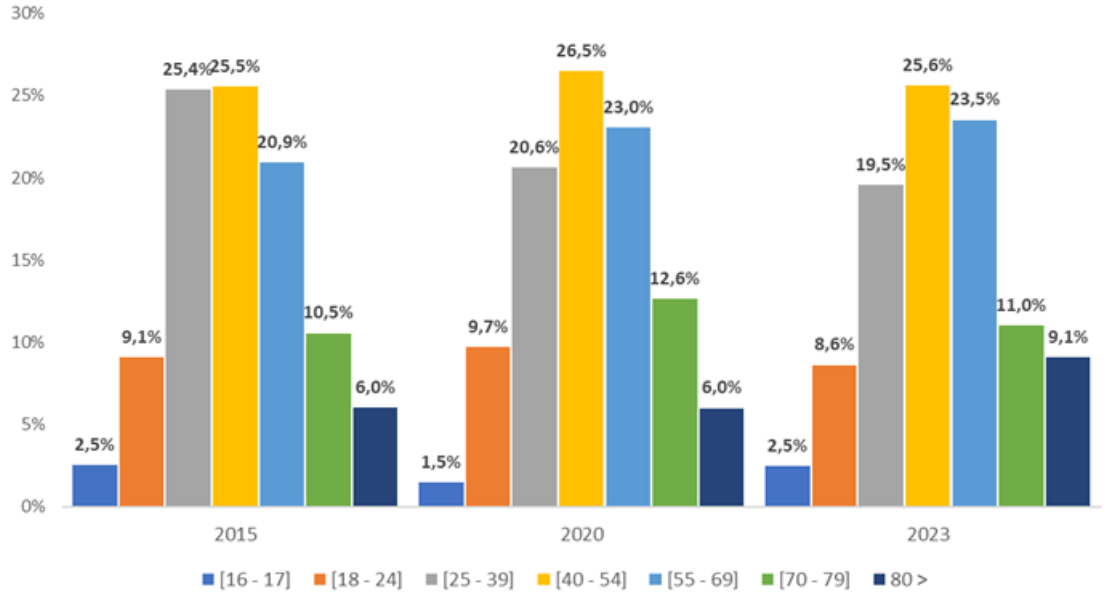


Figure 3.3: Distribution of the respondents age of each survey.

3.2 Software

In this dissertation, Python was used for the descriptive analysis and data pre-processing stages, while software R, along with the libraries cluster, RSDA, symbolicDA, HistDAWass, and MEC, was used for the clustering and symbolic data analysis.

Chapter 4

Methodology

In this section, we provide a description of the methods that will be applied in this dissertation. The methods mentioned here follow two main approaches. The first one is an individual approach, where we will use clustering techniques to segment the individuals based on their financial literacy level to uncover the demographic profiles present in each cluster, and what are the differences between them in terms of financial literacy level and components. In the second approach, we will aggregate the data based on different demographic profiles, for each of the data sets, to understand how their financial literacy scores evolved over the years and try to uncover the main causes of those changes.

4.1 Classification

The classification stage is crucial in data analysis, as its purpose is to organize the observations into predefined classes, allowing the user to make predictions, identify patterns, and extract meaningful insights from data. In this dissertation, this method is used to identify the financial literacy level of each individual in all the three surveys.

The classification will be done according to the guidelines of the OECD/INFE Toolkit for Measuring Financial Literacy (OECD (2022)). This document details how each of the financial literacy components is calculated, as well as the global financial literacy indicator, which is the measure used to compare the level of financial literacy between countries.

This process consists of two phases. First, using the data from the variables related to the questions described in Section 3.1.2 of Chapter 3, the scores of each of the financial components are calculated and stored in three numerical variables: FKS (Financial Knowledge Score), FBS (Financial Behavior Score), and FAS (Financial Attitude Score). Once all these scores are calculated for every individual in each of the three surveys, the second phase corresponds to the calculation of the global financial literacy indicator, which is then stored in a numerical continuous variable.

4.1.1 Financial Knowledge Score

The financial knowledge score is calculated by the total number of correct answers to questions 1 to 7. The first four questions are related to financial numeracy and involve a simple numerical calculation to obtain the correct answer. The remaining questions analyze the respondent's knowledge about the concept of inflation, investment risk, and portfolio

diversification. The correct answers are as follows:

- Question 1: "Less than you can buy today"
- Question 2: 0
- Question 3: 102
- Question 4: "Exactly 110 euros"
- Question 5: True
- Question 6: True
- Question 7: True

The new variable called FKS will be a numerical variable, taking integer values between 0 and 7.

4.1.2 Financial Behavior Score

In this component, the score is obtained by the number of "financially savvy" answers obtained in questions 8 to 18. There is no universal standard for what constitutes a "financially savvy" answer, however the OECD toolkit has specific criteria that must be met in each one of the questions to consider an answer as such:

- Questions 8 and 9: if the respondent is responsible for making the household decisions (alone or jointly), and answered positively to question 9 from 2015 survey or to at least two of the options in question 9 from the 2020 and 2023 surveys, then 1 point is awarded. In all other cases, 0 points are awarded.

- Question 10: If the respondent answered "Yes" to any option from 1 to 6 in the 2015 survey, or to any option from 1 to 8 in the 2020 and 2023 surveys, then 1 point is awarded. In all other cases, 0 points are awarded.

- Question 11: If the respondent selected any of the answers from the "Existing resources" or "additional resources" sections, then 1 point is awarded. In all other cases, 0 points are awarded.

- Questions 12a, 12b, 12c, 13 and 14: The questions 12a to 12c act as filters for questions 13 and 14, which are the ones on which the points are based. Considering the financial products selected by the interviewee in question 12c, the points are awarded as follows:

  - If the answer to question 14 is either "Recommendation from specialized entities (other than the bank where the product was taken out)", "Recommendation in specialized newspapers and magazines" or "Information on product comparison websites", then 2 points are awarded.

  - If the answer to question 13 is either "I considered several options from different institutions before making my decision" or "looked around but there were no other options to consider", and the answer to question 14 is either "Information provided by bank staff where the product was taken out (over the counter, online or over the phone)", "Recommendation from family or friends", "Recommendation found in social networks (for example, influencers)" or "Information from advertising on TV, radio, newspapers,...", then 1 point is awarded.
  - In all other cases, 0 points are awarded.

- Question 15: If the respondent answered "Agree" or "Strongly Agree", then 1 point is awarded. In all other cases, 0 points are awarded.

- Question 16: If the respondent answered "Agree" or "Strongly Agree", then 1 point is awarded. In all other cases, 0 points are awarded.

- Question 17: If the respondent answered "Agree"/"Often" or "Strongly Agree"/"Always", then 1 point is awarded. In all other cases, 0 points are awarded.

- Question 18: If the respondent answered "Agree"/"Often" or "Strongly Agree"/"Always", then 1 point is awarded. In all other cases, 0 points are awarded.

This new variable called FBS will have integer values ranging between 0 and 9.

4.1.3 Financial Atittude Score

This component's score is calculated by the average score of questions 19, 20, and 21. Considering the way these questions were posed, the more the respondent disagrees with the statement, the better the individual's financial attitude. Therefore, we need to change the results when calculating the score so that: if option "Totally Disagree" is selected, 5 points will be awarded; if option "Disagree" is selected, 4 points will be awarded; if option "Neither Agree or Disagree" is selected, 3 points will be awarded; if option "Agree" is selected, 2 points will be awarded; if option "Totally Agree" is selected, 1 point will be awarded and; if option "Does not answer" is selected, 0 points will be awarded. Because the answers range (1 to 5) differs from the component's score range (0 to 4) for this particular question, the average score obtained will be rescaled to fit the component's score range and then assigned to the new variable FAS.

4.1.4 Global Financial Literacy Score

The global financial literacy indicator (GFLI) is obtained by adding the scores of the three variables FKS, FBS and FAS, and then normalized to a scale of 0 to 100. The formula used to compute the values of the GFLI numerical continuous variable is depicted below in 4.1 .

$$GFLI = (FKS + FBS + FAS) * \frac{100}{20} \tag{4.1}$$

4.2 Clustering Analysis

Clustering analysis (Everitt, Landau, Leese, and Stahl (2011), Hennig, Meila, Murtagh, and Rocci (2015), van Vark and Howells (1984)), is a machine learning and data analysis methodology that can be defined as a way to gather similar observations in groups according to a specific criteria, while making sure those groups are distinct from one another. In its formal definition, given a dataset $D = \{x_1, x_2, x_3, \ldots, x_n\}$ containing n observations, the clustering method will group the observations into k subsets of D, now denoted by $C_1, C_2, C_3, \ldots, C_k$. Each subset of D is now considered a cluster, and if an observation x_i belongs to cluster C_h (with $h = 1, 2, \ldots, k$), then we say the label of x_i is h.

Clustering methods can be divided into two main classes: hierarchical and non-hierarchical. In the former, the clustering process is done in a tree-like structure called dendrogram, where it starts by treating each observations as its own cluster, merging the closest pairs of clusters iteratively based on a dissimilarity measure, until all observations belong to a single cluster (agglomerative/bottom-up approach), or vice-versa, where all the observations start in a single cluster and clusters are iteratively split to create smaller clusters (divisive/top-down approach).

Meanwhile, in many non-hierarchical clustering methods, the user typically specifies the number of (k) clusters before the clustering process begins. These methods use a specific object function/algorithm to partition the data by assigning each observation to its respective cluster. However, there are methods, like DBSCAN (Ester, Kriegel, Sander, and Xu (1996)), that do not require the user to specify k, and instead determine the number of clusters based on the data density structure.

To achieve the objectives proposed in the individual approach, we opted to apply an agglomerative hierarchical method. This method will help us gain insight on how the clusters are formed, allowing the possibility of analyzing and characterizing the financial literacy levels beyond the expected categories of "low" and "high".

The grouping process of the observations in hierarchical clustering algorithms is done using a dissimilarity measure. The linkage method used in this type of clustering determines how the dissimilarity between clusters is calculated, which feeds the dissimilarity matrices that help identifying which two clusters we should merge. There are different types of linkage methods used in hierarchical clustering, such as:

- Single Linkage: the dissimilarity between two clusters corresponds to the shortest dissimilarity between any two data points in the two clusters.

- Complete Linkage: the dissimilarity between two clusters corresponds to the dissimilarity between their farthest data points.

- Average Linkage: the dissimilarity between two clusters corresponds to the average dissimilarity between all pairs of observations in the two clusters.

- Centroid Linkage: the dissimilarity between two clusters corresponds to the dissimilarity between their centroids, the mean vector of points in each cluster.

- Ward's Linkage: at each step, it merges the pair of clusters that has the smallest increase in total within-cluster variance.

In the work we developed for the individual approach, we opted to use the Ward's Linkage method (Ward Jr (1963)), since its grouping process tends to create homogeneous and similar sized clusters due to the minimization of the Euclidean squared distance between clusters, as seen in its formula in 4.2. Consider I a set of observations, and A and B two clusters, the Ward's dissimilarity is given as follows:

$$\delta_5(A,B) = \sum_{I \in A \cup B} d^2(I, g_{A \cup B}) - \sum_{I \in A} d^2(I, g_A) - \sum_{I \in B} d^2(I, g_B) = \frac{|A|\,|B|}{|A| + |B|}\,\mathrm{d}^2(g_A, g_B) \tag{4.2}$$

Where $|A|$ denotes the number of observations in cluster A, and similarly for $|B|$. The terms g_A and g_B represent the centroid (mean vector) of clusters A and B, respectively, and the expression $\mathrm{d}^2(g_A, g_B)$ refers to the squared Euclidean distance between the centroids of clusters A and B.

For this clustering process, we opted to only consider the numerical variables FKS, FBS, FAZ, and GFLI.

4.2.1 Determining the number of clusters

One of the great challenges in Cluster Analysis is determining the optimal number of clusters. While most non-hierarchical algorithms require the specification of the number of clusters, hierarchical algorithms allow choosing the number of clusters when the final solution is obtained. Either way, determining the optimal number of clusters is a crucial step to perform an effective and accurate clustering analysis. The Calinski-Harabasz index (Caliński and Harabasz (1974)), also known as the Variance Ratio Criterion, is particularly useful to assess the quality of the clustering algorithm, and it is based on the ratio of the sum of between-cluster dispersion to within-cluster dispersion, calculated as follows:

$$CH = \frac{\mathrm{Tr}(B_k)}{\mathrm{Tr}(W_k)} \cdot \frac{n-k}{k-1} \tag{4.3}$$

Where k is the number of clusters, n is the total number of observations, $Tr(B_k)$ is the trace of between-cluster dispersion matrix, and $Tr(W_k)$ is the trace of within cluster dispersion matrix. The formulas for $Tr(B_k)$ and $Tr(W_k)$ are defined in 4.4 and 4.5, respectively. In $Tr(B_k)$, n_i is the number of points in cluster i, c_i is the centroid of cluster i, and c is the overall centroid of the dataset. While in $Tr(W_k)$, x is the data point, and C_h is cluster h.

$$\mathrm{Tr}(B_k) = \sum_{h=1}^{k} n_h \|c_h - c\|^2 \tag{4.4}$$

$$\mathrm{Tr}(W_k) = \sum_{h=1}^{k} \sum_{x \in C_h} \|x - c_h\|^2 \tag{4.5}$$

The optimal number of clusters is typically the one that maximizes the Calinski-Harabasz index, meaning a higher index value indicates a better-defined clustering where the clusters are well-separated and compact.

Another measure that will be used to evaluate the quality of the clustering is the Silhouette Index (Rousseeuw (1987)) presented in 4.8, where each cluster is represented by the comparison between its tightness $a(i)$ and its separation $b(i)$, given in 4.6 and 4.7, respectively. This

index ranges between -1 and 1, where a value close to 1 signifies that the observations are well matched within their own cluster and distinct from neighboring clusters, therefore confirming that the clustering configuration is appropriate. Let $C(i)$ be the cluster of the individual I_i.

$$a(i) = \frac{1}{|C_i| - 1} \sum_{I_h \in C_i, h \neq i} d(I_i, I_h) \tag{4.6}$$

$$b(i) = \min_{C_h \neq C_i} \frac{1}{|C_h|} \sum_{I \in C_h} d(I_i, I) \tag{4.7}$$

$$S(i) = \frac{b(i) - a(i)}{\max\{a(i), b(i)\}} \tag{4.8}$$

4.3 Symbolic Data Analysis

In classical data analysis, data is typically represented in a nxp array, where n represents the number of individuals and p the number of attributes. Each entry in this array corresponds to the value of a specific numerical or categorical attribute for a specific individual. When working with real-world data arrays, there might be cases where the factors we wish to analyze correspond to groups instead of individual observations where the data has an inherent variability, such as medical specialties in a hospital consisting of several doctors or product categories for an electronics store composed of various products.

Symbolic Data Analysis (SDA) (Billard and Diday (2006), Bock and Diday (2000), Brito (2015)) provides a framework to represent and analyze data with inherent variability. It can be considered as an extension of classical data analysis due to its aggregation component. It is advantageous when dealing with large volumes of data, allowing for a more efficient computational cost, and increases data privacy and confidentiality, since the data is now represented in groups and not individually. Another advantage of SDA is the possibility of combining and analyzing data from different sources as long as the variables are consistent in the aggregation process. However, this integration can be quite challenging when working with individual data, where differences in the set of individuals across sources can prevent the merging of the data sets.

To perform a SDA on aggregated data, the first step consists in grouping the data to generate a symbolic data set such as the one seen on 4.14 and 4.15. In this work, a symbolic data set will be generated for each one of the 2015, 2020, and 2023 surveys, where the observations will be aggregated based on the demographic profiles related to the variables region, gender, and age group of the respondents.

The next step is to choose the correct method to perform the analysis. In this dissertation, we decided to use the agglomerative hierarchical clustering algorithm using the complete linkage criterion to perform the symbolic data analysis, which is further detailed in Subsection 4.3.2 of this chapter.

4.3.1 Symbolic Data

Symbolic data is generally obtained by grouping observations in which each element consists of a finite set of values, intervals, or distributions. Due to its variability, traditional central

tendency measures are not effective in symbolic data, as they lead to a loss of relevant information.

In classical data analysis, a single-valued variable takes one single numerical or categorical value of an underlying domain for each unit (see 4.9 and 4.10). However, when accounting for variability in SDA, new types of data are required to effectively represent symbolic data: in multi-valued variables, the value is represented by a finite nonempty set of real numbers or categories (see 4.11 and 4.3.1); in interval-valued variables, the value is represented as intervals of real numbers (see 4.12); in histogram-valued variables, the value is represented by a distribution over a finite set of intervals (see 4.13); in modal-valued variables, the value is represented by a discrete distribution over a finite set of categories;

The detailed notation of these new types of variables depicted in Brito (2015) is as follows: Let $Y_1, \ldots, Y_p$ be the set of variables, O_j the underlying domain of Y_j, and B_j the set where Y_j takes its value for each unit for $j = 1, \ldots, p$. Let $S = \{s_1, \ldots, s_n\}$ be the set of units, then $Y_j(s_i) \in B_j$ for $j = 1, \ldots, p$, $i = 1, \ldots, n$. A symbolic variable Y is defined by an application $Y : S \longrightarrow O$.

Numerical Single-valued Variables:
Given the set S, a numerical single-valued variable Y is defined by $Y : S \longrightarrow O$, such that:

$$s_i \longrightarrow Y(s_i) = c \in O \in \mathbb{R}, \text{ where } B \equiv O \tag{4.9}$$

Categorical Single-valued Variables
Given the set S and a finite set of categories $O = \{m_1, \ldots, m_k\}$, a categorical single-valued variable is defined by $Y : S \longrightarrow O$, such that:

$$s_i \longrightarrow Y(s_i) = m_l \in O, \text{ where } B \equiv O \tag{4.10}$$

Numerical Multi-valued Variables
Given the set S, a numerical multi-valued variable, also known as set-valued variable, Y is defined by $Y : S \longrightarrow B$, such that:

$$s_i \longrightarrow Y(s_i) = \{c_{i1}, \ldots, c_{in_i}\}, \text{ where } B \text{ is the power set of an underlying set } O \subseteq \mathbb{R} \tag{4.11}$$

Categorical Multi-valued Variables
A categorical multi-valued variable is defined by $Y : S \longrightarrow B$, where B is the power set of $O = \{m_1, \ldots, m_k\}$.

Interval-valued Variables
Given the set S, an interval-valued variable is defined by $Y : S \longrightarrow B$, such that:

$$s_i \longrightarrow Y(s_i) = [l_i, u_i], \text{ where } B \text{ is the set of intervals of an underlying set } O \subseteq \mathbb{R} \tag{4.12}$$

.

Histogram-valued Variables
Given the set S, a histogram-valued variable is defined by $Y : S \longrightarrow B$, such that:

$$s_i \longrightarrow Y(s_i) = \{[\underline{I}_{i1}, \overline{I}_{i1}[, p_{i1}; [\underline{I}_{i2}, \overline{I}_{i2}[, p_{i2}; \ldots \ [\underline{I}_{ik_i}, \overline{I}_{ik_i}[, p_{ik_i}\} \tag{4.13}$$

Where $I_{il} = [\underline{I}_{il}, \overline{I}_{il}], l = 1, \ldots, k_i$ are considered the sub-intervals for observations $s_i, p_{i1} + \ldots + p_{ik_i} = 1$; B is now the set of frequency distributions over $\{I_{i_1}, \ldots, I_{ik_i}\}$.

Modal-valued Variables
A categorical modal-valued variable Y with a finite domain $O = \{m_1, \ldots, m_k\}$ is a variable where, for each element, we are given a category set and, for each category m_l, a weight, frequency, or probability p_l which indicates how frequent that category is for this element.

Applying the example from Billard (2006) to the topic of personal finances, lets suppose the random variable Y_1 represents different types of expenses incurred in a household, such as {Rent, Groceries, Transportation}, and suppose Y_2 is the number of transactions made for these expenses in a given period, assuming the values {1,2,3}. Also consider that the individuals can either use a debit card (D) or credit card (C) to pay for these transactions. A section of the data is shown in Table 4.1.

Transaction ID	Payment Method	Type of Expense	Number of Transactions
1	D	Groceries	2
2	D	Groceries	2
3	D	Transportation	1
4	D	Rent	2
5	C	Transportation	1
6	C	Transportation	3
7	C	Groceries	2
⋮	⋮	⋮	⋮

Table 4.1: Portion of household expenses data.

If we aggregate the data based on the payment method used, the symbolic data would be represented as:

$$Y(debit) = (\{Groceries, Transportation, Rent\}, \{1, 2\}) \tag{4.14}$$

$$Y(credit) = (\{Groceries, Transportation\}, \{1, 2, 3\}) \tag{4.15}$$

For this work, the relevant variables are the four new ones created during the classification process, and their representation in the aggregated symbolic data set depends on their type. FKS and FBS will be represented as set-valued variables, while FAS and GFLI will be represented as interval-valued variables.

4.3.2 Symbolic Clustering

One of the goals of this work is to uncover the factors that explain the level of financial literacy at a group level. We considered the application of a clustering method to the symbolic data sets to be the most appropriate approach to find which groups of Portuguese population have similar characteristics in terms of financial components.

SDA was further developed through new mathematical and statistical techniques, such as symbolic clustering. Brito (2007) characterized symbolic clustering methods into two main

groups: a) Methods that result from adapting classical clustering methods based on dissimilarities adapted to the new data types, by properly defining dissimilarity measures for symbolic data. b) Methods that do not rely on dissimilarities and use the data (i.e., the descriptions of the elements) explicitly in the clustering process. Clustering methods of type a) will cluster units with similar descriptions, not taking into consideration their intrinsic variability. Meaning, if two given descriptions are similar, their dissimilarity will be low, and therefore will tend to be grouped together despite their inherent variability. Meanwhile, clustering methods of type b) will focus on the description of each newly formed cluster to minimize its inherent variability, favoring the grouping of units whose descriptions are less alike if the formed cluster presents a lower variability.

Considering the nature of the four financial variables in our work, we concluded that clustering the data based on the similar characteristics was the most pertinent way to achieve our goals. Therefore, we opted to use a clustering method of type a), where we adapted the agglomerative hierarchical clustering algorithm through the application of dissimilarity measures suited to the type of symbolic variables, which are described further below.

In this clustering algorithm, we opted for the complete linkage criterion mentioned in Subsection 4.2. The reason behind the selection of this criterion is due to the way we obtained our dissimilarity matrix. While in the previous clustering process the dissimilarity matrices were computed using Euclidean squared distances, in the symbolic data analysis we obtained our dissimilarity matrix by adding all the matrices from each one of the symbolic variables.

The methods we used to obtain the matrices varied according to the type of symbolic variable. For the two set-valued symbolic variables FKS and FBS, we used the De Carvalho (1994) agreement and disagreement indices, to compute the dissimilarity matrices.

Let A_j and B_j be two sets of values, $a = [Y_1 \in A_1] \wedge [Y_2 \in A_2] \wedge \ldots \wedge [Y_p \in A_p]$ and $b = [Y_1 \in B_1] \wedge [Y_2 \in B_2] \wedge \ldots \wedge [Y_p \in B_p]$ be two boolean symbolic objects with no logical dependencies between the variables. In De Carvalho (1994), the idea of this approach is to say that a and b are as similar like the two sets A_j and B_j.

In our work, we first computed the De Carvalho's indices shown in Table 4.2 for each pair of sets for each of the set-values variables, in order to calculate the comparison function depicted in 4.16, and then the dissimilarity function in 4.17, thus obtaining the dissimilarity matrix.

	Agreement	**Disagreement**	**Total**
Agreement	$\alpha = \mu(A_j \cap B_j)$	$\beta = \mu(A_j \cap c(B_j))$	$\mu(A_j)$
Disagreement	$\chi = \mu(c(A_j) \cap B_j)$	$\delta = \mu(c(A_j) \cap c(B_j))$	$\mu(c(A_j))$
Total	$\mu(B_j)$	$\mu(c(B_j))$	$\mu(O_j)$

Table 4.2: De Carvalho's agreement/disagreement indices.

Where $\mu(\cdot)$ corresponds to the cardinality of the set, $c(A_j)$ and $c(B_j)$ the complements of sets A_j and B_j, respectively, α the measure of A_j that belongs to B_j, β the measure of A_j that is outside of B_j, χ the measure of B_j that is outside of A_j, and δ the measure of what is outside of A_j and B_j.

$$v_i = \frac{\alpha}{\alpha + \beta + \chi} \tag{4.16}$$

$$d_i = 1 - v_i \tag{4.17}$$

Regarding the interval-valued variables FAS and GFLI, we computed the distance matrices using the Mallows' distance. Irpino and Verde (2006) proposed a new distance for clustering symbolic histogram-valued data, which consisted of the comparison of the associated quantile functions, under the assumption of a uniform distribution within each interval. Irpino, Romano, et al. (2007) showed that this measure can also be adapted to interval-valued observations. The expression that computes the distance between two intervals is depicted as follows:

Let $Y(s_i)$ and $Y(s_{i'})$ be intervals, where c_i and $c_{i'}$ correspond to the midpoints of each interval, and r_i and $r_{i'}$ the half-ranges of the intervals:

$$D_M(Y(s_i), Y(s_{i'})) = \sqrt{(c_i - c_{i'})^2 + \frac{1}{3}(r_i - r_{i'})^2} \tag{4.18}$$

Regarding the determination of the number of clusters, the process is identical to the one described in Subsection 4.2 regarding the clustering analysis. We used the Silhouette (see 4.8) and the Dunn (Dunn (1974)) indices to assess the optimal number of clusters. The reason we used the Dunn Index instead of the Calinski-Harabasz Index, comes from the fact that we did not used Euclidean squared distance to compute our dissimilarity matrix, which is one of the concepts required for using the Calinski-Harabasz Index. The formula for the Dunn Index is depicted in 4.19.

Let C_i and C_j be two distinct clusters and k the number of clusters:

$$DI_m = \frac{\min\limits_{1 \leq i < j \leq k} \delta(C_i, C_j)}{\max\limits_{1 \leq l \leq k} d(C_l)} \tag{4.19}$$

Where $\delta(C_i, C_j)$ is the distance between units in clusters C_i and C_j and $d(C_l)$ the distance between units within a cluster C_l. The quality of the clustering is determined by the value of DI: a larger DI value indicates a more compact and better separation of the clusters, and vice-versa.

4.4 Cluster Monitoring

Usually, clustering is applied in static data, meaning the clusters defined only represent the data at a specific point in time. In the real-world, however, individuals and businesses often make decisions based on past results and their respective evolutions, so it seems counter-intuitive to make medium and long term decisions based on data from a single moment in time. According to the work developed by Oliveira and Gama (2012), "The MEC framework was designed to monitor clusters transitions over time, through the identification of temporal relationships among them", which was based on the MONIC framework (Spiliopoulou, Ntoutsi, Theodoridis, and Schult (2006)). The main difference between the two is that the MEC framework uses a different similarity function and a graph like the one shown in Figure 4.1 as a visualization tool of the temporal relationships between clusters.

In the enumeration representation, a cluster is defined by the observations assigned to it by a given clustering algorithm, formally characterized as follows:

Let $\vec{x_i}, (i = 1, \ldots, n)$ be the i-th $(i = 1, \ldots, n))$ observation defined as a vector of real numbers in a p-dimensional space $\vec{x_i} = (x_{i1}, x_{i2}, x_{i3}, \ldots, x_{ip})$. A possible temporal representation of a cluster is defined as $C_l(t) = \{\vec{x_1}, \ldots, \vec{x_m}\}$ where m is the number of

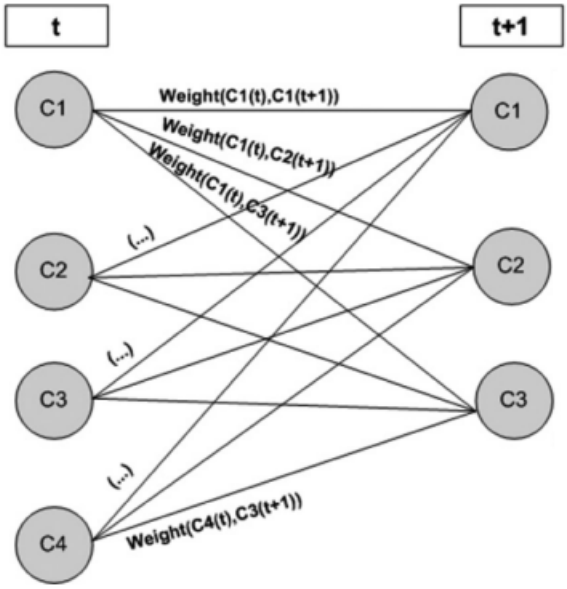


Figure 4.1: Graphical representation of the MEC framework.
Source: Oliveira and Gama (2012)

observations assigned to cluster $C_l(t)$, $l = (1, \ldots, k)$, k is the number of clusters and $t = (1, \ldots, T)$, where T corresponds to the last time period analyzed.

Looking at the visual representation of the MEC framework in Figure 4.1, we see that each node represents a different cluster, while the edges' weights correspond to the conditional probabilities of every pair of possible connections between clusters obtained at consecutive time periods. These are formally defined as follows:

Given the partitions P_i and P_j, where $j = i + \Delta t$, obtained at t_i, t_j, a graph $G = (U, V, E)$ can be created where U represents the first subset of vertices (clusters of P_i), V represents the second subset of vertices (clusters of P_j), and E a set of weighted edges between any pair of clusters belonging to P_i and P_j. The weight assigned to the edge connecting clusters $C_m(t_i)$ and $C_u(t_j)$ ($m = (1, \ldots, k_{t_i})$ and $u = (1, \ldots, k_{t_j})$, where k_{t_i} and k_{t_j} are the number of clusters returned by a given clustering algorithm in time periods t_i and t_j, respectively) are estimated in accordance with the following conditional probability:

$$weight(C_m(t_i), C_u(t_j)) = P(X \subset C_u(t_j) | X \subset C_m(t_i)) = \frac{|C_m(t_i) \cap C_u(t_j)|}{|C_m(t_i)|} \quad (4.20)$$

Where X is the set of observations assigned to cluster $C_m(t_i)$ and $P(X \subset C_u(t_j)|X \subset C_m(t_i))$ corresponds to the probability of X being included in cluster C_u at t_j given that X forms the cluster C_m obtained at a previous time period t_i.

In Oliveira and Gama (2012), the concept of mapping is defined as the process of discovering the matches between clusters obtained at time period t_i, and clusters obtained at a later time period t_j in case they still exist. The changes that occur in the clustering structure are known as transitions. Before we mention the taxonomy used to categorize the transitions, we need to introduce two important concepts: survival threshold (τ), which corresponds to the minimum linkage weight between two clusters at different time periods, so that they can be considered an approximate correspondence of each other, and splitting threshold (ρ), which

consists of the minimum linkage weight between clusters at different time periods that helps clarifying which situations should or should not be considered as a cluster split.

As mentioned in Oliveira and Gama (2012), the taxonomy used to identify the transitions in the clustering structure is as follows:

- **Birth**: When the weights associated with all edges connected to a cluster are lower than the survival threshold.

- **Death**: When the links with the clusters of the following instant have weights lower than the survival threshold, with the exception of the cases foreseen in the split clusters definition.

- **Split**: When a cluster splits into at least two parts at the following instant, and the weights of each of the individual edges are equal to or greater than the splitting threshold and less than the survival threshold, and their sum is equal to or greater than the survival threshold.

- **Merge**: When the weights of the links from at least two clusters at one time period to a single cluster at the subsequent time period are equal to or greater than the survival threshold.

- **Survival**: When a link between two clusters that are separated in time has a weight equal to or greater than the survival threshold, and there are no other edges with weight equal to or greater than the survival threshold in each of the clusters.

The MEC framework also allows identifying the changes related to the composition of the clusters in survival transitions. With that in mind, we analyzed two types of transitions. The first type are size transitions, which are related to the expansion and shrinkage of the cluster. These transitions reveal if the cardinality of the surviving cluster increases or decreases. In other words, if the number of observations of a cluster reduces from one year to the next, it means the cluster shrank, while if the amount of observations increases, it means the cluster expanded. The second type are compactness transitions, and they indicate the compression or dispersal of the cluster, by checking if the density of the surviving cluster increases or decreases. They can be detected by looking at the height of the dendrograms: if the height of a class in the dendrogram increases from one year to the next, it means that there is greater dispersion in that class, otherwise, when the height decreases, it means there was a compression.

The application of this approach is fairly simple and the results are easy to interpret. However, there is a major deficiency: it enforces that the set of objects remains constant across time periods. Looking at the number of symbolic objects of each one of the data sets - 93 in 2015, 89 in 2020, and 95 in 2023 - we can clearly see that not all objects are present in all years. To account for these differences, some extensions to the method are proposed: when objects appear in t_i and disappear at t_{i+1}, it could be interpreted as the missing objects were assigned to an extra cluster. However, in the cases where the objects do not appear in t_{i+1}, we draw an exiting arrow from the disappearing cluster in the graph. In the opposite case, where objects appear in a cluster at t_{i+1} but not at t_i, the algorithm does not require any changes, but an entering arrow will be drawn towards the cluster. The weights of these

changes are computed based on the expression depicted in 4.20, ensuring that the sum of the weights of edges and arrows leaving a cluster is equal to 1.

In the context of our work, the MEC framework will allows us to understand the groups of people that have similar financial literacy characteristics, how did their financial literacy level evolved over the years, and what were the consequences of that change.

Chapter 5

Data Analysis

In this section, I will explain in detail the different stages of the data analysis, both at the individual and aggregated levels.

5.1 Data Pre-Processing

In this stage, I used Python libraries to perform tasks related to data cleaning and data transformation.

5.1.1 Data Cleaning

The data cleaning process consisted of identifying and resolving inconsistencies in the surveys data, such as missing values, duplicates, or outliers, in order to obtain a reliable data set for model application.

When dealing with real-world data, it is common to have missing or inconsistent data. In particular with these survey data, there is a need to distinguish missing values from null values where the interviewee was not asked the question.

Looking through the surveys shown in Tables A.1, A.2 and A.3 of the Appendix, we can identify several guidelines in which the interviewers were instructed to skip one or more questions. To distinguish those instances from missing values, we counted the total number of missing values in each one of the datasets, and then compared them to the number of null values that resulted from the surveys guidelines.

In the 2015 survey data set, the total number of missing values is 65110, and going through the process mentioned above, we conclude that the total number of null values from the guidelines are the same as the total number of missing values. The same conclusion was obtained by repeating this process for the 2020 and 2023 surveys, where there were 66628 and 188675 null values, respectively.

In sum, there are no real missing values in each of the data sets. However, if not treated, those missing values will prevent us from accurately compute the distance matrices for the application of the clustering algorithm. The most common way to handle missing values is to either remove the rows that contain them or to replace the data with 0, with the mean value, or with the most frequent value. Since the data being studied refers to surveys, using these methods would lead to inaccurate and distorted results. The best way to handle them in these cases is to replace them with a neutral value, thus ensuring the safety and integrity of

the interviewees' responses. For that purpose, I opted to replace the missing values with -1.

In the 2020 survey dataset, we saw some inconsistencies in the data. In question "E3 – And which of these sources of information do you feel most influenced your decision?", the survey mentions 11 possible answers, but in the data set there are a total of 12 variables related to this question. Taking into consideration our objectives, we decided to remove it from the dataset, as it does not affect the calculation of the Financial Behavior Score variable.

Additionally, we also removed all the variables that were not going to be used to compute the four new variables FKS, FBS, FAS, and GFLI.

5.1.2 Data Transformation

The data transformation process consisted in converting the data to obtain a data set more suitable for analysis.

One of the variables used in the aggregation process for the symbolic data portion is associated with the age of the interviewees. In the 2015 data set, the question regarding the age of the interviewees is composed of two variables: a numerical variable "A3", and a categorical variable "A3.1", which facilitates this process for this specific survey. However, the 2020 and 2023 surveys only have a numerical variable associated with this question, therefore, we created a categorical variable "A3.1" to meet the same criteria of 2015.

5.2 Classification

The classification process began by first creating the variables of the financial component (FKS, FBS, and FAS), and then the variable for the GFLI for each of the individuals present in each survey.

As mentioned previously in Subsection 4.1.1 of Chapter 4, the values of the FKS component are obtained by adding the number of correct answers to questions 1 to 7. By assigning an output of 1 if the respondent answered correctly and 0 if not, to each of the questions, the values of this variable are obtained by summing the results of all seven outputs for each individual.

To obtain the values for the variable FBS, the process is identical to the previous variable, but now we will add the output of the answers to questions 8 to 18 by following the guidelines indicated in Subsection 4.1.2 of Chapter 4.

The values of variable FAS were calculated by performing the transformation mentioned in Subsection 4.1.3 of Chapter 4, which consisted in averaging the scores of questions 19, 20, and 21, followed by the rescaling the values obtained to a range of 0 to 4.

Lastly, the calculation of the GFLI values is straightforward, as it involves summing the values obtained in the three previously defined variables, and then rescaling the result to a 0–100 scale.

5.3 Clustering Analysis

The next stage of the data analysis process was to apply the clustering algorithm indicated in Subsection 4.2 of Chapter 4. Because the variables FKS, FBS, FAS, and GFLI are the ones being used to perform the clustering, their values need to be on the same scale, so that the Ward's algorithm does not put more emphasis on the variables with a larger scale when

calculating the distances, but instead consider them with equal importance. Therefore, the values of the four variables were standardized (Z-score). This process was replicated in all three data sets.

With the data cleaned and prepared, the first step was to determine the optimal number of clusters. Using the "cluster" package present in R software, this process consisted of first performing the hierarchical agglomerative clustering using the Ward's Linkage criterion iteratively for 2 to 10 clusters, followed by the calculation of the Calinski-Harabasz and Silhouette indexes for each k, and finally the plotting of its respective dendrogram. Once the outcomes were analyzed, we extracted the results of the clustering method based on the optimal number of clusters defined for each of the data sets, and characterized each one of the clusters by their sizes, mean values of the variables, values of the three financial components and their corresponding variables in order to understand the distinctions between the clusters, and what were the successes and difficulties of the individuals that belonged to each cluster.

5.4 Symbolic Data Analysis

The results obtained from the symbolic data analysis applied to each of the 2015, 2020, and 2023 survey data sets were obtained through three main steps.

The first step consisted of converting the four financial component variables - FKS, FBA, FAS, and GFLI - into symbolic ones, by grouping the respondents according to three demographic variables related to the region, gender, and age group.

As mentioned in Subsection 4.3.1, the four financial variables will be represented by various types of symbolic variables, which means that different processes were used to convert them. For the variables FKS and FBS, the corresponding set-valued variables were obtained by using the classic.to.sym() function from in the RSDA package. For the FAS and GFLI variables, we constructed a single class for each group based on the its minimum and maximum values, thus creating a symbolic interval-valued variable. The complete symbolic data sets of the 2015, 2020, and 2023 surveys are shown in Tables D.1, D.2, and D.3 of the Appendix, respectively.

With the symbolic variables now created, we then computed the corresponding dissimilarity and distance matrices for each one of the symbolic variables. The dissimilarity matrices of the set-valued variables FKS and FBS were obtained by first calculating the agreement and disagreement indices between each pair of sets, followed by the application of the comparison and dissimilarity functions shown in equations 4.16 and 4.17, described in Subsection 4.3.2 of Chapter 4. For the interval-valued variables FAS and GFLI, we used the Mallows' distance formula (see equation 4.18), also detailed in the same subsection, to create the corresponding distance matrices. To finish, we normalized all matrices so that the results from the clustering algorithm would not be influenced by the differing ranges of each matrix, and then summed all of them to obtain a single dissimilarity matrix.

The next step was identical to the one performed in the clustering analysis, where we applied the clustering algorithm mentioned in Subsection 4.3.2 to each one of the surveys, computed the Dunn and Silhouette indexes, plotted the corresponding dendrograms, and analyzed them to decide how many clusters we would base our analysis on.

With the number of clusters defined in all three data sets, we then reviewed each cluster, according to their size, the groups of the Portuguese population represented in each cluster, the relative frequencies of the set-valued variables FKS and FBS, and the cluster prototype

intervals of the interval-valued variables FAS and GFLI.

5.5 Monitoring the Evolution of Clusters

In this last section of our work, we examined how the clusters obtained through symbolic clustering evolved over the years.

First, we established the survival and split thresholds. As mentioned in Oliveira and Gama (2012), the most reasonable values are $\tau = 0.5$ and $\rho = 0.2$. We then applied the MEC algorithm, constructed the corresponding graph, and analyzed the evolution of the most significant changes between the pairs 2015-2020 and 2020-2023.

Chapter 6

Analysis of Results

This chapter consists of the interpretation of the results obtained in the Data Analysis.

6.1 Financial Components Variables

To better understand the distribution of the GFLI variable and its financial components FKS, FBS, and FAS in the different surveys, we analyzed the results obtained through the boxplots and histograms presented in Figures C.1 to C.6 in the Appendix. The comparison of the 2015, 2020, and 2023 boxplots and histograms helps us identify tendencies, dispersion, and outliers, and evaluate the consistency of the overall financial literacy levels over time.

Figure C.1 in the Appendix illustrates the boxplot distribution of the FKS variable across all three surveys, where we can see the distributions of the last two are identical. The median score value of 4 remained consistent across the three periods, indicating a stable financial knowledge level of the Portuguese population. The interquartile range of 4 to 6 in the 2015 survey, and 3 to 6 in the following ones suggests that the spread of the scores has not significantly changed over time. In the last two surveys, the range of the lower whisker means that 25% of the scores obtained sat between 0 and 3, while in the 2015 survey that percentage sat between 1 and 4, with the presence of an outlier at 0. However, the upper whisker of [6-7] is identical in all three surveys, indicating that a quarter of the respondents in each of the surveys achieved very high or even perfect scores. In sum, there are no major changes in the distribution of the values obtained in the FKS variable, which means that the financial knowledge levels of the Portuguese population neither improved nor deteriorated over time.

The distributions of the FBS variable represented in the boxplots in Figure C.2 in the Appendix show that the distributions of the 2015 and 2020 surveys are identical, characterized by an interquartile range of [4-6], a first quartile range between 1 and 4, and the presence of outliers with a 0 score. Regarding the most recent survey, the interquartile range expanded to [3-6], meaning half of the respondents obtained scores in that range, showing a slight decline in the individuals' financial behaviors. Another characteristic that supports said detriment is the lower whisker range shifting to [0-3], meaning there were registered lower values in the most recent survey. It is worth noting, however, that the median score of 5 and the upper whisker range of [6-7] remained constant over the years. Despite the changes verified, we can still state that the distribution of this variable has not drastically changed over time.

The boxplots displayed in Figure C.3 show the distribution of the FAS scores in all three surveys, where we can clearly see the distribution of the 2015 and 2023 surveys are identical.

The median score of 2.33 is identical in all three surveys, indicating the overall trend in financial attitude of the population remained consistent. Regarding the interquartile ranges, the 2015 and 2023 surveys sit between the scores of 1.67 and 3, meaning 50% of the interviewees have similar financial attitudes over time, despite this range being smaller in the 2020 survey, sitting between the scores of 1.67 and 2.67. The whiskers extend from 0 to 4 in all three years, except for an outlier in 2020 at 0, indicating there were respondents with particularly very low scores. The narrow upper whisker indicates a concentration of the responses within a small range. The consistency across the years suggests that the financial attitudes have not drastically changed.

On the topic of the GFLI variable, the 2015 histogram shown in Figure C.4 presents a slightly symmetric, although skewed, distribution where the majority of the respondents scores are concentrated in the 55 to 70 range. The frequency closest to 0 indicates, along with the mentioned negative skewness, that the portion of individuals who have a lower financial literacy score is greater than the portion of individuals with a high GFLI. The slightly high kurtosis, suggests that the majority of the scores are concentrated around the mean of 61.1. The 2020 distribution represented in Figure C.5 shows the same characteristics skewness of the previous survey, although now with an accentuated left tail, and a larger portion of individuals with scores between 40 and 50 despite the mean value for this variable being slightly higher (55.6). The last survey from 2023 (see Figure C.6) reveals a more symmetrical distribution, despite its left skewness and the absence of outliers in the lower scores. Despite the mean score being 54, the majority of the respondents presented scores between 55 and 65 points.

When comparing all these three distributions, we can see several patterns, namely their negative skewness, indicating a significant portion of the population has a lower to moderate financial literacy score, leading to the conclusion of a potential need of more widespread initiatives towards financial education.

6.2 Clustering

In this section, the results obtained from the clustering method applied to all three surveys will be described. The first step will consist in the determination of the optimal number of clusters, and the second concerns the analysis and characterization of the clusters.

6.2.1 Determining the number of clusters

To determine the appropriate number of clusters, we computed the Calinski-Harabasz and Silhouette indexes that resulted from the application of the clustering method mentioned in Chapter 4 for two to ten clusters in each one of the surveys.

Starting with the results from the 2015 data set, both the Calinski-Harabasz and Silhouette index plots (see Appendix C.7 and C.8) were very similar, showing their peak at two clusters, followed by a declining tendency as the number of clusters increased, thus meaning that two clusters would be the optimal choice for analysis. Looking at the dendrogram depicted in Figure C.9 of the Appendix, we can now graphically see that two clusters is evidently the optimal solution. Nonetheless, the partition in three clusters can reveal more insights about the individuals. Therefore, we opted to analyze the results obtained from the three clusters partition.

The Calinski-Harabasz and Silhouette index plot of the 2020 survey depicted in Figure C.27 show, once again, the ideal clustering partitioning is by using two clusters, seeing that it obtained the highest value on both measures. Nonetheless, while the dendrogram in Figure C.29 also supports the two cluster partition, we also see that the four cluster partition could provide interesting results. For that reason, we opted to analyze the clustering results obtained from the four clusters division.

Finally, the results from the Calinski-Harabasz and Silhouette indexes of the 2023 survey presented in Figures C.50 and C.51, respectively, show that a two cluster partition would be the ideal division for analysis. Nonetheless, a five cluster partition can also be appropriate for analysis, due to its index value increase from four clusters seen in the Silhouette index, and also the fact that five clusters was the second highest value in both indexes. The dendrogram represented in Figure C.52 also supports this statement regarding the analysis of both cluster partitions, therefore we opted to analyze the results from the five clusters partition.

A pattern we observed when analyzing these measures was that the two-cluster partition appeared to be an optimal solution in all three data sets. As expected, this division separated the individuals with a low level of financial literacy from those with a higher one, which does not align with the goal of this dissertation. Nevertheless, it still provided relevant information on the data, so we opted to include a brief analysis of the two-cluster partition for the 2020 and 2023 data set in Section C.1 of the Appendix. We did not conducted the two-cluster analysis on the 2015 data set, as the subsequent analysis is based on three clusters, making a two-cluster analysis redundant.

6.2.2 Results from the 2015 data set

The results of the clustering presented in Table C.1 of the Appendix show that, in terms of size, cluster 3 has the highest number of individuals, followed by cluster 1. Cluster 2 shows a significantly lower amount. Regarding the mean values, cluster 3 is the only cluster with positive values. Between cluster 1 and 2, the latter presents the lowest mean values. The values from the within-cluster sum of squares reveal that clusters 1 and 3 are the least homogeneous, meaning the data points are more spread out, while cluster 2 shows a very compact cluster formation. Lastly, the explained variance ratio of 36,9% shows that the clustering method explains just over than one third of the total dispersion of the data set.

The financial knowledge scores distribution is represented in Figure C.10, while the detailed answers from clusters 1, 2, and 3 can be seen in Figures C.11, C.12, and C.13 in the Appendix, respectively. In Cluster 1, most individuals scored 4 or 5 points, showing a moderate-to-high performance. While most answered correctly to all questions, many struggled with interest and inflation rate questions. Cluster 2 shows a similar but weaker pattern, with scores mainly around 3 and 4 points, and a larger share of very low scores, largely due to unanswered or unknown responses. In Cluster 3, scores are concentrated at the high end of the scale (no scores below 3), with most individuals answering all questions correctly, though some also had difficulty with interest rate calculations.

On the financial behavior scores distribution plot presented in Figure C.14 of the Appendix, we see a clear distinction between the three clusters: cluster 2 scores are concentrated at the lower end of the scale, cluster 1 in the middle, and cluster 3 at the higher end. The detailed answers shown in Figures C.14, C.15, C.16, and C.17 indicate that individuals in cluster 1 generally budget their household income, save, pay bills on time, and monitor their financial

situation. In contrast, cluster 2 displays poor financial behaviors overall, with the main exception being their consideration before purchasing an item. Finally, most individuals in cluster 3 demonstrate strong financial habits, with the only common difficulty being their reliance on credit to make ends meet, a trait we also observed in the other two clusters.

In the FAS score distribution plot in Figure C.18, despite all clusters having a wider distribution spanning the whole score scale, the results followed the same pattern as the previous variable. Looking at the detailed answers of the clusters in Figures C.19, C.20, and C.21, individuals in cluster 3 generally showed a healthier mindset toward managing their money, while those in cluster 2 reflected the opposite. Cluster 1 performed well on questions regarding careful spending and long term saving habits; however, when confronted with question 21 ("Money is there to be spent"), most respondents either agreed or remained neutral, suggesting a more ambivalent attitude toward consumption.

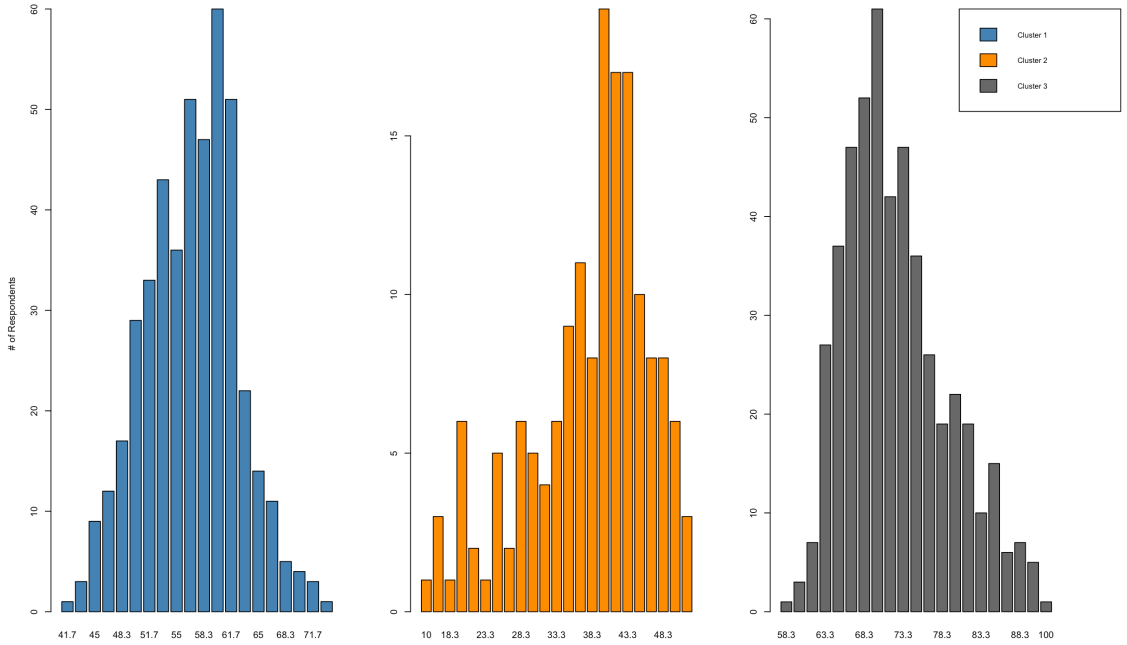


Figure 6.1: Global Financial Literacy Scores of Clusters 1, 2, and 3 from the 2015 data set.

As expected, the GFLI results in Figure 6.1 reflect the patterns observed in the analysis of the three component variables. On an intermediate level, cluster 1 scores showed that most of the individuals had a financial literacy level closer to the entire data set. Cluster 2 shows the worst financial literacy scores out of all three clusters being the only one with scores below 40 points, while cluster 3 scores were the complete opposite.

Now, we will be looking at the demographic variables related to the region, gender, age group, schooling level and occupation.

Starting with region (see Figure C.22, all clusters were mainly represented by individuals from areas with high population density (North, Lisbon, and Centre), while the least populated areas had the least representation. Nonetheless, we still see a considerable amount of individuals from the Alentejo region in clusters 1 and 3.

In Figure C.23, we see the distribution of the gender variable in all three clusters, where we see the proportion of female individuals being higher in clusters 1 and 2. In cluster 3, we

see the opposite situation where the number of male individuals is higher, despite the small difference between the two genders.

Regarding the age group variable in Figure C.24, all three clusters have a significant portion of individuals between 25 and 69 years old, with cluster 3 having the highest share. However, cluster 1 is most prominent in the older brackets (70 and above), while cluster 2 contains the largest portion of individuals within the [16-17] age group out of the three.

Looking at the distribution of the education variable in C.25, clusters 1 and 2 stand out due to having the highest amount of people with no education and incomplete primary education. On the opposite size, we see that cluster 3 completely overshadows in any schooling level at or above elementary education.

Lastly, Figure C.26 shows the distribution of the occupation variable. We see that all clusters have a considerable, and fairly even, number of students between them. Cluster 1 has the highest number of "Retired" and "Unemployed, looking for work" individuals. In contrast, Cluster 3 has a large proportion of employed individuals, which is consistent with the earlier age group results, and a considerable number of retired individuals as well. Cluster 2 presents a more balanced distribution between employed and retired individuals.

In sum, we can see that education level is the main driver between obtaining moderate or better results in each of the financial components, specially in financial knowledge, as evidenced by the GFLI scores obtained in clusters 1 and 3, which have very similar demographic characteristic: employed (self or not) or retired individuals mainly from developed areas, aged between 25 and 69. On the opposite end, individuals from cluster 2, who are typically females from less developed areas of the country, either retired or unemployed, with generally lower levels of education, have a tendency to do not have the same knowledge or contact with financial information or products, thus the overall lower results obtained in each of the financial variables.

6.2.3 Results from the 2020 data set

Table C.2 shows the results of the four cluster division for the 2020 dataset. In terms of size, cluster 4 has the largest number of individuals (489), followed by cluster 3 with just over 400, while clusters 1 and 2 are smaller, with 375 and 251 individuals, respectively. The cluster mean values indicate that clusters 1 and 3 represent individuals with a lower level of financial literacy, whereas cluster 2 has the highest proportion of financially literate individuals, followed by cluster 4. The within-cluster sum of squares values shows that clusters 2 and 3 are more homogeneous, with data points closer to the centroid, while clusters 1 and 4 are more dispersed. The explained variance ratio indicates that this clustering formation captures only 36% of the total variance. Nonetheless, we still carried with the analysis.

Figures C.30 to C.34 show the distribution of the scores obtained in variable FKS, as well as the responses from each of the clusters. Cluster 1 has a wide score range, despite most individuals obtaining lower scores due to not answering or answering incorrectly, except on a few interest rates and inflation related question. Cluster 3 shows a similar behavior, although its scores are more in the low-to-middle range. The reason being the majority answered correctly to most questions related with how interest and inflation rates work, but failing to practically applying them. In contrast, cluster's 2 scores were higher, showing only some difficulty with interest rate calculations. Cluster 4 scores were also concentrated in the higher end of the scale, displaying the strongest results, with very few incorrect responses in all

questions.

The distribution of the financial behavior scores presented in Figure C.35 shows cluster 1 to have the weakest performance, due to individuals revealing poor financial habits, except for paying their bills on time and thinking carefully before purchasing an item (see Figure C.36). Cluster 3 scores were at the middle range level, where the answers reflected a good control over their finances despite showing little effort to improve them (see Figure C.38). In cluster 2, the results were concentrated in the middle-to-high range, as the individuals answered correctly to most questions, except for those involving long-term planning and reliance on credit to make ends meet, as seen in Figure C.37. Finally, in Figure C.39 we see the responses from cluster 4, standing out as the strongest cluster, with most scores in the higher end of the scale, thus reflecting a solid grasp of their financial situation, despite also relying occasionally on credit when their income is insufficient.

Figure C.40 to C.44 shows a clear contrasts in the financial attitude score across all clusters. Cluster 1 displayed the widest spread but generally low scores, due to individuals not prioritizing saving and planning for their financial future. The results from cluster 2 were the strongest, where most showed a great awareness of the importance of planning for future needs. Cluster 3 scores were moderate. These individuals recognize the value of planning and saving, but tend to spend impulsively. Finally, cluster 4 was similar to cluster 1 in distribution but with a narrower range, showing some contradicting attitudes: while they acknowledge the importance of planning, they are still reluctant to do it when money is involved.

The last variable, GFLI, is shown in Figure 6.2. Cluster 1 is comprised of the individuals with the lowest financial literacy levels, as it is the only group with scores below 35. Clusters 3 and 4 represent moderate levels, with the latter tending towards the higher side. Cluster 2 stands out with the highest literacy levels, ranging from 60 to 95 points, and with most individuals scoring between 70 and 80, a score well above the average recorded of

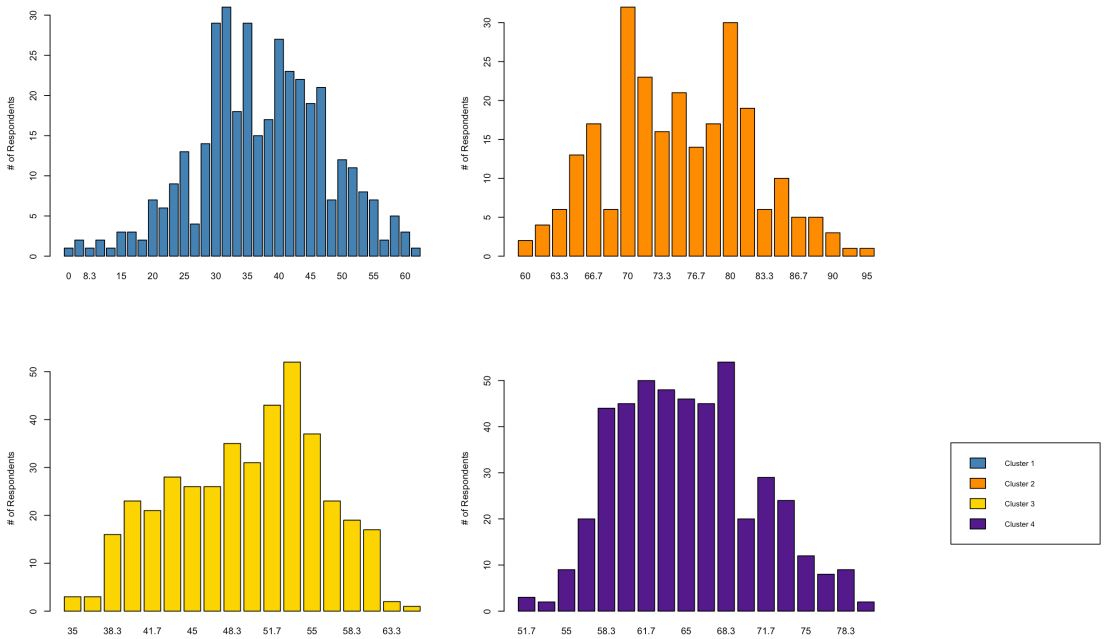


Figure 6.2: Global Financial Literacy Index of Clusters 1, 2, 3, and 4 from the 2020 data set.

Taking a look at the demographic variables of these four clusters, we saw that the distribution of the region variable in Figure C.45 shows that Lisbon is the most represented region in cluster 1, and North the most represented in the other clusters. We also see regions of Alentejo, Algarve, and AR regions of Madeira and Azores are the least represented, despite Alentejo having a considerable number of individuals in cluster 1.

Regarding the gender variable, we see in Figure C.46 that cluster 4 is the only one where the number of male individuals surpasses the number of female interviewees. We also see that cluster 2 had the smallest difference between the number of male and female interviewees.

Looking now at distribution of the age group variable depicted in Figure C.47, we see that the [55-69] age group is the most represented clusters 1 and 3, and [40-54] in the other two clusters. We also see that cluster 1 shows a fairly even distribution between the age groups [18-24], [40-54], [70-79], and [80+], while the other clusters show the youngest and oldest age groups the least represented.

Figure C.48 shows clear differences in schooling levels across clusters. The number of individuals from clusters 1 and 3 dominate in the lower education level, with many respondents having only completed primary or lower secondary school. In contrast, clusters 2 and 4 have the highest proportion of interviewees with a upper secondary education or higher, with cluster 4 being the strongest in highly educated individuals.

Figure C.49 highlights similar contrasts in occupation. Cluster 1 is mainly composed by retirees and includes the highest proportions of unemployed, disabled, and student respondents, reflecting a largely inactive group. Clusters 2, 3, and 4 are mostly composed of employed individuals, with cluster 4 standing out for its large portion of both employed and self-employed respondents.

The demographic patterns align closely with the financial literacy scores observed across the clusters. Cluster 1, characterized by older, less educated, and largely inactive individuals, had the lowest scores in all three components, thus reflecting the impact of a limited education level and low employment levels. Cluster 3, with a similar education profile but where most individuals integrated in the work force, shows a moderate-to-low literacy level, suggesting that employment may slightly improve financial knowledge, which had the lowest scores out of all three financial variables.

In contrast, cluster 4, composed of highly educated, employed, and self-employed individuals, aligns with moderate-to-high literacy, emphasizing the influence of education and the benefit of being in the work force. However, the considerable portion of interviewees from less developed area, who typically have lower levels of education, might be the reasoning behind some of the lower scores seen in the financial knowledge component. Finally, cluster 2, with relatively balanced demographics and a vast representation of higher educated and employed individuals, has the overall highest literacy scores, underscoring the importance of education and economic activity as main contributors for their financial capability.

6.2.4 Results from the 2023 data set

Table C.3 shows the results of a five cluster division. The clusters are similar in size, each with around 300 individuals. Cluster means indicate that cluster 2 is the only one with positive values across all four variables, suggesting a level higher financial literacy, followed by cluster 5 with positive values in FKS and GFLI. Clusters 1 and 3 show only one positive value each, while cluster 4 has all negative values. The within-cluster sum of squares shows

clusters 1, 3, and 5 to be more dispersed, especially compared to cluster 2 (469.2). Cluster 4 has the greatest dispersion from the centroid. Finally, the explained variance ratio of 22.8% shows the clustering explains just over a fifth of the data's variance. Despite this low value, we proceeded with the analysis.

The distribution of the financial knowledge component in Figure C.53 shows cluster 1 with lower scores, mostly around 3 points. Figure C.54 indicates slight difficulties in calculating inflation, interest rates, and understanding investment risks. Cluster 2 scores are very good overall, though multiple answers in question 3 on interest rates reveal some difficulty (Figure C.55). Cluster 3 falls in the mid-range, with most individuals scoring 3–4 points; their main issues also relate to interests and inflation (Figure C.56). Cluster 4 shows the weakest results, concentrated between 0 and 2 points, with most individuals answering six of seven questions incorrectly (Figure C.57), indicating very poor financial knowledge. In contrast, cluster 5 performs best, answering all questions correctly except for a considerable portion of incorrect answers in question 4 on interest rates (Figure C.58).

The distribution of financial behavior scores in Figure C.59 is quite similar to the previous variable: clusters 1 and 4 show lower scores, cluster 3 centers around the middle, and cluster 2 occupies the higher range. Cluster 5, however, now falls within the middle range. In Figure C.60, cluster 1 shows mixed results. Despite individuals having positive behaviors, such as budgeting and saving, they fail to improve them. Cluster 2 individuals show generally responsible behaviors, such as paying their bills on time and setting long-term goals, a considerable portion rely on credit to make ends meet. Results from cluster 3 (Figure C.62) are also mixed, but unlike cluster 1, these individuals are more consistent in saving money and are able to evaluate financial products, when evaluating financial products. In cluster 4 (Figure C.63), individuals exhibit little progress toward stability beyond paying bills on time. Finally, cluster 5 (Figure C.64) reflects financial awareness and responsibility, yet limited improvement, as most do not budget, save, or set long-term goals.

Figure C.65 shows the distribution of the FAS variable, where clusters 1 and 2 scored higher, with cluster 1 covering a wider range from 1.3 to 4 points. Figures C.66 and C.67 show similar patterns in questions about being careless with money and prioritizing spending over saving, both with positive results. However, when asked if money's purpose is to be spent, the individuals from cluster 1 had stronger positive results, explaining its wider range. Cluster 3 scores were mostly between 1 and 2 points, reflecting a poor financial mindset (see Figure C.68). Cluster 4 displayed a more central concentration of scores, with Figure C.69 showing that many agreed with all three statements, indicating poor attitudes, partly offset by neutral or disagreeing answers. Cluster 5 was similar to cluster 4 but with fewer low scores. Here, individuals largely agreed or stayed neutral on prioritizing saving money over spending it, yet many still showed poor attitudes toward the purpose of money.

The global financial literacy index distributions (Figure 6.3) show cluster 1 with a narrow score range compared to the rest, centered around the middle of the score scale, thus indicating that most individuals in this cluster obtained average scores. Cluster 2 exhibits the highest scores, where the minimum score obtained was of 60 points, of course due to the high scores obtained in each of the three financial components. In cluster 3, the distribution shows most individuals obtained a moderate-to-low score, with a peak around the 50 point mark. Cluster 4 represents the individuals with the lowest scores out of all clusters, where some even reached a score of zero. Finally, the plot of cluster 5 shows moderate-to-high levels of financial literacy.

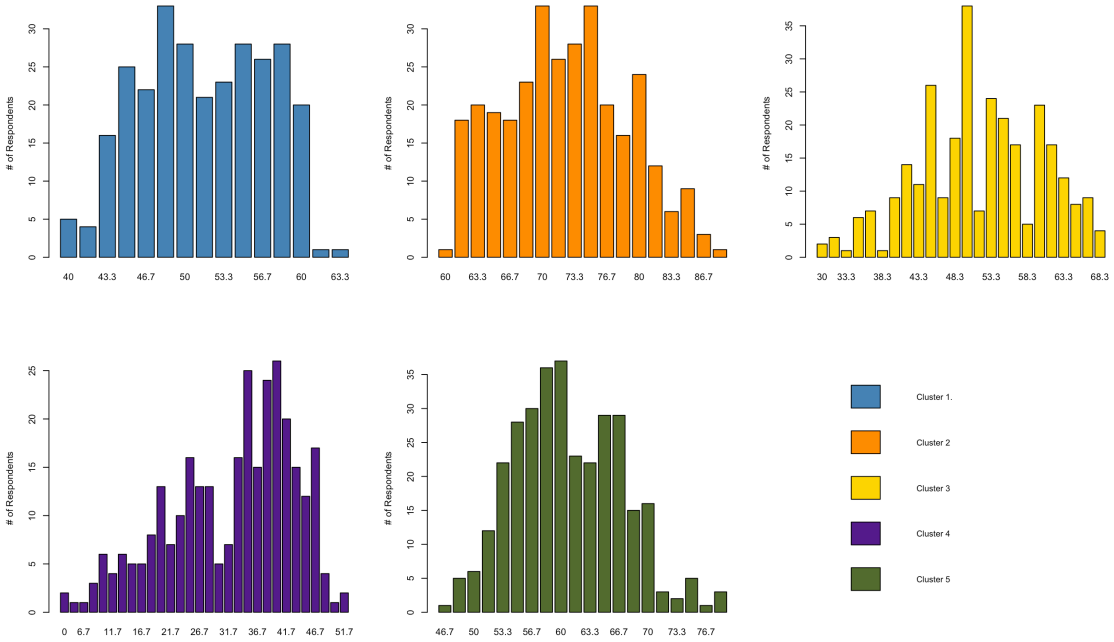


Figure 6.3: Global Financial Literacy Index of Clusters 1, 2, 3, 4, and 5 from the 2023 data set.

Examining the demographic variables, individuals from clusters 1 and 5 are mostly from Lisbon & Tejo Valley, while the North region dominates the other clusters. The Centre region is notably represented in clusters 3, 4, and 5, while Alentejo, Algarve, and the AR regions of Madeira and Azores are the least represented, as seen in Figure C.71

The gender distribution plot in Figure C.72 shows cluster 1 and 4 to be predominantly female, while the proportion of male interviewees is higher in the other clusters. We also see that clusters 3 and 5 have the lowest disparities between genders, while cluster 1 shows a considerable imbalance.

Regarding the age group variable (see Figure C.73), we see that the age groups that are considered representative of the active population, between 25 and 69 years old, are the most represented in the majority of the clusters. In cluster 1, most respondents were age between 55 and 69 years old, while clusters 2, 3, and 5, the age most represented age group was the [40-54]. In contrast, cluster 4 shows very high proportions of younger and older age groups, compared to the others.

The representation of the education level variable seen in Figure C.74 of all 5 clusters show that clusters 1 and 4 have a high concentration of lower education levels, while cluster 2 has the least, being more representative of more highly educated individuals. The interviewees from cluster 3 mostly possessed a primary or secondary education, while cluster 5 is evenly distributed across primary secondary and university levels of education.

Occupation patterns shown in Figure C.75 indicate that clusters 1 and 4 have a lower proportions of employed/self-employed individuals, and a higher of retired or home-making individuals. Clusters 2, 3, and 5 have the highest shares of employed and retired respondents. In cluster 4, curiously, we have a large portion of student interviewees. "Trainees/apprentices", "Not working and not looking for work" and "Active – other" categories were the

least represented across all five clusters.

The clusters show clear links between demographics and financial literacy components. Cluster 1's older, less educated, and inactive demographic profile aligns with the low-to-moderate knowledge, moderate behaviors, but strong attitudes scores obtained, suggesting that these individuals value being cautious with their money to compensate for their financial knowledge gap. Cluster 2's younger, highly educated, and employed individuals from developed areas achieve the strongest results overall, with high scores in each of the financial components.

Cluster 3's mix of employed and retired individuals with moderate education explains its average knowledge and behaviors, though its weak scores in the attitudes component suggest these individuals are not confident or motivated to improve their financial situation. In cluster 4, dominated by students, retirees, and unemployed individuals with low education, we see poor performance in the knowledge and behaviors variables, but average attitudes, indicative that their socio-economic disadvantages hinder their overall level of financial literacy while leaving room for improvement. Finally, cluster 5 stands out for its high knowledge scores, clearly due to the higher education levels and varied occupational status, yet its average behaviors and attitudes scores highlight a disconnect between knowing and applying their financial skills.

6.3 Symbolic Data Analysis

Since one of the main goals of this work is to uncover the factors that explain the level of financial literacy in specific groups of the population, it makes sense to first divide the Portuguese population into homogeneous groups in terms of their financial components scores and financial literacy index.

After the transformation of the original data sets into the symbolic data sets of each survey depicted in Tables D.1, D.2, and D.3, and the posterior application of the clustering technique mentioned in Chapter 5, the results were as follows.

6.3.1 Determining the number of clusters

Similarly to the process used in the clustering section of this work, we computed the Dunn and Silhouette indices to identify the optimal number of clusters to analyze each symbolic data set.

Regarding the 2015 symbolic clustering, the results of the Dunn and Silhouette indices presented in Figures E.1 and E.2 of the Appendix show that a partition of the dataset into 2, 3, or 4 clusters are the ideal divisions, as both indices plots show a considerably decrease on more than four clusters, with exception of a small peak at six clusters. Looking also at the dendrogram represented in Figure E.3 of the Appendix, we clearly see two smaller clusters and a larger one, in which its branches only start to appear from a five cluster partition onward. Therefore, we opted to analyze the results obtained from six cluster division, which will provide us more detailed information on the larger cluster.

Analyzing the results of the Silhouette and Dunn indices from the 2020 and 2023 data sets (see Figures E.4, E.5, E.7, and E.8 of the Appendix), we see a similar behavior as the 2015 data set, where a drastic drop of the indices values occur after five clusters in 2020, and four clusters in 2023.

Looking at the dendrogram of the 2020 data set depicted in Figure E.6, we can see that the optimal division would be of four or five clusters, while in the 2023 data set, the optimal division would be of three or four clusters, as seen in Figure E.9 of the Appendix.

In conclusion, we decided that we will be analyzing the results from the five clusters division for the 2020 data set, and four clusters for the 2023 data set.

6.3.2 Results from the 2015 data set

Tables E.1 and E.2 in the Appendix show the size and groups of the population that belong to each cluster.

We see that cluster 2 is the largest in terms of size, with almost two thirds of the total symbolic groups belonging to this cluster. Looking at its composition, most groups come from the three most populated regions (Lisbon, North, and Centre), with both genders and adults of ages 18 and above also being represented. Smaller clusters mainly included groups from the less populated regions of the country (AR Azores, AR Madeira, Alentejo, and Algarve). Clusters 1, 2, 3 and 6 contained both genders, though clusters 1 and 6 were mostly male, while clusters 4 and 5 were exclusively female and male, respectively. Age-wise, clusters 4 to 6 concentrated on the youngest (16–24) and oldest (70+) groups, while clusters 1 to 3 had wider age ranges. Still, over two-thirds of cluster 1 were under 25 years old, compared to just under half in cluster 3.

Prototypes	**FKS**
Data Set	$0(\frac{7}{345})$; $1(\frac{23}{345})$; $2(\frac{36}{345})$; $3(\frac{54}{345})$; $4(\frac{65}{345})$; $5(\frac{62}{345})$; $6(\frac{54}{345})$; $7(\frac{44}{345})$
Cluster 1	$1(\frac{4}{26})$; $2(\frac{1}{26})$; $3(\frac{3}{26})$; $4(\frac{3}{26})$; $5(\frac{5}{26})$; $6(\frac{6}{26})$; $7(\frac{4}{26})$
Cluster 2	$0(\frac{6}{280})$; $1(\frac{16}{280})$; $2(\frac{30}{280})$; $3(\frac{43}{280})$; $4(\frac{55}{280})$; $5(\frac{50}{280})$; $6(\frac{43}{280})$; $7(\frac{37}{280})$
Cluster 3	$1(\frac{1}{27})$; $2(\frac{3}{27})$; $3(\frac{7}{27})$; $4(\frac{7}{27})$; $5(\frac{5}{27})$; $6(\frac{3}{27})$; $7(\frac{1}{27})$
Cluster 4	$0(\frac{1}{3})$; $1(\frac{2}{3})$
Cluster 5	$6(\frac{2}{4})$; $7(\frac{2}{4})$
Cluster 6	$2(\frac{2}{5})$; $3(\frac{1}{5})$; $5(\frac{2}{5})$

Table 6.1: Symbolic description of the prototypes of the clusters for the FKS variable from the 2015 symbolic clustering.

Tables 6.1 and 6.2 show the relative frequencies of the prototypes of the full data set and of each cluster regarding variables FKS and FBS, respectively. The distribution of the FKS variable of clusters 4 and 5 stand out from the others, due to being complete opposites of each other, with the former being on the lower end of the score range. Clusters 1 and 3 have an identical range score. The difference between them relates to the fact that cluster 1 had a higher proportion of higher scores, while the majority of the scores of cluster 3 are concentrated in the mid-range of the scale. Cluster 2 presents the most similar distribution to the whole data set, due to most of the groups belonging to this cluster. Lastly, cluster 6 show relatively low scores, despite 40% of the scores being considerable high.

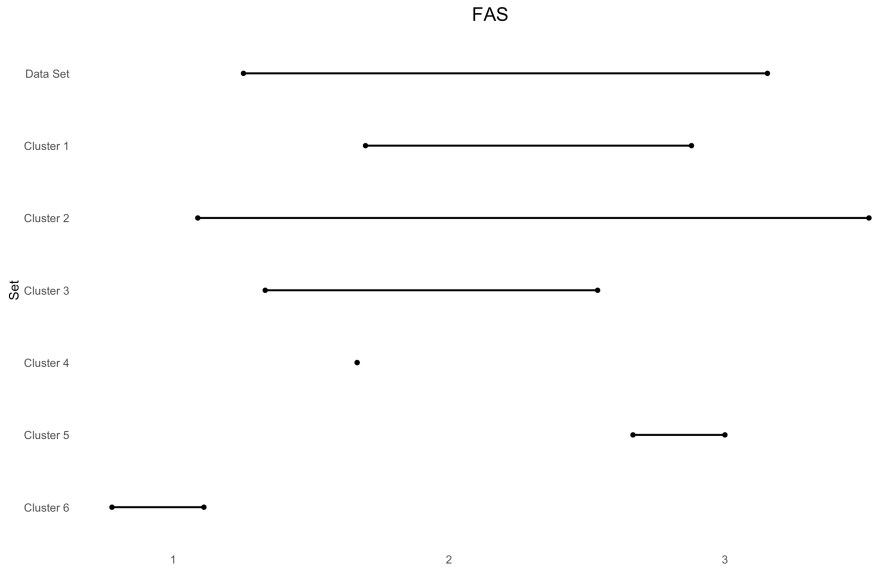


Figure 6.4: Representation of the prototypes of the clusters for the FAS variable from the 2015 symbolic clustering.

Looking at the values from the FBS table, the results of clusters 2, 4, 5 are very similar to the previous variable. Clusters 1 and 3 have fairly similar score ranges, but contrary to what we saw in the FKS variables, cluster 3 now has the highest portion of high values. The cluster 6 results clearly show very low score range.

Prototypes	**FBS**
Data Set	$0(\frac{5}{366})$; $1(\frac{17}{366})$; $2(\frac{39}{366})$; $3(\frac{47}{366})$; $4(\frac{57}{366})$; $5(\frac{62}{366})$; $6(\frac{56}{366})$; $7(\frac{52}{366})$; $8(\frac{27}{366})$; $9(\frac{4}{366})$
Cluster 1	$1(\frac{2}{28})$; $2(\frac{2}{28})$; $3(\frac{8}{28})$; $4(\frac{10}{28})$; $5(\frac{3}{28})$; $6(\frac{3}{28})$
Cluster 2	$0(\frac{4}{299})$; $1(\frac{9}{299})$; $2(\frac{25}{299})$; $3(\frac{33}{299})$; $4(\frac{42}{299})$; $5(\frac{55}{299})$; $6(\frac{52}{299})$; $7(\frac{50}{299})$; $8(\frac{26}{299})$; $9(\frac{3}{299})$
Cluster 3	$1(\frac{4}{28})$; $2(\frac{8}{28})$; $3(\frac{5}{28})$; $4(\frac{5}{28})$; $5(\frac{4}{28})$; $6(\frac{1}{28})$; $8(\frac{1}{28})$
Cluster 4	2(1)
Cluster 5	$7(\frac{2}{3})$; $9(\frac{1}{3})$
Cluster 6	$0(\frac{1}{5})$; $1(\frac{2}{5})$; $2(\frac{1}{5})$; $3(\frac{1}{5})$

Table 6.2: Symbolic description of the prototypes of the clusters for the FBS variable from the 2015 symbolic clustering.

The plots of the prototypes of the FAS and GFLI variables in Figures 6.4 and 6.5, respectively, mimic the results obtained in the previous variables, where we see that cluster 1 and 3 intervals have similar ranges, despite the latter tending to be on the lower end of the score scale. Cluster 2 has the most similar intervals to the whole data set due to the reason mentioned. Clusters 4 and 5 intervals sit on opposite sides of the scale with former having the highest min and max scores. Finally, cluster 6 shows the lowest intervals out of all clusters,

Linking these results to financial literacy, cluster 1 represents the groups with a moderate

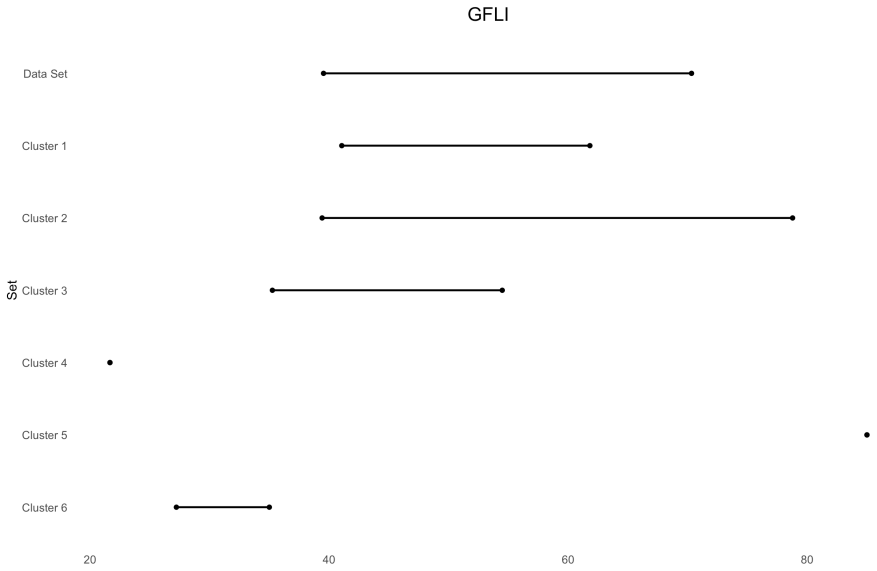


Figure 6.5: Representation of the prototypes of the clusters for the GFLI variable from the 2015 symbolic clustering.

level of financial literacy, though the results of all four variables consistently fell on the higher end. This suggests that these groups are knowledgeable on financial matters, but struggle to put them in practice. Cluster 2 closely mirrors the overall distribution of the whole data set, with nearly 89% of the symbolic groups. The wide results seen in all four components can be explained by inequalities between the more and less developed regions of the country related to opportunities and easy access to financial information.

The results from cluster 3 exhibit a pattern similar to cluster 1, although now the scores tend to fall in the middle-to-lower range. Both clusters have similar demographic characteristics in terms of region and age. The main distinction is that cluster 3 has a higher proportion of female individuals, a group that historically shown lower levels of financial literacy. The same reasoning can be applied to cluster 4, as its composed of exclusively female groups, which when combined with the fact they are from less developed areas, and that their ages sit in the youngest and oldest brackets, explain the lower level of financial literacy. In contrast, cluster 5 clearly exhibits elevated scores of financial literacy, likely due to higher education levels or frequent exposure to financial products. Notably, these results reject the assumption that groups from less developed areas are not able to achieve higher scores.

Finally, cluster 6 consistently showed low scores across all financial variable. Being composed of both younger and older groups of people from less populated areas of the country, these groups often have limited access to financial resources, products, or education, thus explaining the lower levels of financial literacy obtained.

6.3.3 Results from the 2020 data set

Tables E.3 and E.4 show the results from the application of the clustering algorithm to the 2020 symbolic data set. Cluster 1 is composed of 70 groups, while the others are composed of less than 10 groups each. Similarly to the previous survey, groups of the smaller clusters were mostly from less developed and less populated areas of the country. Meanwhile in cluster 1, 38 out of the total 70 groups were from more developed regions of Portugal, namely, Centre,

Lisbon, and North. Regarding the gender, female groups were more predominant in clusters 3 and 5, men in clusters 1 and 6, and cluster 4 had one female and one male group. Looking at the age groups, we also see a similar pattern to the 2015 groups in the smaller clusters, where the younger groups had ages between 16 and 24 years old, and the older groups 70 and more, meaning the groups reflective of the active population belonged exclusively to cluster 1.

Table 6.3 presents the distribution of the FKS scores of each cluster and the whole data set. The results clearly show that cluster 1 has the most similar distribution to the entire data set, mainly due its size. Clusters 2 and 5 had generally moderate-to-high scores, despite their small proportion of very low scores of 0 and 1 points, respectively. Cluster 3 had the worst scores, seeing that all score were below 4 points, while cluster 4 shows the complete opposite, with all groups obtaining perfect scores.

Prototypes	**FKS**
Data Set	$0(\frac{36}{420})$; $1(\frac{53}{420})$; $2(\frac{57}{420})$; $3(\frac{62}{420})$; $4(\frac{58}{420})$; $5(\frac{57}{420})$; $6(\frac{56}{420})$; $7(\frac{41}{420})$
Cluster 1	$0(\frac{32}{388})$; $1(\frac{47}{388})$; $2(\frac{54}{388})$; $3(\frac{56}{388})$; $4(\frac{56}{388})$; $5(\frac{54}{388})$; $6(\frac{50}{388})$; $7(\frac{39}{388})$
Cluster 2	$0(\frac{2}{7})$; $4(\frac{1}{7})$; $5(\frac{1}{7})$; $6(\frac{3}{7})$
Cluster 3	$0(\frac{2}{13})$; $1(\frac{5}{13})$; $2(\frac{3}{13})$; $3(\frac{3}{13})$
Cluster 4	7(1)
Cluster 5	$1(\frac{1}{10})$; $3(\frac{3}{10})$; $4(\frac{1}{10})$; $5(\frac{2}{10})$; $6(\frac{3}{10})$;

Table 6.3: Symbolic description of the prototypes of the clusters for the FKS variable from the 2020 symbolic clustering.

The FBS score distribution table referenced in 6.4 shows very similar results to the ones observed in the FKS table, where cluster 1 shows the most similar distribution to the data set, and cluster 3 had the worst scores out of all the clusters. We see that clusters 2 and 4 had fairly good scores, with most of them being above 5, despite having a lower score of 2 and 3 points, respectively. The opposite situation is seen in cluster 5, where most had scores below 4, despite a small portion having an very high score of 8 points.

The plot of the FAS prototypes seen in 6.6 show that cluster 1, once again, had the most similar interval to the one of the data set. Despite clusters 2 and 3 having smaller intervals, their placing is fairly central in relation to the data set, meaning most groups had fairly average scores in the component. Cluster 4's interval corresponds to a single point of 2.16, also a relatively average score. Cluster 5, however, shows the worst interval score out of all clusters, where the upper limit does not reach the 1.5 point mark.

Looking now at the plot of the GFLI prototypes depicted in 6.7, we evidently see that clusters 3 and 5 have the worst intervals on this variable, seeing that both sit in the lower portion of the plot between 25 and 45 points. Cluster 1 has the widest interval, very similar to the data set due to the same reason described above. The intervals of clusters 2 and 4 sit on the higher portion, with cluster's corresponding to a single point just above 70 points.

Overall, the results from cluster 1 mirrored the data set, with scores centered around the middle. Because most groups came from developed regions, their levels of financial literacy tend to be higher due to being able to access more opportunities and resources to improve it,

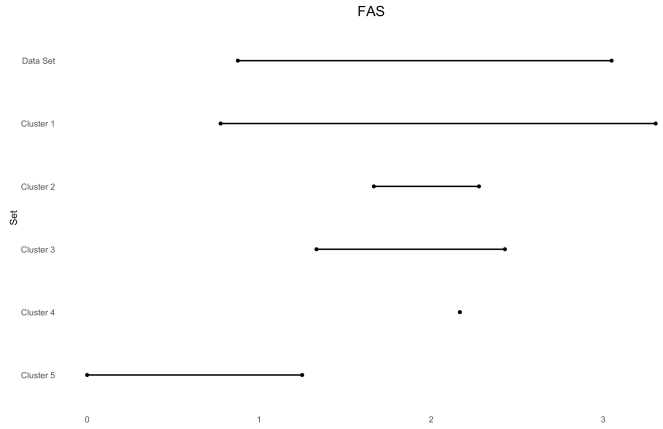


Figure 6.6: Representation of the prototypes of the clusters for the FAS variable from the 2020 symbolic clustering.

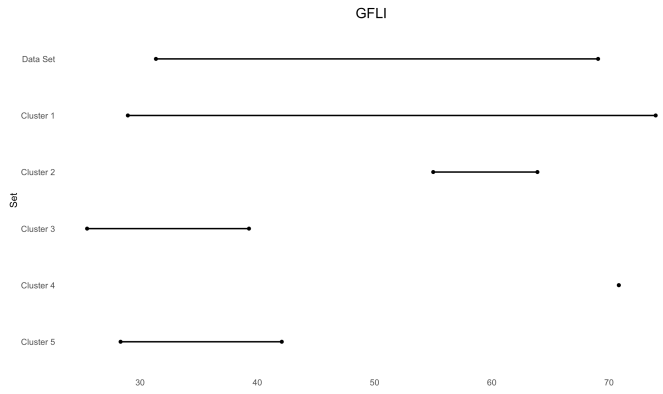


Figure 6.7: Representation of the prototypes of the clusters for the GFLI variable from the 2020 symbolic clustering.

Prototypes	FBS
Data Set	$0(\frac{4}{387})$; $1(\frac{19}{387})$; $2(\frac{42}{387})$; $3(\frac{64}{387})$; $4(\frac{67}{387})$; $5(\frac{61}{387})$; $6(\frac{57}{387})$; $7(\frac{46}{387})$; $8(\frac{26}{387})$; $9(\frac{1}{387})$
Cluster 1	$0(\frac{3}{350})$; $1(\frac{13}{350})$; $2(\frac{37}{350})$; $3(\frac{53}{350})$; $4(\frac{62}{350})$; $5(\frac{61}{350})$; $6(\frac{51}{350})$; $7(\frac{44}{350})$; $8(\frac{25}{350})$; $9(\frac{1}{350})$
Cluster 2	$2(\frac{1}{8})$; $6(\frac{6}{8})$; $7(\frac{1}{8})$
Cluster 3	$1(\frac{2}{16})$; $2(\frac{2}{16})$; $3(\frac{7}{16})$; $4(\frac{5}{16})$
Cluster 4	$3(\frac{1}{2})$; $7(\frac{1}{2})$
Cluster 5	$0(\frac{1}{11})$; $1(\frac{4}{11})$; $2(\frac{2}{11})$; $3(\frac{3}{11})$; $8(\frac{1}{11})$

Table 6.4: Symbolic description of the prototypes of the clusters for the FBS variable from the 2020 symbolic clustering.

which when united with the lower scores from the less developed regions, those scores balance each other out. Cluster 2 showed moderate-to-high results in all three financial component variables. The considerable portion of high scores obtained was offset by the very low scores in the FKS and FBS variables, which taking into consideration the composition of this cluster, contradicts the general idea that older groups in less developed areas have a weaker financial literacy level.

In cluster 3, the mid-range score obtained in the FAS variable were not sufficient to counter the well below average scores obtained in the two financial components. The inexperience of the younger groups, specially from the less developed areas is one of the main reasons for the scores obtained, paired with the fact that female individuals tend to have lower financial literacy levels explain the results obtained. Cluster 4 achieved the highest scores, obtaining strong results across all variables. Seeing that the two groups are complete opposite in all three demographic characteristic, we can then infer that factors like their level of education, or occupation, might be the motives behind their scores and their grouping.

Lastly, the results from cluster 5 show consistent lower scores in all variables, despite some registering a few high scores. These results clearly indicate that younger female individuals have an overall overall limited exposure to financial concepts and practical experience, which then conditions their ability to make informed financial decisions.

6.3.4 Results from the 2023 data set

In Tables 6.5 and 6.6 we can see the relative frequencies of each cluster, and whole data set, regarding the set-valued variables FKS and FBS of from the 2023 symbolic data set. In the former we see that the distribution of cluster 1 is the most similar to the whole data set, due to being composed by a vast majority of the groups of the population. Cluster 2 has a smaller distribution, where the scores fall around the mid-range portion. Cluster 3 is undeniably the cluster with the lowest distribution, where every group obtained a score of 1. Lastly, cluster 4 presented also a wide distribution, despite nearly half of the scores being below 4 points.

The symbolic description of the FBS scores of each cluster show that clusters 1 and 4 had a similar behavior to the FKS variable: both had a wider spread of the scores, and cluster 4 scores were concentrated on the lower end of the point scale. Clusters 2 and 3 are also quite similar, considering that most scores sit on the lower end, between 0 and 3, and a few of the

Prototypes	FKS
Data Set	$0(\frac{19}{397})$; $1(\frac{44}{397})$; $2(\frac{60}{397})$; $3(\frac{73}{397})$; $4(\frac{68}{397})$; $5(\frac{60}{397})$; $6(\frac{54}{397})$; $7(\frac{19}{397})$
Cluster 1	$0(\frac{12}{329})$; $1(\frac{28}{329})$; $2(\frac{51}{329})$; $3(\frac{59}{329})$; $4(\frac{57}{329})$; $5(\frac{56}{329})$; $6(\frac{48}{329})$; $7(\frac{18}{329})$
Cluster 2	$3(\frac{4}{6})$; $4(\frac{2}{6})$
Cluster 3	1(1)
Cluster 4	$0(\frac{7}{52})$; $1(\frac{9}{52})$; $2(\frac{9}{52})$; $3(\frac{8}{52})$; $4(\frac{8}{52})$; $5(\frac{4}{52})$; $6(\frac{6}{52})$; $7(\frac{1}{52})$

Table 6.5: Symbolic description of the prototypes of the clusters for the FKS variable from the 2023 symbolic clustering.

scores are on the mid-high portion of the scale, more precisely, scores above 4.

Prototypes	FBS
Data Set	$0(\frac{21}{408})$; $1(\frac{29}{408})$; $2(\frac{48}{408})$; $3(\frac{64}{408})$; $4(\frac{63}{408})$; $5(\frac{64}{408})$; $6(\frac{56}{408})$; $7(\frac{42}{408})$; $8(\frac{20}{408})$; $9(\frac{1}{408})$
Cluster 1	$0(\frac{8}{341})$; $1(\frac{14}{341})$; $2(\frac{40}{341})$; $3(\frac{53}{341})$; $4(\frac{55}{341})$; $5(\frac{58}{341})$; $6(\frac{53}{341})$; $7(\frac{40}{341})$; $8(\frac{19}{341})$; $9(\frac{1}{341})$
Cluster 2	$0(\frac{2}{10})$; $1(\frac{3}{10})$; $2(\frac{1}{10})$; $3(\frac{1}{10})$; $5(\frac{1}{10})$; $7(\frac{2}{10})$
Cluster 3	$0(\frac{4}{8})$; $1(\frac{1}{8})$; $3(\frac{1}{8})$; $4(\frac{1}{8})$; $6(\frac{1}{8})$
Cluster 4	$0(\frac{7}{49})$; $1(\frac{11}{49})$; $2(\frac{7}{49})$; $3(\frac{9}{49})$; $4(\frac{7}{49})$; $5(\frac{5}{49})$; $6(\frac{2}{49})$; $8(\frac{1}{49})$

Table 6.6: Symbolic description of the prototypes of the clusters for the FBS variable from the 2023 symbolic clustering.

The representation of the prototypes of the FAS variable shown in 6.8 clearly indicate that cluster 4 has the worst interval despite its wide range, seeing it is the only one where the lower limit is below the 1 point mark. Cluster 1 is practically identical to the data set's distribution, although its the upper limit is higher. Cluster 2's interval sits on the lower end of the point scale, while cluster 3 sits right at the middle point range of 2.

Finally, looking at the plot of the GFLI variable in Figure 6.9, we see that representations of the data set, cluster 1, and cluster 4, are very similar to the ones observed in the FAS. The cluster 2 prototype sits on the lower-to-mid range of the plot, while cluster 3 has the smallest prototype on the lower scores scale.

The results from cluster 1 are similar to the overall dataset, with distributions centered on mid-to-high scores across the four variables. As seen in the previous years, these moderate levels of financial literacy resulted from the two different realities between highly developed and less developed areas of the country.

In cluster 2, the groups show a tendency towards lower levels of financial literacy, despite recording a few high scores in behaviors components, which is expected considering its composed solely by female individuals aged 17–24 from less developed regions, who typically lack financial experience.

Cluster 3 consists mainly of individuals over 70 years old, which explains the below average results in all variables, except for FAS where its interval sits at the mid-range. Nonetheless,

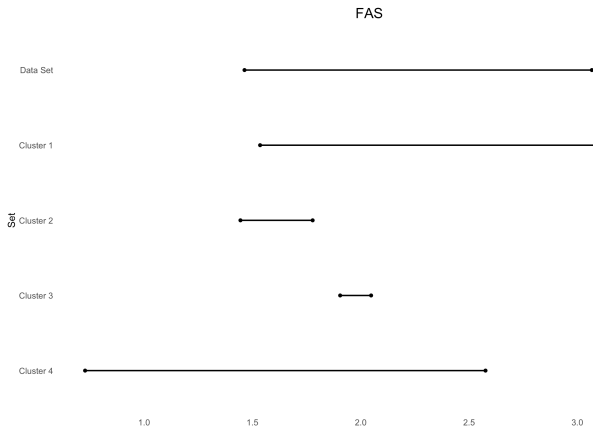


Figure 6.8: Representation of the prototypes of the clusters for the FAS variable from the 2023 symbolic clustering.

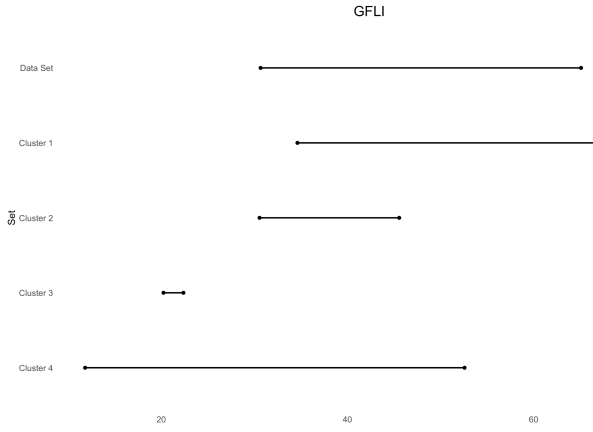


Figure 6.9: Representation of the prototypes of the clusters for the GFLI variable from the 2023 symbolic clustering.

these results are indicative show a healthy and responsible financial approach towards money, most likely due to their extensive experience with personal finances.

Finally, cluster 4 shows a resemblance of the distributions of the overall data set, though its results lean towards lower-to-moderate scores, mostly due to the vast proportion of younger groups, whose limited experience with finances lead to a weak outcome of their overall level of financial literacy.

6.4 MEC Framework

To study the evolution of the segments of the population over the years, we applied the MEC Framework to the clusters obtained in the symbolic clustering, and analyzed the results of the pairs 2015-2020 and 2020-2023.

Figure 6.10 represents the graph obtained through the application of the MEC Framework to monitor the cluster transitions between all three years.

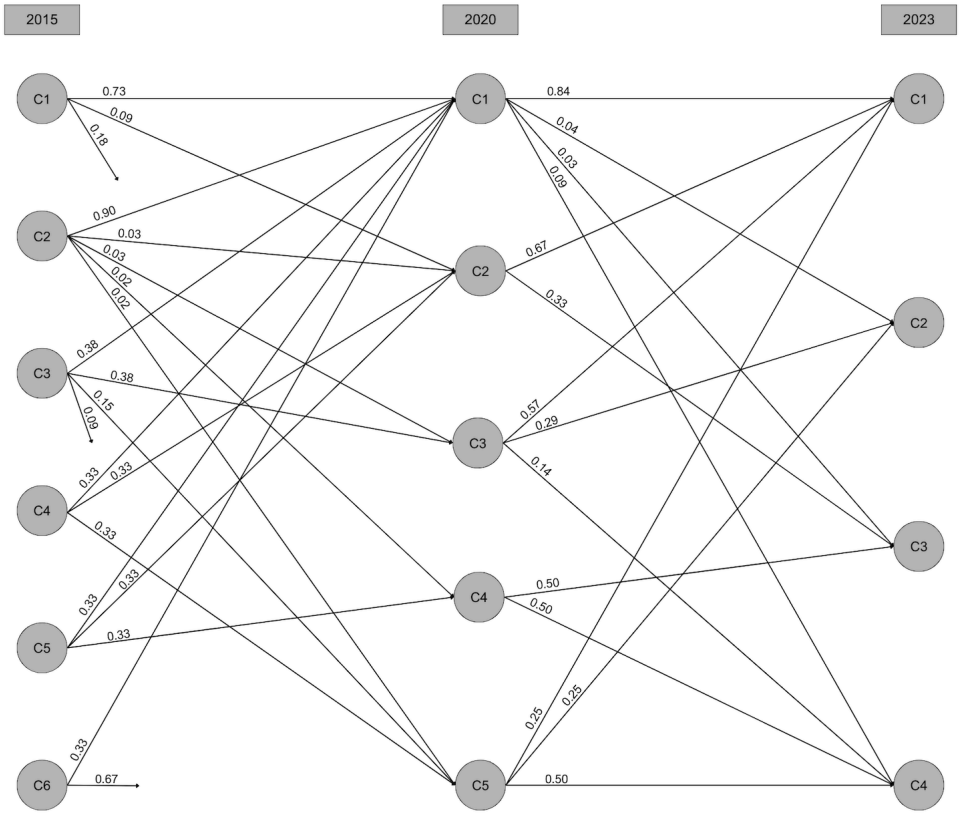


Figure 6.10: Cluster Monitoring Graph 2015-2020-2023.

2015-2020

- Three births: $\emptyset \to C_3(2020), \emptyset \to C_4(2020), \emptyset \to C_5(2020)$
- One death: $C_6(2015) \to \emptyset$
- Three splits:
  $C_3(2015) \overset{\subseteq}{\to} \{C_1(2020), C_3(2020)\}$;

$C_4(2015) \overset{\subsetneq}{\to} \{C_1(2020), C_2(2020), C_5(2020)\}$;
$C_5(2015) \overset{\subsetneq}{\to} \{C_1(2020), C_2(2020), C_4(2020)\}$

- One merge: $\{C_1(2015), C_2(2015)\} \overset{\subsetneq}{\to} C_1(2020)$

2020-2023

- Two merges:
  $\{C_1(2020), C_2(2020), C_3(2020)\} \overset{\subsetneq}{\to} C_1(2023)$;
  $\{C_4(2020), C_5(2020)\} \overset{\subsetneq}{\to} C_4(2023)$

Looking at Figure 6.10, we observe several changes in the cluster structure, especially in the 2015–2020 transitions. When analyzing these, we took into account the composition of clusters and groups, since many clusters consist of only a few groups and most groups are composed by very few individuals. In practice, this means that certain changes do not have the same impact as others. For this reason, we focused our analysis on transitions where conditional probabilities were higher than 50% in the pairs 2015–2020 and 2020–2023. In particular, we observed that $C_1(2015)$,$C_3(2015)$, and $C_6(2015)$ have arrows extending outside of any group, indicating groups of individuals that do not appear in any of the clusters from 2020.

The transitions that fitted our requirement can be categorized into two different types: a) transitions from a smaller to a bigger cluster, such as the case of $C_1(2015) \to C_1(2020)$ and $C_2(2020) \to C_1(2023)$; and b) transitions related to the bigger cluster evolution seen in $C_2(2015) \to C_1(2020) \to C_1(2023)$. Because of their smaller size, we decided to analyze the results of each group individually for transitions if type a). As for the type b) transitions, we opted to analyzed the results of the groups as a whole.

The plots in Figures 6.11, F.1, and F.2 in the Appendix, as well as Figure 6.12 show the changes occurred in the groups of individuals from $C_1(2015)$ that transitioned to $C_1(2020)$. The composition of $C_1(2015)$ is fairly small with just 11 groups: two female groups from the AR Azores aged [16-17] and [18-24]; one female group aged [40-54] from the AR Madeira; two male groups aged [18-24] and [40-54] from AR Madeira; three male groups aged [16-17], [18-24], and [70-79] from Alentejo; one male group from Algarve aged [55-69]; one male group from the Centre region aged [18-24]; and one male group aged [16-17] from the North region. In this transition, only eight groups transitioned to $C_1(2020)$.

In the FKS variable, most groups observed a decline in their scores, except for the AR Madeira male groups where we saw an improvement of scores, and "AR Açores Female [18-24]" group that remained stable.

The FBS changes over the 2015 to 2020 period, saw the older groups to have a general increase of their higher scores, and a decrease of the lower. On the other hand, the younger groups from the AR regions saw an improvement of their scores, while the mainland ones saw an overall expansion on both higher and lower ends of the scores.

Regarding the FAS and GFLI variables, we see an overall improvement of the intervals from 2015 to 2020 in the groups from the AR regions, and a general decrease in the minimum values in the mainland groups.

These results show a consistent decline in financial literacy levels among mainland groups. Due to these being from less populated ares of the country, the uneven access to resources and opportunities could explain the results obtained. In contrast, groups from the AR regions

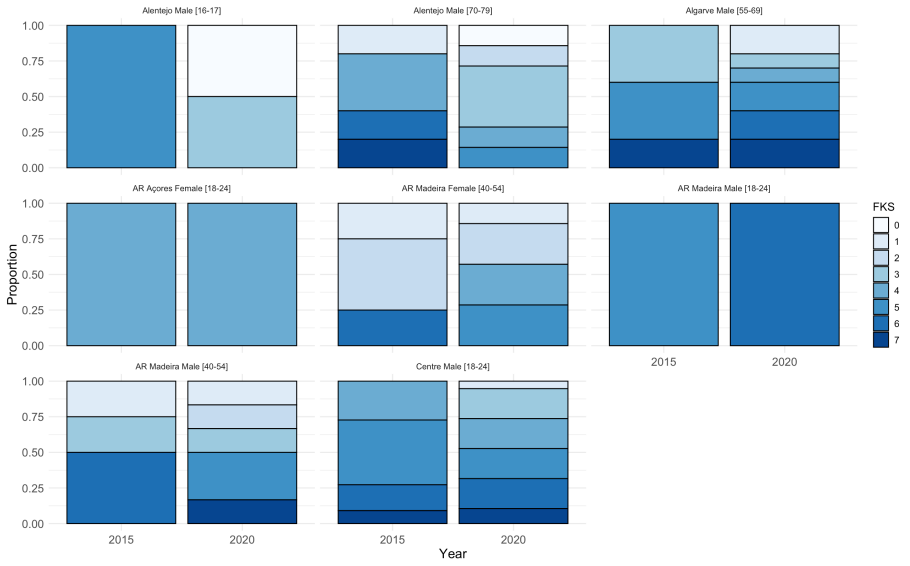


Figure 6.11: Financial Knowledge Score variation between $C_1(2015)$ and $C_1(2020)$.

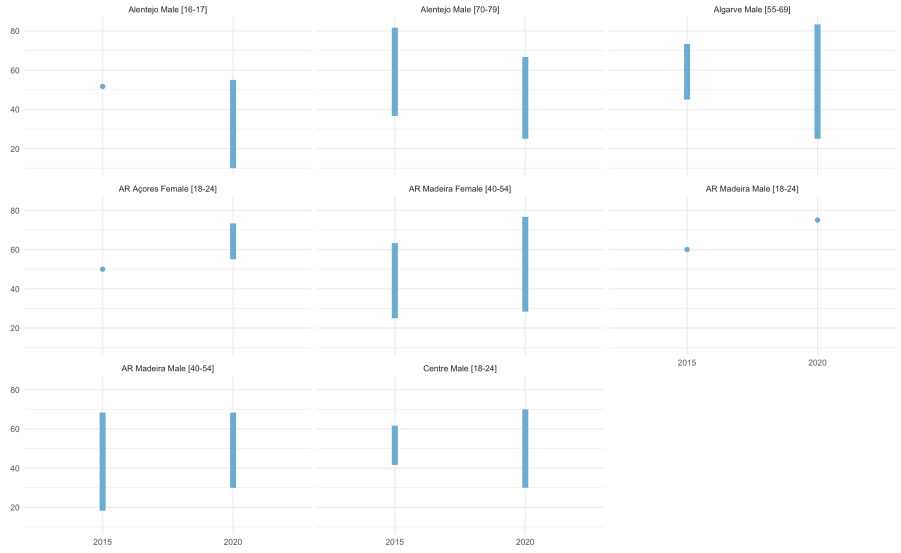


Figure 6.12: Global Financial Literacy Index variation between $C_1(2015)$ and $C_1(2020)$.

showed consistently better outcomes over this period, particularly in the younger group, who generally benefit from easier access to financial information and products that help improve their overall literacy.

Regarding the changes in clusters composition, we see that in Subsection 6.3.2 of the symbolic clustering analysis that $C_1(2015)$ showed moderate levels of financial literacy, where the financial knowledge variable stood out from the others due to its higher proportion of scores above 5 points, meaning that these groups have the knowledge, but fail to apply it. When compared to the composition of $C_2(2020)$ (see Table E.3), we see the main difference to be the vast size of the cluster, meaning its distribution is very similar to the whole data set. Because of that, the moderate financial literacy levels seen in this cluster were caused by the mixture of high and low values in each of the financial variables from the developed and

underdeveloped regions of the country, respectively.

Now looking at the other transition from type a), Figure F.3, 6.13, F.4, and 6.14 show the changes in the groups that transitioned from $C_2(2020)$ to $C_1(2023)$. Cluster 2 from 2020 is composed by only six groups, namely, "AR Açores Female [70-79]", "AR Açores Male [80+]", "AR Madeira Male [18-24]", "AR Madeira Male [70-79]", "Algarve Female [70-79]", and "Algarve Male [70-79]". Only the four of these groups transitioned to cluster 1 from 2023: the female and male groups from Algarve aged [70-79], and two male groups from AR Madeira aged [18-24] and [70-79].

The FKS results showed mixed trends changes: while the "Algarve Female [70-79]" and "AR Madeira Male [70-79]" saw a decrease in their values, the other two groups saw the opposite trend, with the younger group achieving a perfect score in this variable.

In the FBS variable, we see a general decrease of the values from 2020 to 2023 in each of the groups, though group "Algarve Male [70-79]" had a small portion of individuals that presented a higher score than the previous year.

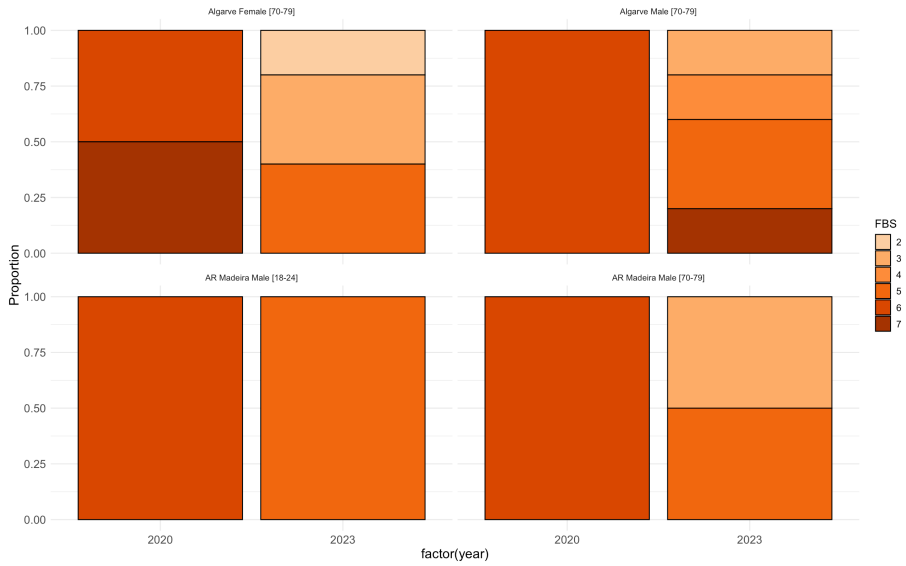


Figure 6.13: Financial Behavior Score variation between $C_2(2020)$ and $C_1(2023)$.

The results from the FAS variable show a consistent results in the "Algarve Female [70-79]" groups, while "AR Madeira Male [18-24]" saw a decrease in its interval. The other two groups saw an increase in their minimum and maximum values from the year before, with the group from the male AR group having achieving better scores than the corresponding mainland one.

The GFLI scores indicate a decrease in three out of the four groups, albeit some more accentuated than other. The "Algarve Male [70-79]", on the contrary, saw a very positive increase in its interval.

The results above do not show a clear trend across groups or variables, meaning the changes occurred due to group-specific factors and not due to generalized assumptions, such as the low levels of literacy in less developed ares, specially in younger and older age groups.

Reviewing these clusters composition, we see a similar pattern as the one observed in the 2015-2020 transition. $C_2(2020)$ shows a moderate-to-high levels in the GFLI variable, due to their high scores in all variables being slightly canceled out by a small proportion of

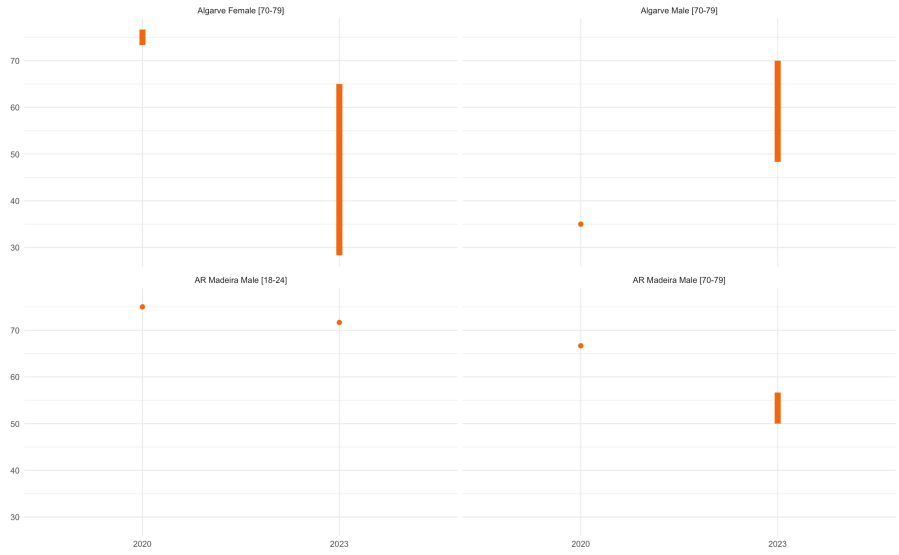


Figure 6.14: Global Financial Literacy Index variation between $C_2(2020)$ and $C_1(2023)$.

lower scores. Due to $C_1(2023)$ being the biggest cluster in size, their overall scores closely mirror the ones from the 2023 data set, where we also have an overall moderate-to-high financial literacy level, due to the same imbalance caused by the lower and high scores from the developed and less developed regions.

Now looking at the transitions of type b), Figures F.5 to F.8 show the changes in the scores of each financial component in the groups that transitioned from $C_2(2015)$ to $C_1(2020)$. In the financial knowledge and behavior variables, we see an increase in the proportion of low scores from 2015 to 2020, more accentuated in the FKS variable. The results from the FAS were identical, meaning the variety of scores spanned over the entire score scale, however, in the global financial literacy index we see a small increase in the maximum value, and a more accentuated drop in the minimum. These results show that the level of financial literacy of a vast group of individuals declined from 2015 to 2020.

Finally, the last transitioned we analyzed was the scores of the groups that transitioned from $C_1(2020)$ to $C_1(2023)$. Figures F.9 to F.12 show the scores distribution of each year for each financial variable. In the FKS plot, we see that the lowest scores 0 and 1 had a significant decrease from 2020. We also see an increase of the proportions of scores 3 and 6, and a decrease in the 7 point share. We can then conclude that we had an overall improvement of the financial knowledge in this time period. The emergence of social media content towards financial literacy over these past few years, could explain the positive impact from previous survey.

The financial behaviors score distribution in Figure F.10 shows a slight increase of the proportion of lower scores, and an loss on the higher ones. These changes in this score are often associated to the detriment of an individual's ability to budget, save money, pay their bills on time, or even set long term financial goals. In the financial attitudes variable (see Figure F.11, on the other hand, shows a small increase of its lower limit, which is a positive indicator that these groups of people see the importance of planning for their financial future and not be careless about it.

Lastly, the changes in the GFLI variable seen in Figure F.12 show a small increase of its

lower score, as well as a slight decline of its upper score, which is the inverse situation we saw in the 2015-2020 transition. Despite this small improvement, we can still see that the general Portuguese population has difficulty when it comes to the application of the financial knowledge obtained.

Chapter 7

Conclusion

7.1 Main Conclusions

The objective of this work was to understand the factors that explained the financial literacy level of the Portuguese population and of specific groups of individuals, by using Clustering and Symbolic Data Analysis on the 2015, 2020, and 2023 financial literacy surveys.

The analysis of the financial component variables showed the financial literacy level of the Portuguese population is situated at a low to moderate score, mostly caused by the slight decline in the scores of the FKS and FBS variables over the years.

The clustering analysis of the 2015, 2020, and 2023 surveys revealed similar results. The clusters that represent individuals with high levels of financial literacy were characterized by having a strong understanding of their current financial situation and are knowledgeable in various financial terms, have a tight control of their financial situation, and are mindful when spending money, and do not possess a careless attitude when it comes to money. In contrast, the clusters representative of low levels of financial literacy show these individuals have a terrible proficiency related to financial terms, often having no knowledge on simple concepts. They have a carefree attitude, and completely disregard the importance of budgeting, saving money, and planning for their financial future. The intermediate clusters have a fairly good knowledge of how inflation and investments work, but they show a great difficulty in applying them. They know how to budget, know how to save money, are aware of their financial situation, but do not set any long term financial goals. In these clusters we saw that the results from FAS was what differentiated the cluster from being on the lower or higher end of the scale of the GFLI variable. The higher the FAS, the higher the level of financial literacy.

Nonetheless, we saw common traits present in all these types of clusters. We concluded that most individuals had difficulty in answering questions that require calculation of interest rates, resorted to credit when their income was insufficient to cover their expenses, had difficulty in discerning a reliable source of information when choosing a financial product, and had a general attitude that could lead to a lack of financial stability. In terms of demographic components, we see that high levels of education were typically associated with high level of financial knowledge and overall financial literacy, and vice-versa. The same can be said for the developed and underdeveloped regions, the former usually showing higher levels of financial knowledge and behaviors. We also were able to conclude that clusters that mostly represented older individuals showed lower levels of financial knowledge, but scored high in the attitudes component.

The results from the symbolic clustering analysis of each survey revealed clear disparities between all three demographic components used to construct the symbolic data set.

While groups from more developed regions generally displayed a higher financial literacy level, we still saw various inequalities in the less populated areas, specifically among women and younger or older groups of individuals, as they consistently exhibited lower levels of financial knowledge. However, there were results that questioned common assumptions, as some clusters composed of groups from less developed areas reached higher scores, thus suggesting that factors such as education level and contact with financial products can compensate regional imbalances.

Across the three years, this analysis highlighted recurring patters, such as that larger clusters tend to mirror the national averages, while smaller ones put into evidence some vulnerabilities, particularly among women in less developed areas and younger adults with very limited financial experience. On the other hand, the higher financial literacy scores were often associated with high education levels, occupation, and access to financial information and opportunities. These observations reveal the importance of creating targeted policies to address the disparities seen in gender and regions in order to enhance the financial knowledge and practical skills across all segments of the Portuguese population.

The MEC Framework analysis showed that the financial literacy of the Portuguese population remained at a low to moderate level between 2015 and 2023. Although some clusters displayed modest improvements in financial behavior and attitudes, these were not sufficient to see significant positive changes, as financial knowledge continued to be the weakest component. This lack of progress in knowledge component hindered the impact of the better practices in behaviors and attitudes, which in turn also prevented a more substantiation evolution of the country's overall financial literacy level.

Persistent difficulties were observed throughout the period, with many individuals struggling with basic interest rate calculations, their reliance on credit to manage expenses, and failure to identify reliable sources when searching financial products.

The framework also confirmed consistent demographic disparities. Populations in more developed regions and with higher education levels consistently obtained better scores, while women, the youngest and oldest groups, and residents of less developed areas remained concentrated in the lowest-performing clusters. The analysis therefore highlighted that financial literacy gaps are not only persistent but also unevenly distributed, reflecting both social and regional inequalities.

7.2 Limitations and Future Work

During this work, one the limitations we saw was the scarcity of packages available in R that are able to compute the complexity of the clustering algorithms for symbolic data and the application of the MEC framework. Another limitation we had was related to the data from the 2010 survey not being usable for this analysis, since this survey was not done under the OECD/INFE guidelines, which could've provided a more complete picture of the evolution of the level of financial literacy over the years.

Regarding future work, it would be interesting to study the influence of the level of schooling level variable, specially if used as one of the grouping variables in the symbolic data analysis. One of measures proposed by the PNFF that has been constantly on the forefront of the news cycle, was the implementation of financial literacy classes in schools, so it would

be interesting the effect of schooling level in the level of financial literacy, specially in the younger groups of the population.

Finally, this work could also serve as a basis for the creation of learning courses targeted specifically to the segments of the Portuguese population that have showed consistently presented low values in the financial knowledge component over the years. The symbolic data analysis could be further developed to aid in the creation of the educational content that could be used and adjusted according to the needs of the different demographic groups.

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Appendix A

National Financial Literacy Surveys

A.1 2015 Survey

A – Profile of the interviewee

- A1 – Region (Record the region of residence) (See quotas)
    1. North
    2. Centre
    3. Lisbon
    4. Alentejo
    5. Algarve
    6. Autonomous Region of Madeira
    7. Autonomous Region of the Azores
- A1.1 – Place
    1. Up to 4,999 inhabitants
    2. From 5,000 to 19,999 inhabitants
    3. From 20,000 to 99,999 inhabitants
    4. 100,000 or more inhabitants
- A2 – Gender (Record the gender of the interviewee) (See quotas)
    1. Female
    2. Male
- A3 – Age (Record the age group of the interviewee) (See quotas)
    1. 16 to 17 years
    2. 18 to 24 years
    3. 25 to 39 years

4. 40 to 54 years
5. 55 to 69 years
6. 70 to 79 years
7. 80 or older

- A4 – What is your level of schooling? (See quotas)

1. No formal education
2. Attended primary education
3. Primary education (4th year)
4. Attended elementary education
5. Elementary education (9th year)
6. Attended secondary education
7. Secondary education (12th year)
8. Attended polytechnic education beyond secondary school
9. Polytechnic education beyond secondary school
10. Attended university education
11. Undergraduate or graduate education
12. More than a completed licentiate degree (Master's/PhD)
13. Does not answer (do not read)

- A5 – What is your current work or occupational situation? (See quotas)

1. Active – Self-employed
2. Active – Employee
3. Active – Trainee/apprentice
4. Active – Unemployed looking for work
5. Not active – Works at home looking after the family
6. Not active – Retired
7. Not active – Disabled/Retired due to sickness or ill-health
8. Not active – Not working and not looking for work
9. Not active – Student
10. Active – Other
11. Not active – Other
12. Does not answer (do not read)

- A6 – Who do you usually live with in your household? (Multiple answer)

1. Alone
2. With spouse/partner

3. With children under the age of 18 (yours or your spouse's/partner's)
4. With children over the age of 18 (yours or your spouse's/partner's)
5. With parents or parents-in-law
6. With other family members
7. With friends, colleagues or students
8. In some other type of household
9. Does not answer (do not read)

- A7 – Who is responsible for making day-to-day decisions about money in your household?

1. You make these decisions by yourself
2. You make these decisions with your spouse/partner
3. You make these decisions in conjunction with another person
4. Someone else makes these decisions
5. Does not know (do not read)
6. Does not answer (do not read)

B – Inclusion in the banking system

- B1 – Do you hold one or more current accounts?

1. Yes → Go to B2
2. No → Go to B4
3. Does not know (do not read) → End the interview (does not count for the sample)
4. Does not answer (do not read) → End the interview (does not count for the sample)

- B2 – How many current accounts do you hold, in total?

1. Number: _____
2. Does not know (do not read)
3. Does not answer (do not read)

- B3 – How often do you use your main bank account, including payments by ATM?

1. More than once a week → Go to C1
2. More than once a month → Go to C1
3. Not every month → Go to C1
4. Almost never over the year → Go to C1
5. Never → Go to C1

6. Does not know (do not read) → End the interview (does not count for the sample)
7. Does not answer (do not read) → End the interview (does not count for the sample)

- B4 – So, please tell me if:

1. You have never had a bank account
2. You have had one in the past, but no longer have a bank account
3. Does not answer (do not read) → Go to C1

- B5 – Why do you not have a bank account?

1. Do not have income to justify it
2. Another person's bank account is sufficient
3. The costs of having a bank account are high
4. Another reason
5. Does not know (do not read)
6. Does not answer (do not read)

C – Planning of household budget and savings

- C1 – Does your household have a budget? How frequently do you plan it?

1. Yes, daily
2. Yes, weekly
3. Yes, monthly
4. Yes, annually
5. Yes, but not regularly
6. No
7. Does not know (do not read)
8. Does not answer (do not read)

The next set of questions concerns only you. Please answer in relation to you and not in relation to your household.

- C2 – Do you save?

1. Yes, regularly
2. Yes, irregularly (extra income, holiday allowance or Christmas bonus, other bonuses…)
3. No → Go to C4
4. Does not answer (do not read)

- C3 – What is the main reason that leads you to save?

1. For non-regular subsequent expenses (holidays, travel...)
2. To buy/replace durable goods (bigger house, furniture, household appliances, means of transport…)
3. For children's education or to help them when they start working
4. To meet unforeseen expenses
5. To use in retirement
6. Other
7. Does not answer (do not read)

→ Go to C5

- C4 – Why do you not save?

1. Your income does not allow it
2. You do not consider it a priority
3. You make unplanned expenses – impulse buying
4. Other reason
5. Does not answer (do not read)

- C5 – In the past 12 months have you been saving money in any of the following ways, whether or not you still have the money. (Multiple answer)

1. Building up a balance of money in your bank account
2. Paying money into a savings account
3. Buying financial investment products, other than pension funds (shares, bonds, investment funds...)
4. Applying the money in another way (transfers to family overseas, purchase of gold, purchase of property, purchase of art, …)
5. Giving money to family to save on your behalf
6. Saving cash at home or in your wallet
7. I did not save (do not read)
8. Does not know (do not read)
9. Does not answer (do not read)

- C6 – If you, personally, faced a major expense today - equivalent to your own monthly income – would you be able to pay it without borrowing the money or asking family or friends to help?

1. Yes
2. No
3. Does not know (do not read)
4. Not applicable – I don't have any personal income (do not read) → Go to C8

5. Does not answer (do not read)

- C7 – Sometimes people find that their income does not quite cover their living costs. In the last 12 months, has this happened to you, personally?

1. Yes → Go to C7.1
2. No → Go to C8
3. Does not know (do not read) → Go to C8
4. Does not answer (do not read) → Go to C8

- C7.1 – What did you do to make ends meet the last time this happened? (Multiple answer)

Existing resources

1. Draw money out of savings or transfer savings into current account
2. Cut back on spending, spend less, do without
3. Sell something that you own

Creating resources

4. Work overtime, earn extra money

Access credit by using existing contacts or resources

5. Borrow from family or friends
6. Borrow from employer (e.g.: loan, salary advance…)
7. Pawn something that you own

Borrow from existing credit line

8. Use overdraft or line of credit
9. Use credit card for a cash advance or to pay bills/buy food

Access additional credit

10. Take out a personal loan from a bank or financial institution
11. Take out a loan from another entity (informal)

Fall behind/go beyond arranged amount

12. Use an overdraft on current account higher than the authorized amount
13. Pay my bills late/miss payments

Other responses

14. Other
15. Does not know (do not read)
16. Does not answer (do not read)

- C8 – If you lost your main source of household income, how long could your household continue to cover living expenses, without borrowing any money or moving house?

    1. Less than a week
    2. At least a week, but not one month
    3. At least one month, but not three months
    4. At least three months, but not six months
    5. More than six months
    6. Does not know (do not read)
    7. Does not answer (do not read)

- C9 – Tell me to what extent you agree with the statements I am going to read. On a scale of 1 to 5, where 1 (totally disagree), 2 (disagree), 3 (neither agree nor disagree), 4 (agree) and 5 (totally agree).

	Totally disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Totally agree**	**Does not answer**
1. Before I buy something I carefully consider whether I can afford it	1	2	3	4	5	6
2. I tend to live for today and let tomorrow take care of itself	1	2	3	4	5	6
3. I find it more satisfying to spend money than to save it for the long term	1	2	3	4	5	6
4. I pay my bills on time	1	2	3	4	5	6
5. I am prepared to risk some of my own money when saving or making investment	1	2	3	4	5	6
6. I keep a close watch on my financial affairs	1	2	3	4	5	6
7. I set long-term financial goals and strive to achieve them	1	2	3	4	5	6
8. Money is there to be spent	1	2	3	4	5	6
9. My financial situation limits my ability to do the things that are important to me	1	2	3	4	5	6
10. I tend to worry about paying my normal living expenses	1	2	3	4	5	6

11. I have too much debt right now	1	2	3	4	5	6
12. I am satisfied with my present financial situation	1	2	3	4	5	6
13. To buy something, I would rather save first	1	2	3	4	5	6
14. When I want to buy something, I immediately resort to credit	1	2	3	4	5	6
15. I tend to buy things in an impulsive manner	1	2	3	4	5	6

- C10 – How confident are you that you have done a good job of making financial plans for your retirement?

  1. Not at all confident
  2. Not very confident
  3. Confident
  4. Very confident
  5. Totally confident
  6. Does not (or did not) plan for retirement (do not read)
  7. Does not know (do not read)
  8. Does not answer (do not read)

- C10.1 – How will you – or do you - fund your retirement? (Multiple answer)

  1. From drawing a government pension (social security or another compulsory scheme)
  2. From an occupational or workplace pension plan
  3. From a private pension plan
  4. From selling your financial assets (such as: stocks, shares, bonds, investment funds…)
  5. From selling your non-financial assets (such as a car, property, art, jewels, antiques…)
  6. From income generated by your financial or non-financial assets
  7. By relying on a spouse or partner to support you
  8. By relying on your children or other family members to support you
  9. Something else
  10. Does not know (do not read)
  11. Does not answer (do not read)

D – Choice and management of financial products

- D1.1 – Please can you tell me whether you have heard of any of these financial products? (Multiple answer)
- D1.2 – Now can you tell me whether you (personally or jointly) currently hold any of these types of products? (Multiple answer)
- D1.3 – In the past two years, which of the following types of financial products have you chosen (personally or jointly) whether or not you still hold them? Please do not include products that were renewed automatically. (Multiple answer)
- D1.4 – Which of these did you choose most recently?

	D1.1 I have heard about them	**D1.2 Have them**	**D1.3 Took them out in the last 2 years**	**D1.4 Took them out more recently**
1. Current account	1	1	1	1
2. Time deposits (savings account)	2	2	2	2
3. Saving certificates/Treasury bills	3	3	3	3
4. Stocks and shares	4	4	4	4
5. Bonds	5	5	5	5
6. Commercial paper	6	6	6	6
7. Investment funds	7	7	7	7
8. Complex financial products	8	8	8	8
9. Pension or retirement product (Do not consider compulsory contributions to social security or other compulsory contribution schemes)	9	9	9	9
10. Insurance	10	10	10	10
11. Credit card	11	11	11	11
12. Bank overdraft	12	12	12	12
13. Home loan or mortgage	13	13	13	13
14. Other loans (e.g.: personal loan, car loan, home)	14	14	14	14
15. Microfinance loan (for professional/ commercial financing)	15	15	15	15
16. Others	16	16	16	16
17. None	17	17	17	17
18. Does not know	18	18	18	18
19. Does not answer	19	19	19	19

- D2 – Which of the following statements best describes how you made your choice?

1. I considered several options from different institutions before making my decision
2. I considered the various options from one institution
3. I looked around but there were no other options to consider
4. I didn't consider any other options at all
5. Does not know (do not read)
6. Does not answer (do not read)

- D3 – (For the product chosen by the interviewee in question D1.4) Which sources of information do you feel most influenced your decision? (Multiple answer)
  General advice

1. Advice from sales staff of the institution where you acquired the product
2. Advice of friends/relatives

Best buy guidance

3. Recommendation from independent financial adviser or broker
4. Specialist magazines/publication

Product specific information

5. Information picked up in a branch of the institution (e.g.: leaflets, flyers,...)
6. Product specific information found on the internet
7. Unsolicited information sent through the post

Adverts

8. Advertising on TV, radio, newspapers…

Media coverage

9. Television or radio programs, newspaper articles…

Other

10. My own previous experience
11. Other
12. Does not know (do not read)
13. Does not answer (do not read)

If D1.2 and D1.3 and D1.4 equal to "None" (Has no Financial Product) → Go to D15

- D4 – Before you take out a financial product (e.g. savings applications, investments, loans, insurance…) do you read the information which the institution gives you on the conditions of the products?

1. Yes, I read it in great detail
2. Yes, I read it in some detail
3. Yes, I read it, but not in great detail
4. I don't read it, I trust what the branch employee conveys me verbally
5. I don't read it, I don't consider it very important
6. Does not answer (do not read)

- D5 – Do you read the contracts of the financial products (e.g. savings applications, investments, loans, insurance …) you take out?

1. Yes, I read it in great detail
2. Yes, I read it in some detail
3. Yes, I read it, but not in great detail
4. I don't read it, I trust in what the branch employee conveys me verbally
5. I don't read it, I don't consider it very important
6. Does not answer (do not read)

If B1=1 and D1.2 = 1 (Current account) → Do D6, D7 and D8. Otherwise → Go to the Note before D9.

- D6 – What is the main reason why you chose the bank where you have your main current account?

1. Recommendation from a family member or friend
2. It is the bank where you have your mortgage loan or other loan
3. It has low fees/costs
4. The account is better remunerated
5. The employer entity requires having an account in this bank
6. Proximity to home or the workplace
7. Other reason
8. Does not answer (do not read)

- D7 – With what frequency do you monitor the movements and balance of your main bank account?

1. Daily
2. More than once a week
3. More than once a month
4. Less than once a month
5. Rarely

6. Never
7. Does not answer (do not read)

- D8 – Do you know the maintenance fee your bank charges for your current account?

1. Yes, the exact amount
2. Yes, approximately
3. No
4. Does not answer (do not read)

If D1.2 = (2 or 3 or 11 or 12 or 13 or 14) (Time Deposit; Saving Certificates/Treasury bills; Credit card; Bank overdraft; Home loans or mortgage loans; Other loans (e.g.: personal loan, car loan, home)) → Do D9 and D10. Otherwise → Go to Note before D11.

- D9 – Do you know the value of the interest rates of the savings applications or loans you have?

1. Yes, always and in the exact value
2. Yes, always and in an approximate value
3. I only ask when I take out the savings product or loan
4. No
5. Does not answer (do not read)

- D10 – And do you compare the interest rates before taking out a savings application or a loan?

1. Yes, among the banks where I am a customer
2. Yes, among the banks where I am a customer and with those of other banks
3. No, I always use my bank
4. No
5. Does not answer (do not read)

If D1.2 = (13 or 14) (Home loan or mortgage loans; Other loans (e.g.: personal loan, car loan, home)) → Do D11. Otherwise → Go to Note before D12.

- D11 – What is the main reason for the choice of your loans (mortgage loan or consumer credit)?

1. Value of instalment
2. Interest rate
3. Annual Percentage Rate of Charge (APR)
4. Repayment period
5. I went to my usual bank

6. I followed the bank's advertising
7. Other
8. Does not answer (do not read)

If D1.2 = (11 or 12 or 13 or 14) (Credit card; Bank overdraft; Home loan or mortgage loans; Other loans (ex: personal loan, car loan, home)) → Do D12. Otherwise → Go to Note before D13.

- D12 – Do you have an idea of how much the service of loans represent on your monthly income?

1. Less than a quarter (25%)
2. Less than half
3. More than half
4. Does not know (do not read)
5. Does not answer (do not read)

If D1.2 = (11 or 12 or 13 or 14) (Credit card; Bank overdraft; Home loan or mortgage loans; Other loans (ex: personal loan, car loan, home)) → Do D13. Otherwise → Go to Note before D14.

- D13 – How did you choose the insurance you have associated to your loans?

1. I had no choice. The insurance was part of the package that was presented to me
2. I checked with other insurance companies but this was the cheapest
3. It was recommended by a family member or friend
4. Other reason
5. I have no insurance associated with the loans
6. Does not answer (do not read)

If D1.2 = 11 (Credit card) → Do D14. Otherwise → Go to D15.

- D14 – What payment scheme do you normally use with your credit card?

1. Pay the next month, in full
2. Pay it off partially
3. Does not know (do not read)
4. Does not answer (do not read)

- D15 – How would you rate your level of risk in relation to investments in financial products?

1. Very risk averse/I do not like to take risks at all
2. Risk averse/I do not like to take risks

3. Neutral in relation to risk/I am indifferent to taking risks
4. Risk prone/I like to take risks
5. Very risk prone/I like to take risks a lot
6. Does not know (do not read)
7. Does not answer (do not read)

- D16 - What attitude best describes your behavior in relation to investments in financial products?

1. The priority is not to lose the money invested
2. The priority is not to lose the money invested, but I can tolerate small losses
3. The priority is to earn money, so I am willing to tolerate moderate losses
4. The priority is to earn as much money as possible, so I am willing to tolerate big losses
5. Does not know (do not read)
6. Does not answer (do not read)

- D17 – How would you rate your knowledge on securities markets and products?

1. Not knowledgeable at all
2. Not very knowledgeable
3. Reasonably knowledgeable
4. Knowledgeable
5. Very knowledgeable
6. Does not know (do not read)
7. Does not answer (do not read)

For the next set of questions, consider investments in securities such as stocks, bonds, investment units, government debt securities, derivatives (such as futures and options), among others.

- D18 – Do you currently have investments in any security (including individual portfolio management services)? Confirm with the interviewee that answer D1.2 = 4 or 5 or 6 or 7 or 8

1. Yes, I do
2. Not now, but I had in the past → Go to D26
3. I have never had any → Go to D32
4. Does not know (do not read) → Go to D35
5. Does not answer (do not read) → Go to D35

- D19 – What percentage of your total assets does your current securities portfolio represent?

1. Between 0 and 10%
2. From 10% to 25%
3. From 25% to 50%
4. More than 50%
5. Does not know (do not read)
6. Does not answer (do not read)

- D20 – How do you normally finance your investments in securities?

1. Own savings
2. Resort to credit
3. Both, own savings and credit
4. Does not know (do not read)
5. Does not answer (do not read)

- D21 – As a rule, what would you do in the case of a sharp drop in the price of a security held by you?

1. I would sell the security immediately
2. I would not sell it and would seek advice
3. I would not sell it and I would wait for the price to go up
4. I would buy more securities
5. Other
6. Does not know (do not read)
7. Does not answer (do not read)

- D22 – What reasons would make you decide to invest in securities? (Multiple answer)

1. Tax reasons
2. The return is higher than bank deposits
3. I like the risk
4. Out of habit
5. Friends/acquaintances/family members also invest
6. Advised by the account/bank manager
7. Earn capital gains
8. Other reasons
9. Does not know (do not read)
10. Does not answer (do not read)

- D23 – What is most important when choosing your investments in securities?

1. Tax reasons
2. The return is higher than bank deposits
3. I like the risk
4. Out of habit
5. Friends/acquaintances/family members also invest
6. Advised by the account/bank manager
7. Earn capital gains
8. Other reasons
9. Does not know (do not read)
10. Does not answer (do not read)

- D24 – If you lost money with investments made in the securities markets, why would you say you lost the money?

1. I have never lost money
2. Market vicissitudes
3. Good luck or bad luck
4. Bad advice
5. Other
6. Does not know (do not read)
7. Does not answer (do not read)

- D25 – How often do you carry out transactions involving securities? → Go to D35

1. More than once a week
2. More than once a month
3. Not every month
4. Almost never throughout the year
5. Never
6. Does not know (do not read)
7. Does not answer (do not read)

- D26 – What was most important when choosing your investments in securities?

1. The advice of the account/bank manager
2. The advice of friends
3. The evolution of prices
4. The dividends you were expecting to receive
5. Preference for large companies
6. Preference for well-known companies

7. Technical analysis
8. Other
9. Does not know (do not read)
10. Does not answer (do not read)

- D27 – If you lost money with investments made in the securities markets, why would you say you lost the money?

1. I have never lost money
2. Market vicissitudes
3. Good luck or bad luck
4. Bad advice
5. Other
6. Does not know (do not read)
7. Does not answer (do not read)

- D28 – How often did you carry out transactions involving securities?

1. More than once a week
2. More than once a month
3. Not every month
4. Almost never throughout the year
5. Never
6. Does not know (do not read)
7. Does not answer (do not read)

- D29 – What was the main reason why you stopped investing in securities?

1. I lost money
2. I needed liquidity
3. It is too risky
4. You need to keep a close eye on things
5. I only earned capital gains sporadically
6. I do not know anything about this
7. I was influenced to buy
8. Termination or maturity of the security (example: bonds)
9. Other
10. Does not know (do not read)
11. Does not answer (do not read)

- D30 – What is the main reason why you do not have securities at present?

    1. The income does not justify it
    2. Not knowledgeable enough to invest in securities
    3. These investments are too risky
    4. The costs of having a securities account are high
    5. Lost money in a past investment
    6. Other reason
    7. Does not know (do not read)
    8. Does not answer (do not read)

- D31 – What would have to happen for you to decide to invest in securities once again? (Multiple answer) → Go to D34

    1. Have more money
    2. Higher return on securities
    3. Low interest rates on term deposits
    4. Have more information on securities
    5. Have more trust in the securities market
    6. There must be greater stability in the economy
    7. Not thinking of investing or investing once again
    8. Other
    9. Does not know (do not read)
    10. Does not answer (do not read)

- D32 – What is the main reason why you do not have securities?

    1. The income does not justify it
    2. Not knowledgeable enough to invest in securities
    3. These investments are too risky
    4. The costs of having a securities account are high
    5. Lost money in a past investment
    6. Other reason
    7. Does not know (do not read)
    8. Does not answer (do not read)

- D33 – What would have to happen for you to start investing in securities? (Multiple answer)

    1. Have more money
    2. Higher return on securities

3. Low interest rates on term deposits
4. Have more information on securities
5. Have more trust in the securities market
6. There must be greater stability in the economy
7. Not thinking of investing or investing once again
8. Other
9. Does not know (do not read)
10. Does not answer (do not read)

- D34 – What is your biggest fear in relation to the securities market?

1. Crash (sharp, sudden and generalized drop in prices)
2. Ease of manipulation of the Portuguese securities market/abuse of insider knowledge
3. High risk level/realization of losses
4. Dependence of the Portuguese market on external conditions
5. Lack of liquidity in the market
6. Expensive investment (high broker commissions or stock exchange fees)
7. Other
8. Does not know (do not read)
9. Does not answer (do not read)

- D35 – Do you currently have any insurance? (car, fire, life, health, accidents at work insurance). Confirm with the interviewee that answer D1.2 = 10

1. Yes → Go to D38
2. No
3. Does not know (do not read)
4. Does not answer (do not read)

- D36 – Then please tell me if:

1. You have never had insurance
2. You had insurance in the past but you no longer have insurance
3. Does not answer (do not read)

- D37 – What is the main reason why you do not have insurance? → Go to Note before D45

1. Do not have assets that are worth protecting
2. The costs of insurance are too high
3. Prefer to bear directly the risks that may occur

4. Other
5. Does not know (do not read)
6. Does not answer (do not read)

- D38 – Did you buy or subscribe any of the following products in the last two years? (Multiple answer) Confirm with the interviewee that answer D1.3 = 10

1. Life insurance
2. Car loan insurance
3. Fire/multi-risk home insurance
4. Health insurance
5. Capitalization operation
6. Retirement Savings Plan
7. Other
8. Did not subscribe insurance
9. Does not know (do not read)
10. Does not answer (do not read)

- D39 – What was the main reason that led you to take out insurance?

1. Compliance with a legal obligation
2. Guarantee the financial security of the members of my family
3. Tax reasons
4. Security of the investment
5. Profitability of the investment
6. Advice from friends/family members
7. Other
8. Does not answer (do not read)

- D40 – What was the main reason that led you to choose the insurance company where you have your insurance?

1. Recommendation of a family member or friend
2. Recommendation of an insurance broker
3. Recommendation of the bank where I have a mortgage loan or other loan
4. It was the cheapest one
5. It was the one that presented the best product
6. Other
7. Does not answer (do not read)

- D41 – In the last 3 years did you think of changing your insurance to another insurance company?

    1. Yes, and I have already changed it → Go to D43
    2. Yes, but I have never changed it
    3. No
    4. Does not answer (do not read)

- D42 – Why did you not change to another insurance company? → Go to D44

    1. High costs involved
    2. It takes too much time to change to another insurance company
    3. I am happy with the current insurance company
    4. Uncertain about the benefit of changing
    5. Other
    6. Does not answer (do not read)

- D43 – Why did you change insurance companies?

    1. I found a cheaper alternative
    2. Dissatisfied with the service provided
    3. The insurance was not suited to my objective
    4. Recommendation of a friend/family member
    5. Recommendation of my insurance broker
    6. Other
    7. Does not answer (do not read)

- D44 – Have you ever benefited from insurance (for example, after a car accident, theft or fire)?

    1. Yes, once
    2. Yes, more than once
    3. Never
    4. Does not answer (do not read)

  Ask question D45 if D1.2 = 9 (Retirement Savings Plan)

- D45 – Does your retirement savings plan:

  If D1.2 = (1 to 10) (Current account; Term deposits; Saving certificates/Treasury bills; Shares; Bonds; Commercial paper; investment funds; Complex financial products; Retirement savings plans; Insurance) → Do D46. Otherwise go to E1

	Yes	No	Does not know (do not read)	Does not answer (do not read)
1. Have guaranteed capital	1	2	3	4
2. Have guaranteed income	1	2	3	4

- D46 – How often do you read information regarding the profitability of your applications in financial products?

    1. Very often
    2. Not very often
    3. As a rule, I do not
    4. Does not know (do not read)
    5. Does not answer (do not read)

E – Choice and awareness of information sources

- E1 – What type of information do you follow regularly?

	Yes	No
1. General news on the economy	1	2
2. News on the real-estate market	1	2
3. News on the stock market	1	2
4. Changes in interest rates	1	2
5. Legislation and regulations on financial products	1	2
6. Other	1	2

- E2 – What other sources of information do you normally resort to when you want to obtain information on financial products? (Multiple answer)

    1. Account/bank manager
    2. Financial intermediary/insurance broker
    3. Friends/family members/colleagues
    4. Specialty newspapers (paper or online)
    5. Other press (paper or online)
    6. Television/radio
    7. Internet (except the press)
    8. Others
    9. Does not know (do not read)
    10. Does not answer (do not read)

- E3 – What entity would you consult, or have you consulted, in the event of disagreement/misunderstanding about a financial product? (Multiple answer)

    1. To the supervisory body (Banco de Portugal, Comissão do Mercado de Valores Mobiliários or Autoridade de Supervisão de Seguros former Instituto de Seguros de Portugal)
    2. Courts
    3. Consumer associations (e.g.: Deco, Sefin, etc.)
    4. Ministry of Finance
    5. Other
    6. Does not know (do not read)
    7. Does not answer (do not read)

- E4 – What entity would you consult, or have you consulted, in the event of inability to pay the installments of your loans? (Multiple answer)

    1. Family
    2. Your bank
    3. Banco de Portugal
    4. Consumer associations (e.g.: Deco, Sefin, etc.)
    5. Assistance Network for Over-indebted Consumers
    6. Ministry of Finance
    7. Other
    8. Does not know (do not read)
    9. Does not answer (do not read)

F – Financial understanding

- F1 – Could you tell me how you would rate your overall knowledge about financial matters compared with the Portuguese population?

    1. Very high
    2. Quite high
    3. About average
    4. Quite low
    5. Very low
    6. Does not know (do not read)
    7. Does not answer (do not read)

- F2 – Imagine that five brothers are given a gift of 1000 euros in total. If the brothers have to share the amount equally how much does each one get?

    1. Record response: _____

2. Does not know (do not read)
3. Does not answer (do not read)

- F2.1 – Now imagine that the brothers have to wait for one year to get their share of the 1000 euros and inflation stays at 2%. In one year's time will they be able to buy:

  1. More than they could today
  2. The same amount
  3. Less than they could buy today
  4. It depends on the types of things that they want to buy (do not read)
  5. Does not know (do not read)
  6. Does not answer (do not read)

- F3 – You lend 25 euros to a friend one evening and he gives you 25 euros back the next day. How much interest has he paid on this loan?

  1. Amount: _____
  2. Does not know (do not read)
  3. Does not answer (do not read)

- F4 – Suppose you put 100 Euros into a no fee and tax free savings account with a guaranteed interest rate of 2% per year. You don't make any further payments into this account and you don't withdraw any money. How much would be in the account at the end of the first year, once the interest payment is made?

  1. Amount: _____
  2. Does not know (do not read)
  3. Does not answer (do not read)

- F4.1 – How much would be in the account at the end of 5 years? (Considering that no fees or taxes are charged and that at the end of each year you leave the amount of interest in the same savings account)

  1. More than 110 Euros
  2. Exactly 110 Euros
  3. Less than 110 Euros
  4. It is impossible to tell from the information given
  5. Does not know (do not read)
  6. Does not answer (do not read)

- F5 – I would like to know whether you think the following statements are true or false:

- F6 – Do you know that there are basic bank accounts?

	T	F	Does not answer
1. If you pay off your credit card balance partially, you do not pay interest.	1	2	3
2. If you withdraw money at the ATM with your credit card, you pay fees on that amount.	1	2	3
3. The insurance premium is the price paid for the insurance.	1	2	3
4. High inflation means that the cost of living is increasing rapidly	1	2	3
5. An investment with a high return is likely to be high risk.	1	2	3
6. It is usually possible to reduce the risk of investing in the stock market by buying a wide range of stocks and shares.	1	2	3

1. Yes
2. No → Go to F8
3. Does not answer (do not read) → Go to F8

- F7 – What is necessary to have access to basic bank accounts?

1. To have a low income
2. To be unemployed
3. To have only one current account
4. Does not know (do not read)
5. Does not answer (do not read)

I am going to ask you to look at the following statement of a current account.

Bank ABC, S. A.

Current account – Account statement as at 20 April 2015		EUR	
Date	Description	Amount	Balance
	Previous balance		110.00
24-03-2015	ATM withdrawal	-60.00	50.00
30-03-2015	Transfer of salary	1,200.00	1,250.00
01-04-2015	Transfer to term deposit	-120.00	1130.00
02-04-2015	Mortgage loan instalment	-525.00	605.00
03-04-2015	Mobile phone	-40.00	565.00
08-04-2015	Supermarket	-210.00	355.00
12-04-2015	Electricity	-60.00	295.00
13-04-2015	Restaurant	-40.00	255.00
16-04-2015	Cheque	-70.00	185.00
18-04-2015	ATM withdrawal	-50.00	135.00
20-04-2015	XPT petrol station	-35.00	100.00
	Available balance		100.00
	Authorised balance		1,060.00

- F8 – According to this statement, what is the balance of the current account that can be used as at 20 April 2015 without the use of a bank overdraft?

    1. 110 euros
    2. 100 euros
    3. 1,060 euros
    4. 1,160 euros
    5. Does not know (do not read)
    6. Does not answer (do not read)

- F9 – Suppose that the insurance of your car, in an amount of 150 euros, will be debited on 21 April 2015. Is the balance of the account sufficient to meet this payment?

    1. No
    2. Yes, but the account will have an overdraft of 50 euros
    3. Yes, the balance of the account is sufficient, an overdraft is not necessary
    4. Yes, but the account will have an overdraft of 150 euros
    5. Does not know (do not read)
    6. Does not answer (do not read)

- F10 – For most mortgage loans, the interest rate paid to the bank is indexed to a reference rate, which is normally the "Euribor". Please tell me if the Euribor:

    1. Is a rate defined by the Portuguese Government
    2. Is a rate defined by Banco de Portugal
    3. Is a rate defined by the European Central Bank
    4. Is the rate resulting from the loans made amongst a group of European banks
    5. Does not know (do not read)
    6. Does not answer (do not read)

- F11 – Do you know what the "spread" is?

    1. Does not know
    2. It is the total interest rate charged by your bank on loans
    3. It is the increase established by your bank in relation to a reference interest rate, which may vary from customer to customer
    4. It is the increase established by your bank in relation to a reference interest rate, which is the same for all customers
    5. It is an interest rate defined by your bank according to the amount of the loans
    6. Other
    7. Does not answer (do not read)

- F12 – In an insurance contract, the deductible corresponds to:

    1. The amount of the indemnity which is borne by the insurer
    2. The amount of the indemnity which is borne by the insured
    3. Does not know (do not read) → Go to F14
    4. Does not answer (do not read) → Go to F14

- F13 – The higher the deductible:

    1. The lower the price of the insurance
    2. The higher the price of the insurance
    3. Does not know (do not read)
    4. Does not answer (do not read)

- F14 – In an insurance contract, the grace period corresponds to:

    1. The period of time during which the insurance or a certain insurance coverage cannot be used
    2. The period of time taken by the insurer to pay the indemnity of the accident
    3. Does not know (do not read)
    4. Does not answer (do not read)

- F15 – Classify, on a scale from 1 to 3, the following financial products by degree of risk, related to the chance of getting back the money invested.

	Low	**Average**	**High**	**Does not answer**
1. Shares	1	2	3	4
2. Bonds	1	2	3	4
3. Saving certificates/Treasury bills	1	2	3	4
4. Investment funds	1	2	3	4
5. Financial derivative instruments (e.g.: CFD, warrants, Forex, Swaps)	1	2	3	4
6. Retirement/savings plans	1	2	3	4
7. Term deposits	1	2	3	4

- F16 – What does it mean for a security to have guaranteed capital on the maturity date?

    1. I am entitled to receive the capital invested at any time
    2. On the maturity date I always receive the capital invested
    3. The issuer of the security reimburses the capital invested on the maturity date, provided it has the financial conditions to do so
    4. Does not know (do not read)

5. Does not answer (do not read)

- F17 – If you had to choose a financial investment to invest in the long term, usually which of the following should give you more money at the end?

    1. Portuguese government bonds
    2. Shares
    3. Investment funds
    4. Term deposits
    5. Capitalization insurance
    6. Saving certificates
    7. Other
    8. Does not know (do not read)
    9. Does not answer (do not read)

- F18 – Normally, which of the assets below has greater price fluctuations over time?

    1. Bonds
    2. Investment fund
    3. Pension fund
    4. Retirement savings plan
    5. Shares
    6. Does not know (do not read)
    7. Does not answer (do not read)

- F19 – If a company goes bankrupt, which of the following assets is more likely to worth close to zero?

    1. Senior bonds of the company
    2. Subordinated bonds of the company
    3. Shares of the company
    4. Does not know (do not read)
    5. Does not answer (do not read)

- F20 – You invested in a fixed-rate bond. In the meantime, interest rates in the market declined. If you sell that bond, the price should be:

    1. Higher than the price you paid for it
    2. Lower than the price you paid for it
    3. The same price that you paid for it
    4. Does not know (do not read)
    5. Does not answer (do not read)

- F21 – In which of these categories does your household gross monthly income falls into?

    1. No income
    2. Up to 500 euros
    3. Between 500 and 1000 euros
    4. Between 1000 and 2500 euros
    5. Over 2500 euros
    6. Does not know (do not read)
    7. Does not answer (do not read)

A.2 2020 Survey

A – Profile of the interviewee

- A1 – Region (Record the region of residence) (See quotas)
    1. North
    2. Centre
    3. Lisbon
    4. Alentejo
    5. Algarve
    6. Autonomous Region of Madeira
    7. Autonomous Region of the Azores
- A1.1 – Place
    1. Up to 4,999 inhabitants
    2. From 5,000 to 9,999 inhabitants
    3. From 10,999 to 49,999 inhabitants
    4. From 50,000 to 99,999 inhabitants
    5. 100,000 or more inhabitants
- A2 – Gender (Record the gender of the interviewee) (See quotas)
    1. Male
    2. Female
- A3 – Age (Record the age group of the interviewee) (See quotas)
  Age: _____ years old
- A4 – What is your level of education?
    1. No formal education
    2. Attended primary school
    3. Completed primary school (4th year)
    4. Attended lower secondary school or middle school
    5. Completed lower secondary school or middle school (9th year)
    6. Attended upper secondary school or high school
    7. Completed upper secondary school or high school (12th year)
    8. Attended university level education (e.g. degree or higher-level vocational training)
    9. Completed university level education (e.g. degree or higher-level vocational training)

10. More than a completed licentiate degree (Master's/PhD)
11. Does not reply (do not read) → Questionnaire ends

- A5 – What is your current work or occupational situation? (See quotas)

1. Active – Self-employed
2. Active – Employee
3. Active – Trainee/apprentice
4. Active – Unemployed looking for work
5. Not active – looking after the home
6. Not active – Retired
7. Not active – Disabled/Retired due to sickness or ill-health
8. Not active – Not working and not looking for work
9. Not active – Student
10. Active – Other
11. Not active – Other
12. Does not reply (do not read) → Questionnaire ends

- A6 – Who do you usually live with in your household? (Multiple answer)

1. Alone
2. With spouse/partner
3. With children under the age of 18 (yours or your spouse's/partner's)
4. With children over the age of 18 (yours or your spouse's/partner's)
5. With other young people under the age of 18
6. With parents or parents-in-law
7. With other relatives
8. With friends, colleagues or students
9. In some other type of household
10. Does not reply (do not read)

- A6.1 - How many adults (aged 18 or over) live in your household, including yourself?
  Number: _____

- A6.2 - How many children under the age of 18 live in your household, including yourself??
  Number: _____

B - Financial Inclusion

- B1 - Do you have one or more current accounts?

1. Yes

2. No → Go to B4
3. Does not know (do not read) → Questionnaire ends
4. Does not reply (do not read) → Questionnaire ends

- B2 - How many current accounts do you have, in total?

1. Number: _____
2. Does not know (do not read)
3. Does not reply (do not read)

- B3 – How often do you use your main bank account, including payments with your bank card or at the ATM?

1. More than once a week → Go to C1
2. More than once a month → Go to C1
3. Not every month → Go to C1
4. Almost never over the year → Go to C1
5. Never → Go to C1
6. Does not know (do not read) → Questionnaire ends
7. Does not reply (do not read) → Questionnaire ends

- B4 – Why don't you have a bank account?

1. Does not have the income to justify it
2. Another person's bank account is sufficient
3. The costs of having a bank account are high
4. Other reason
5. Does not know (do not read)
6. Does not reply (do not read)

Go to group D

C - Management of the Bank Account

- C1 – What is the main reason why you chose the bank where you have your main current account?

1. Recommendation from family or friend
2. It is the bank where I have the mortgage loan or other loan
3. It has low fees/costs
4. Employer requires an account in that bank
5. Proximity to home or workplace

6. Other reason
7. Does not reply (do not read)

- C2 – How often do you check the movements and the balance of your main current account?

  1. Daily
  2. More than once a week
  3. More than once a month
  4. Less than once a month
  5. Rarely
  6. Never
  7. Does not reply (do not read)

- C3 – Do you know the maintenance fees that your bank charges for your current account?

  1. Yes, the exact amount
  2. Yes, approximately
  3. No
  4. Does not reply (do not read)

- C4 – Banks provide access to the account and other banking products and services on digital channels, for example through home banking or mobile applications (apps). Which do you use?

  1. Uses both (home banking and apps)
  2. Uses only home banking
  3. Uses only apps (mobile phone applications)
  4. Does not use them → Go to C7
  5. Does not reply (do not read) → Go to group D

- C5 – On average, how often do you use home banking or apps?

	1. Home banking	**2. Apps**
Almost daily	1	1
At least once a week	2	2
At least once every two weeks	3	3
At least once a month	4	4
Less than once a month	5	5
Does not reply (do not read)	6	6

	1. Home banking	2. Apps
Checking of account movements and balance	1	1
Payment of services	2	2
Transfers	3	3
Taking out a time deposit	4	4
Subscribing insurance	5	5
Investing in bonds, shares or investment funds	6	6
Taking out consumer credit	7	7
Opening of a current account	8	8
Does not reply (do not read)	9	9

- C6 – Which services did you use in digital channels in the last 2 years? (Multiple)

- C7 – What is the main reason why you do not use digital channels?

  1. Does not access the internet regularly
  2. Has difficulty in dealing with technology
  3. Does not have appropriate financial knowledge
  4. Does not trust they are safe
  5. Is concerned with sharing personal data
  6. Does not know the applicable legislation
  7. Prefers personal contact/branch
  8. Prefers to use the ATM
  9. Does not know (do not read)
  10. Does not reply (do not read)

D – Planning of Personal Finances

- D1 – Do you make day-to-day decisions about your own money?

  1. Yes
  2. No
  3. Does not reply (do not read)

- D2 – Who is responsible for making day-to-day decisions about money in your household?

  1. You make these decisions by yourself
  2. You make the decisions with your spouse/partner
  3. You make the decisions with another person
  4. Someone else makes these decisions
  5. Does not know (do not read)

6. Does not reply (do not read)

- D3 – Do you do any of the following for yourself or your household? (Multiple)

1. Make a plan to manage your income and expenses
2. Keep a note of your spending
3. Keep money for bills separate from day-to-day spending money
4. Make a note of upcoming bills to make sure you don't miss them
5. Use a banking app or a money management tool to keep track of your outgoings
6. Arrange automatic payments for regular outgoings
7. None of the above (do not read)
8. Does not reply (do not read)

The next set of questions concerns only you. Please answer in relation to yourself and not in relation to your household.

- D4 – Do you usually save?

1. Yes, regularly
2. Yes, irregularly (extra income, holiday allowance or Christmas bonus, bonuses…)
3. No → Go to D6
4. Does not reply (do not read) → Go to D7

- D5 – What is your main reason for saving?

1. For later non-regular expenses (holidays, travel...)
2. To purchase/replace durable goods (bigger house, furniture, household appliances, means of transport…)
3. For education or initial help for children
4. To meet unforeseen expenses
5. To use in retirement
6. Other
7. Does not reply (do not read) → Go to D7

- D6 – Why do you not save?

1. Income does not allow it
2. Does not consider it a priority
3. Makes unplanned expenses – impulse buying
4. Other
5. Does not reply (do not read)

- D7 – In the past 12 months have you been (personally) saving money in any of the following ways, whether or not you still have the money? (Multiple)

1. Building up a balance of money in your current account
2. Paying money into a savings account
3. Buying bonds
4. Investing in stocks or investment funds
5. Investing in crypto-assets or ICOs
6. Saving or investing in some other way (transfers to family abroad, buying gold, buying property, buying art objects, …)
7. Saving cash at home or in your wallet
8. Giving money to family to save on your behalf
9. I did not save in the last year
10. Does not reply (do not read)

- D8 – If you, personally, faced a major expense today – equivalent to your own monthly income – would you be able to pay it without borrowing the money or asking family or friends to help?

1. Yes
2. No
3. Does not know (do not read)
4. Not applicable – does not have personal income (do not read)
5. Does not reply (do not read)

- D9 – Some people set themselves financial goals, such as paying university fees, buying a car or becoming debt free. Do you have any financial goal?

1. Yes
2. No → Go to D11
3. Does not know (do not read) → Go to D11
4. Does not reply (do not read) → Go to D11

- D10 – What actions have you taken to meet your most important goal? (Multiple)

1. Prepared a plan of action
2. Increased your credit card or loan repayments
3. Saved or invested money
4. Looked for new/different/additional source of income
5. Identified a source of credit
6. Cut-back on spending
7. Something else
8. Nothing

9. Does not know (do not read)
10. Does not reply (do not read)

- D11 – Sometimes people find that their income does not quite cover their living expenses. In the last 12 months, has this happened to you, personally?

  1. Yes
  2. No → Go to D12
  3. Does not know (do not read) → Go to D12
  4. Not applicable – does not have personal income (do not read) → Go to D12
  5. Does not reply (do not read) → Go to D12

- D11.1 – What did you do to make ends meet the last time this happened? (Multiple)

  Existing resources

  1. Draw money out of savings or transfer savings into current account
  2. Cut back on spending, spend less, do without
  3. Sell something that you own

  Additional resources

  4. Work overtime, take an extra job, earn extra money
  5. Claim support from the government
  6. Ask for help from family or friends

  Access credit by using existing contacts or resources

  7. Borrow from family or friends
  8. Borrow from employer/salary advance
  9. Pawn something that you own

  Borrow from existing credit line

  10. Use authorized arranged overdraft or line of credit
  11. Use credit card for a cash advance or to pay bills/buy food

  Access additional credit

  12. Take out a personal loan from a bank or other institution
  13. Take out a loan from another entity (informal)

  Fall behind/go beyond arranged amount

  14. Use an overdraft on current account higher than authorised amount
  15. Pay my bills late; miss payments

Other responses

16. Other
17. Does not know (do not read)
18. Does not reply (do not read)

- D12 – If you lost your main source of income, how long could you continue to cover your living expenses, without borrowing any money or moving house?

1. Less than a week
2. At least a week, but not one month
3. At least one month, but not three months
4. At least three months, but not six months
5. Six months or more
6. Does not know (do not read)
7. Does not reply (do not read)

- D13 – Tell me to what extend you agree with the statements I am going to read. Please use a scale of 1 to 5, where: 1 (totally disagree), 2 (disagree), 3 (neither agree nor disagree), 4 (agree) and 5 (totally agree).

	Totally disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Totally agree**	**Does not reply**
1. I find it more satisfying to spend money than to save it for the long term	1	2	3	4	5	6
2. I am prepared to risk some of my own money when saving or making an investment	1	2	3	4	5	6
3. Money is there to be spent	1	2	3	4	5	6
4. I am satisfied with my present financial situation	1	2	3	4	5	6
5. I keep a close personal watch on my financial affairs	1	2	3	4	5	6
6. I use my mobile phone to make or receive payments	1	2	3	4	5	6
7. My financial situation limits my ability to do the things that are important to me	1	2	3	4	5	6

8. I set long term financial goals and strive to achieve them	1	2	3	4	5	6
9. I have too much debt right now	1	2	3	4	5	6
10. If I borrow money I have a responsibility to pay it back	1	2	3	4	5	6

- D14 – And how often would you say the following statements apply to you? Please use a scale of 1 to 5, where: 1 (never), 2 (rarely), 3 (sometimes) 4 (often) and 5 (always).

	Never	**Rarely**	**Sometimes**	**Often**	**Always**	**Does not reply**
1. I tend to worry about paying my normal living expenses	1	2	3	4	5	6
2. My finances control my life	1	2	3	4	5	6
3. Before I buy something I carefully consider whether I can afford it	1	2	3	4	5	6
4. I have money left over at the end of the month	1	2	3	4	5	6
5. I pay my bills on time	1	2	3	4	5	6
6. I tend to buy things on impulse	1	2	3	4	5	6

- D15 – Tell me to what extend you agree with the statements I am going to read. Please use a scale of 1 to 5, where: 1 (totally disagree), 2 (disagree), 3 (neither agree nor disagree), 4 (agree) and 5 (totally agree).

	Totally disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Totally agree**	**Does not reply**
1. I tend to live for today and let tomorrow take care of itself	1	2	3	4	5	6
2. I am just getting by financially	1	2	3	4	5	6
3. I am concerned that my money won't last	1	2	3	4	5	6

4. Because of my money situation, I feel like I will never have the things I want in life	1	2	3	4	5	6

- D16 – How confident are you that you are doing (have done) a good job of making financial plans for your retirement?

  1. Totally confident
  2. Very confident
  3. Confident
  4. Not very confident
  5. Not at all confident
  6. Does not (or did not) plan for retirement (do not read)
  7. Does not know (do not read)
  8. Does not reply (do not read)

- D17 – And how will you – or do you – fund your retirement? (Multiple)

  1. Draw a government pension (social security or another compulsory scheme)
  2. Draw an occupational or workplace pension plan
  3. Draw a private pension plan
  4. Sell your financial assets (such as stocks, bonds or investment funds)
  5. Sell your non-financial assets (such as a car, property, art, jewels, antiques)
  6. From income generated by your financial or non-financial assets (such as dividends or rental income)
  7. Rely on a spouse or partner to support you
  8. Rely on your children or other family members to support you
  9. Draw on your savings
  10. Continue to work
  11. From the revenues of a business that you own
  12. Other
  13. Does not know (do not read)
  14. Does not reply (do not read)

E – Choice and Management of Financial Products

- E1.1 – Can you tell me whether you have heard of the following financial products? (Multiple)

- E1.2 – Can you tell me whether you (personally or jointly) currently hold any of these types of products? (Multiple)

- E1.3 – In the last two years, which of the following financial products have you purchased? Answer even if you no longer have the products. Do not include products that were automatically renewed. (Multiple)

- E1.4 – And which of these have you purchased most recently?

	E1.1 Have heard about it	**E1.2 Have it**	**E1.3 Purchased in the last 2 years**	**E1.4 Purchased most recently**
1. Current account	1	1	1	1
2. Time deposits (savings account)	2	2	2	2
3. Saving certificates/Treasury bills	3	3	3	3
4. Stocks and shares	4	4	4	4
5. Bonds	5	5	5	5
6. Investment funds	6	6	6	6
7. Pension or retirement product (disregarding compulsory social security contributions or other compulsory contribution schemes)	7	7	7	7
8. Insurance	8	8	8	8
9. Credit card	9	9	9	9
10. Bank overdraft	10	10	10	10
11. Home loan or mortgage	11	11	11	11
12. Other loans (e.g.: personal loan, car, household loan)	12	12	12	12
13. A microfinance loan (for professional/ commercial financing)	13	13	13	13
14. MBWay	14	14	14	14
15. Cryptoassets (such as cryptocurrencies or virtual currencies) or ICOs	15	15	15	15
16. Crowdfunding	16	16	16	16
17. Others	17	17	17	17
18. None	18	18	18	18
19. Does not know	19	19	19	19
20. Does not reply	20	20	20	20

(NOTE: If E1.2 and E1.3 and E1.4 equal "None" – no Financial Product → Go to E12)
(NOTE: If E1.4 equals "None" → Go to E4)

- E2 – And which of the following statements best describes how you made your most recent choice?

    1. I considered several options from different institutions before making my decision
    2. I considered various options from one institution
    3. I looked around but there were no other options to consider
    4. I didn't consider any other options at all
    5. Does not know (do not read)
    6. Does not reply (do not read)

- E3 – And which of these sources of information do you feel most influenced your decision? (Multiple)

    Advice

    1. Advice from sales staff of the institution where you purchased the product
    2. Advice from friends or family

    Best buy guidance

    3. A recommendation from an independent financial advisor
    4. Specialist product comparisons or best-buy guidance (such as specialist magazine, or a price comparison website)

    Product specific information

    5. Information picked up in a branch of the institution (e.g. leaflets, flyers, etc)
    6. Information on the internet

    Adverts

    7. Advertising on TV, radio, newspapers…

    Other

    8. My own previous experience
    9. Other
    10. Does not know (do not read)
    11. Does not answer (do not read)

- E4 – Before purchasing a financial product (e.g. savings applications, investments, loans, insurance...) do you read the information provided by the institution on the conditions of the products?

    1. Yes, I read it in great detail
    2. Yes, I read it in some detail

3. Yes, I read it, but not in detail
4. I don't read it, I trust in what the bank employee conveys me verbally
5. I don't read it, I don't consider it that important
6. Does not reply (do not read)

- E5 – Do you read the contracts of the financial products (e.g. savings, investments, loans, insurance) you purchase?

1. Yes, I read them in great detail
2. Yes, I read them in some detail
3. Yes, I read them, but not in detail
4. I don't read them, I trust in what the bank employee conveys me verbally
5. I don't read it, I don't consider it that important
6. Does not reply (do not read)
7. Does not apply (do not read)

(NOTE: Answer E6 and E7 if E1.2 = 2 or 3 or 9 or 10 or 11 or 12 (Time deposits; Savings Certificates; Credit cards; Bank overdraft; Home or mortgage loans; Other loans (e.g. personal, car, household)). Otherwise, skip to NOTE before E8)

- E6 – Do you know the interest rates of the savings applications or loans you have?

1. Yes, always and the exact amount
2. Yes, always and an approximate amount
3. I only ask for information when I take out the savings product or loan
4. No
5. Does not reply (do not read)

- E7 – And do you compare interest rates before you invest in savings or take out a loan?

1. Yes, from the banks where I am a customer
2. Yes, from the banks where I am a customer and from those practiced by other banks
3. No, I always use my bank
4. No
5. Does not reply (do not read)

(NOTE: Answer E8 if E1.2 = 2 or 3 or 4 or 5 or 6 or 7 or 8 (Time deposits; Certificates; Shares; Bonds; Investment funds; Pension; Insurance). Otherwise, skip to NOTE before E9)

- E8 – How often do you consult information on the profitability of your investments in financial products?

1. Very often
2. Not very often
3. As a rule, I don't consult any information
4. Does not know (do not read)
5. Does not reply (do not read)

(NOTE: Answer E9 if E1.2 = 11 or 12 (Home or mortgage loan; Other loans (e.g. personal, car, household)). Otherwise, skip to Note before E10)

- E9 – What is the main criterion you used to choose your loans (mortgage or consumer credit)?

1. Amount of the instalment
2. Interest rate
3. Annual percentage rate of charge (APR)
4. Repayment term
5. I went to my usual bank
6. I followed the bank's advertising
7. Other
8. Does not reply (do not read)

(NOTE: Answer E10 if E1.2 = 9 or 10 or 11 or 12 (Credit card; Bank overdraft; Home or mortgage loan; Other loans (e.g. personal, car, household)). Otherwise, go to Note before E11)

- E10 – Do you have an idea of how much the service of loans represent on your household's net monthly income?

1. Less than a quarter (25%)
2. Less than half
3. More than half
4. Does not know (do not read)
5. Does not reply (do not read)

(NOTE: Answer E11 if E1.2 = 9 (Credit card). Otherwise, Go to E12)

- E11 – Which payment scheme do you usually use for your credit card?

1. Pays off the next month, in full
2. Pays off partially
3. Does not know (do not read)
4. Does not reply (do not read)

- E12 – In the last 2 years, have you experienced any of the following issues? (Multiple)

1. Accepted advice to invest in a financial product that you later found to be a scam (such as a pyramid scheme)
2. Accidentally provided financial information in response to an email or phone call that you later found out was not genuine
3. Discovered that someone has used your credit card details to pay for goods without your authorization
4. Queried the bank about a transaction listed on your bank statement that you did not recognize
5. Made a formal complaint about the service you have received from a bank or other financial institution
6. Tried to open a bank account and it was refused for some reason
7. A claim on an insurance product that you expected to cover you was refused
8. Complained to a remittance provider about high charges when sending or receiving money
9. Lost money as a result of hackers or phishing schemes
10. None of these things happened to you (do not read)
11. Does not know (do not read)
12. Does not reply (do not read)

F – Choice and knowledge of the sources of information

- F1 – What kind of information do you regularly follow?

	Yes	**No**	**Does not reply**
1. General news on the economy	1	2	3
2. News about real-estate market	1	2	3
3. News about stock market	1	2	3
4. Interest rate developments	1	2	3
5. Legislation and regulations on financial products	1	2	3
6. Other	1	2	3

- F2 – What sources of information do you usually use when you want to obtain information on financial products? (Multiple)

1. Account/bank manager
2. Financial intermediary/insurance broker
3. Friends/family/colleagues
4. Specialized newspapers (print or online)
5. Other press (print or online)

6. Television/radio
7. Internet (except the press)
8. Others
9. Does not know (do not read)
10. Does not reply (do not read)

- F3 – What entity would you turn to, or have you turned to, in case of disagreement/misunderstanding about a financial product? (Multiple)

1. The supervisory authority (Banco de Portugal, Securities Market Commission or Insurance and Pension Funds Supervisory Authority)
2. Courts
3. Consumer protection associations (e.g.: Deco)
4. Ministry of Finance
5. Other
6. Does not know (do not read)
7. Does not reply (do not read)

- F4 – Which entity would you turn to, or have you turned to, in case of inability to pay your loan instalments? (Multiple)

1. Family
2. Your bank
3. Banco de Portugal
4. Consumer protection associations (e.g.: Deco)
5. Assistance Network for Over-indebted Consumers
6. Ministry of Finance
7. Other
8. Does not know (do not read)
9. Does not reply (do not read)

G – Financial understanding

- G1 – Could you tell me how you would rate your overall knowledge about financial matters compared with the Portuguese population?

1. Very high
2. Quite high
3. About average
4. Quite low
5. Very low

6. Does not know (do not read)
7. Does not reply (do not read)

- G2 – Imagine that five brothers are given a gift of 1000 euros in total. If the brothers have to share the money equally how much does each one get?

    1. Record response: _____
    2. Does not know (do not read)
    3. Does not reply (do not read)

- G2.1 – Now imagine that the brothers have to wait for one year to get their share of the 1000 euros and inflation stays at 2%. In one year's time will they be able to buy:

    1. More than they could today
    2. The same amount
    3. Less than they could buy today
    4. Depends on the types of things that they want to buy (do not read)
    5. Does not know (do not read)
    6. Does not answer (do not read)

- G3 – You lend 25 euros to a friend one evening and he gives you 25 euros back the next day. How much interest has he paid on this loan?

    1. Record response: _____
    2. Does not know (do not read)
    3. Does not reply (do not read)

- G4 – Imagine that someone puts 100 Euros into a savings account with a guaranteed interest rate of 2% per year. They don't make any further payments into this account and they don't withdraw any money. How much would be in the account at the end of the first year, once the interest payment is made?

    1. Record response: _____
    2. Does not know (do not read)
    3. Does not reply (do not read)

- G4.1 – How much would be in the account at the end of 5 years? (Assume that no fees or taxes are charged and that at the end of each year you leave the amount of interest in that same savings account)

    1. More than 110 Euros
    2. Exactly 110 Euros
    3. Less than 110 Euros
    4. Impossible to tell from the information given

5. Does not know (do not read)
6. Does not reply (do not read)

- G5 – I would like to know whether you think the following statements are true or false:

	T	**F**	**Does not reply**
1. If I partially pay off the balance on my credit card, I pay no interest	1	2	3
2. If I withdraw money from the ATM with my credit card, I pay commissions on that amount	1	2	3
3. High inflation means that the cost of living is increasing rapidly	1	2	3
4. An investment with a high return is likely to be high risk	1	2	3
5. It is usually possible to reduce the risk of investing in the stock market by buying a wide range of stocks and shares	1	2	3

- G6 – Do you know that there are basic bank accounts?

1. Yes
2. No → Go to G8
3. Does not answer (do not read) → Go to G8

- G7 – What is necessary in order to have access to a basic bank account?

1. Have a low income
2. Be unemployed
3. Have only one current account
4. Does not know (do not read)
5. Does not reply (do not read)

I am going to ask you to look at the following statement of a current account.

- G8 – According to this statement, what is the balance of the current account that can be used as at 20 April 2019 without the use of a bank overdraft?

1. 110 euros
2. 100 euros
3. 1,060 euros
4. 1,160 euros
5. Does not know (do not read)
6. Does not reply (do not read)

Bank ABC, S. A.

Current account – Account statement as at 20 April 2019		EUR	
Date	Description	Amount	Balance
	Previous balance		110.00
24-03-2019	ATM withdrawal	-60.00	50.00
30-03-2019	Transfer of salary	1,200.00	1,250.00
01-04-2019	Transfer to term deposit	-120.00	1130.00
02-04-2019	Mortgage loan instalment	-525.00	605.00
03-04-2019	Mobile phone	-40.00	565.00
08-04-2019	Supermarket	-210.00	355.00
12-04-2019	Electricity	-60.00	295.00
13-04-2019	Restaurant	-40.00	255.00
16-04-2019	Cheque	-70.00	185.00
18-04-2019	ATM withdrawal	-50.00	135.00
20-04-2019	XPT petrol station	-35.00	100.00
	Available balance		100.00
	Authorised balance		1,060.00

- G9 – Suppose that on 21 April 2019 your car insurance of €150 will be debited. Does your account has sufficient balance to cover this payment?

    1. No
    2. Yes, but the account will overdrawn by 50 euros
    3. Yes, the balance of the account is sufficient, so there is no need to resort to overdrafts
    4. Yes, but the account will be overdrawn by 150 euros
    5. Does not know (do not read)
    6. Does not reply (do not read)

- G10 – In most mortgage loans, the interest rate paid to the bank is indexed to a reference rate, which is usually Euribor. Please tell me if the Euribor:

    1. Is a rate defined by the Portuguese Government
    2. Is a rate defined by Banco de Portugal
    3. Is a rate defined by the European Central Bank
    4. Is a rate resulting from the loans made between a group of European banks
    5. Does not know (do not read)
    6. Does not reply (do not read)

- G11 – Do you know what the "spread" is?

    1. Does not know

2. It is the total interest rate charged by the bank for loans
3. It is the increase that your bank establishes, in relation to a reference interest rate, which may vary from customer to customer
4. It is the increase that your bank establishes in relation to a reference interest rate, which is the same for all customers
5. It is an interest rate that your bank defines according to the loan amount
6. Other
7. Does not answer (do not read)

- G12 – On a scale of 1 to 3, where 1 is low, 2 is medium and 3 is high, please rank the following financial investments by risk level, in terms of getting back the money invested.

	Low	**Medium**	**High**	**Does not know**
1. Shares	1	2	3	4
2. Bonds	1	2	3	4
3. Saving certificates/Treasury bills	1	2	3	4
4. Investment funds	1	2	3	4
5. Derivative financial instruments (e.g.: CFD, warrants, forex, swaps)	1	2	3	4
6. Retirement savings plans	1	2	3	4
7. Time deposits	1	2	3	4

- G13 – And finally, could you tell me which of these categories your household net monthly income usually falls into?

1. No income
2. Up to €500
3. Between €501 and €1000
4. Between €1001 and €2500
5. Between €2501 and €3500
6. Between €3501 and €5000
7. Over €5000
8. Does not know (do not read)
9. Does not reply (do not read)

A.3 2023 Survey

A – Profile of the interviewee

- A1 – Region (Record the region of residence) (See quotas)
    1. North
    2. Centre
    3. Lisbon and Vale do Tejo
    4. Alentejo
    5. Algarve
    6. Autonomous Region of Madeira
    7. Autonomous Region of the Azores
- A1.1 – Place
    1. Up to 4,999 inhabitants
    2. From 5,000 to 19,999 inhabitants
    3. From 20,000 to 99,999 inhabitants
    4. 100,000 or more inhabitants
- A2 – Gender (Record the gender of the interviewee) (See quotas)
    1. Female
    2. Male
- A3 – How old are you?
  Age: _____ years old
- A4 – What is your level of education?
    1. No primary education
    2. Primary education (4th year)
    3. Elementary education (9th year)
    4. Secondary education (12th year)
    5. University-level education (e.g. degree or higher-level vocational training)
    6. Post-graduate education or equivalent (Master's/PhD)
    7. Refused to answer (do not read out)
- A5 – What is your current work or occupational situation?
    1. Active – Self-employed
    2. Active – Employee

3. Active – Trainee/apprentice
4. Active – Unemployed looking for work
5. Not active – looking after the home
6. Not active – Retired
7. Not active – Not working and not looking for work
8. Not active – Student
9. Active – Other
10. Not active – Other
11. Refused to answer (do not read out)

- A6 - What is your nationality?

1. Portuguese
2. Other

- A7 – Who do you normally live with in your household? (Multiple answer)

1. Alone
2. With spouse/partner
3. With children under the age of 18 (yours or your spouse's/partner's)
4. With children over the age of 18 (yours or your spouse's/partner's)
5. With parents or parents-in-law
6. With other relatives
7. With friends, colleagues or students
8. In another type of household
9. Refused to answer (do not read out)

- A7.1 - How many adults (aged 18 or over) live in your household, including yourself? Note: Only ask if A7 = 2 to 9

1. Number: _____
2. Refused to answer (do not read out)

- A7.2 - How many children (under the age of 18) live in your household, including yourself? Note: Only ask if A7 = 3

1. Number: _____
2. Refused to answer (do not read out)

- A8 - Do you have access to the internet?

1. Yes
2. No

3. Do not know (do not read out)
4. Refused to answer (do not read out)

B – Planning Personal Finances

- B1 – Do you make day-to-day decisions about your money?

1. Yes
2. No
3. Refused to answer (do not read out)

- B2 – Who is responsible for making day-to-day decisions about money in your household?

1. You make these decisions by yourself
2. You make these decisions with your spouse/partner
3. You make these decisions with someone else
4. Someone else makes the decisions
5. Do not know (do not read out)
6. Refused to answer (do not read out)

- B3 – Who is responsible for making decisions regarding investments in your household?

1. You make these decisions by yourself
2. You make these decisions with your spouse/partner
3. You make these decisions with someone else
4. Someone else makes the decisions
5. You do not save (do not read out)
6. Do not know (do not read out)
7. Refused to answer (do not read out)

- B4 – Do you do any of the following for yourself or your household? (Multicoded)

1. Make a plan to manage your income and expenses
2. Keep note of your spending
3. Keep money for bills separate from day-to-day spending money
4. Keep note of upcoming bills to make sure you do not miss them
5. (If you answered "Yes" to question A8) Use the bank's app or a personal finance management tool to manage expenses
6. Arrange automatic payments for regular outgoings
7. Refused to answer (do not read out)

The next set of questions concerns only you. Please answer in relation to yourself and not in relation to your household.

- B5 – In the past 12 months did you save money in any of the following ways? Answer whether or not you still have the money. (Multicoded)

    1. Building up a balance of money in your current account
    2. Putting the money in a time deposit
    3. Buying bonds
    4. Investing in stocks or investment funds
    5. Investing in crypto-assets or ICOs
    6. Investing in some other way (remitting money to relatives abroad, buying gold, buying property, buying art objects)
    7. Saving cash at home or in your wallet
    8. Giving money to family to save on your behalf
    9. I did not save in the last year
    10. Other
    11. Refused to answer (do not read out)

- B6 – If you personally faced a major expense today – equivalent to your own monthly income – would you be able to pay it without borrowing the money or asking family or friends to help?

    1. Yes
    2. No
    3. Do not know (do not read out)
    4. Not applicable – I do not have any personal income (do not read out)
    5. Refused to answer (do not read out)

- B7 – Sometimes people find that their income is not enough to cover their living costs. Did this happen to you in the last year?

    1. Yes → Go to B8
    2. No → Go to B9
    3. Do not know (do not read out) → Go to B9
    4. Refused to answer (do not read out) → Go to B9

- B8 – How did you make ends meet the last time this happened? (Multicoded)

    Existing resources

    1. Draw money out of savings
    2. Cut back on expenses

3. Sell something that you own

Additional resources

4. Work overtime, take an extra job, earn extra money
5. Claim support from the government
6. Ask for help from family or friends

Access credit by using existing contacts or resources

7. Borrow from family or friends
8. Borrow from employer/salary advance
9. Pawn something that you own

Borrow from existing credit line

10. Use authorized arranged overdraft or line of credit
11. Use credit card to pay regular expenses or for a cash advance

Access additional credit

12. Take out a personal loan from a financial institution
13. Take out a loan from another entity (informal)

Fall behind/go beyond arranged amount

14. Use an overdraft on current account higher than authorized amount
15. Pay my bills late/miss payments

Other responses

16. Other
17. Does not know (do not read)
18. Refused to answer (do not read)

- B9 – If you lost your main source of income, how long could you continue to cover your living expenses, without borrowing any money or moving house?

1. Less than a week
2. At least a week, but not one month
3. At least one month, but not three months
4. At least three months, but not six months
5. More than six months
6. Does not know (do not read)
7. Refused to answer (do not read)

- B10 – How confident are you that you are doing (or have done) a good job of making financial plans for your retirement?

    1. Not at all confident
    2. Not very confident
    3. Confident
    4. Very confident
    5. Fully confident
    6. Does not (or did not) plan for retirement (do not read)
    7. Does not know (do not read)
    8. Refused to answer (do not read)

- B11 – How will you (or do you) fund your retirement? (Multiple)

    1. Draw a government pension (social security or another compulsory scheme)
    2. Draw an occupational or workplace pension plan
    3. Draw a pension fund set up by the interviewee
    4. Draw a private pension funds
    5. Sell your financial assets (such as stocks, bonds or investment funds)
    6. Sell your non-financial assets (such as a car, property, art, jewels, antiques)
    7. From income generated by your financial or non-financial assets
    8. Rely on a spouse/partner to support you
    9. Rely on your children or other family members to support you
    10. Draw on your savings
    11. Continue to work
    12. From the revenues of a business that you own
    13. Other
    14. Does not know (do not read)
    15. Refused to answer (do not read)

- B12 – On a scale of 1 to 5, tell me how much you agree or disagree with each of these statements, where 1 (Strongly disagree), 2 (Disagree), 3 (Neither agree nor disagree), 4 (Agree) and 5 (Strongly agree).

	Strongly disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly agree**	**Refused to answer**

1. I find it more satisfying to spend money than to save it for the long term	1	2	3	4	5	6
2. I am prepared to risk some of my own money when saving or making an investment	1	2	3	4	5	6
3. Money is there to be spent	1	2	3	4	5	6
4. I am satisfied with my current financial situation	1	2	3	4	5	6
5. I keep a close personal watch on my financial affairs	1	2	3	4	5	6
6. My financial situation limits my ability to do the things that are important to me	1	2	3	4	5	6
7. I set long-term financial goals and strive to achieve them	1	2	3	4	5	6
8. I have too much debt right now	1	2	3	4	5	6
9. If I borrow money, I have a responsibility to pay it back	1	2	3	4	5	6

- B13 – How often would you say this statement applies to you, using a scale from 1 to 5, where 1 (never), 2 (rarely), 3 (sometimes), 4 (often) and 5 (always).

	Never	**Rarely**	**Sometimes**	**Often**	**Always**	**Refused to answer**
1. I tend to worry about paying my normal living expenses	1	2	3	4	5	6
2. My finances control my life	1	2	3	4	5	6
3. Before I buy something I carefully consider whether I can afford it	1	2	3	4	5	6
4. I have money left over at the end of the month	1	2	3	4	5	6
5. I pay my bills on time	1	2	3	4	5	6
6. I tend to buy things on impulse	1	2	3	4	5	6
7. I share passwords and PINs of my bank account with my close friends	1	2	3	4	5	6

8. [If 'Yes' to question A8] Before buying a financial product online I check if the institution is regulated in my country	1	2	3	4	5	6
9. [If 'Yes' to question A8] I share information about my personal finances online (e.g. on social networks)	1	2	3	4	5	6

- B14 – How much you agree or disagree with each of these statements, where 1 (Strongly disagree), 2 (Disagree), 3 (Neither agree nor disagree), 4 (Agree) and 5 (Strongly agree).

	Strongly disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly agree**	**Refused to answer**
1. I tend to live for today and let tomorrow take care of itself	1	2	3	4	5	6
2. I am just getting by financially	1	2	3	4	5	6
3. I am concerned that my money won't last	1	2	3	4	5	6
4. Because of my money situation, I feel like I will never have the things I want in life	1	2	3	4	5	6
5. [If 'Yes' to question A8] I regularly change the passwords on the websites that I use for online shopping and my personal finances	1	2	3	4	5	6

- B15 – [If 'Yes' to question A8] How much you agree or disagree with each of these statements, where 1 (Strongly disagree), 2 (Disagree), 3 (Neither agree nor disagree), 4 (Agree) and 5 (Strongly agree).

	Strongly disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly agree**	**Refused to answer**
1. I think that it safe to shop online using public Wi-Fi networks (e.g. in cafés, airports, shopping malls)	1	2	3	4	5	6

2. It is important to pay attention to the security of a website before making a transaction online (e.g. https sites, safety logo	1	2	3	4	5	6
3. I think it is not important to read the terms and conditions when buying something online	1	2	3	4	5	6
4. I trust the financial services provided by online banks and FinTechs	1	2	3	4	5	6
5. I believe that financial institutions should use a wide range of non-financial personal data, including from social networks, in decisions about granting credit	1	2	3	4	5	6
6.I am more likely to buy impulsively when I buy online than in person in a shop	1	2	3	4	5	6
7.It is more likely that I read the terms and conditions of a contract if it is on paper than if it is online	1	2	3	4	5	6

- B16 – How much you agree or disagree with each of these statements, where 1 (Strongly disagree), 2 (Disagree), 3 (Neither agree nor disagree), 4 (Agree) and 5 (Strongly agree).

	Strongly disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly agree**	**Refused to answer**
1. It is more important to invest in companies that are making a profit than in companies that strive to minimise their negative impact on the environment	1	2	3	4	5	6
2. It is more important to invest in companies that are making a profit than in companies that strive to improve their social impact	1	2	3	4	5	6

3. It is more important to invest in companies that are making a profit than in companies that strive to improve their risk management, ethics and accountability	1	2	3	4	5	6
4. I am afraid of getting a low financial return if I invest in sustainable investments	1	2	3	4	5	6
5. I do not know enough about this subject to invest in sustainable investments	1	2	3	4	5	6
6. I have never been offered the chance to invest in sustainable investments	1	2	3	4	5	6

C – Choice and management of financial products

- C1.1 – Can you tell me whether you have heard of the following financial products? (Multicoded)
- C1.2 – Can you tell me whether you (personally or jointly) currently hold any of these types of products? (Multicoded)
- C1.3 – In the last two years, which of the following financial products have you purchased? Answer even if you no longer have the products. Do not include products that were automatically renewed. (Multicoded)
- C1.4 – And which of the products did you choose most recently?

	C1.1 Heard of	**C1.2 Currently holds**	**C1.3 Chosen in the last 2 years**	**C1.4 Chosen most recenly**
1. Current account	1	1	1	1
2. Time deposit	2	2	2	2
3. Saving certificates/Treasury bills	3	3	3	3
4. Stocks and shares	4	4	4	4
5. Bonds	5	5	5	5
6. Investment funds	6	6	6	6
7. Retirement savings plans (do not consider compulsory social security contributions or other compulsory contributory schemes)	7	7	7	7

8. Pension funds (exclude retirement savings plans and do not take into account compulsory social security contributions or other compulsory contribution schemes)	8	8	8	8
9. Insurance (e.g. car insurance, health insurance, life insurance, house insurance)	9	9	9	9
10. Credit card	10	10	10	10
11. Bank overdraft	11	11	11	11
12. Mortgage or home loan	12	12	12	12
13. Car loan	13	13	13	13
14. Other loans (e.g.: personal loan, household loan, travel loan)	14	14	14	14
15. A microfinance loan (for professional/ commercial financing)	15	15	15	15
16. Mobile phone payment account (e.g.: MBWay)	16	16	16	16
17. Crypto-assets or ICOs	17	17	17	17
18. Crowdfunding	18	18	18	18
19. Financial products labelled as sustainable, ESG or green [This option 19 cannot be the only option checked in C1.1-1.3. Additionally, it should not be shown in C1.4.]	19	19	19	19
20. Others	20	20	20	20
21. None	21	21	21	21
22. Do not know	22	22	22	22
23. Refused to answer	23	23	23	23

(NOTE: If C1.1 is "None" or "Do not know" or "Refused to answer" – Go o C4) (NOTE: If respondent chose products in C1.1 and C1.2, C1.3 and C1.4 is "None" or "Do not know" or "Refused to answer" – Go to C4) (NOTE: If C1.4 was "None", "Do not know" or "Refused to answer" go to C4)

- C2 – Which of the following statements best describes how you made your choice?

    1. I considered several options from different institutions before making my decision
    2. I considered the various options from one institution
    3. I looked around but there were no other options to consider

4. I did not consider any other options at all
5. Do not know (do not read)
6. Refused to answer (do not read)

- C3 – Which sources of information do you feel most influenced your decision? (Multicoded)

1. Information provided by bank staff where the product was taken out (over the counter, online or over the phone)
2. Recommendation from family or friends
3. (If 'Yes' to question A8) Recommendation found in social networks (for example, influencers)
4. Recommendation from specialised entities (other than the bank where the product was taken out)
5. Recommendation in specialised newspapers and magazines
6. (If 'Yes' to question A8) Information on product comparison websites
7. Information from advertising on TV, radio, newspapers, …
8. Others
9. Do not know (do not read out)
10. Refused to answer (do not read out)

- C4 – (If 'Yes' to question A8) Have you ever done any of the following things?

	Yes	**No**	**Refused to answer (do not read)**
1. Have guaranteed capital	1	2	3
2. Requested a debit or credit card completely online	1	2	3
3. Took out insurance completely online	1	2	3
4. Took out a loan completely online	1	2	3
5. Made an investment completely online	1	2	3

- C5 – (If 'Yes' to question A8) In the last 12 months, how often have you done the following?

	Very Often	**Often**	**Sometimes**	**Never**	**Does not know/ Refused to answer**
Online consultation of my bank account movements and balance	1	2	3	4	5

Online shopping or goods and services	1	2	3	4	5
Online transfers	1	2	3	4	5
Online management of financial products and services (e.g, deposits, investments, credits, insurance)	1	2	3	4	5

D – Financial knowledge

- D1 – How would you rate your overall knowledge about financial matters compared with the average in Portugal?

    1. Well above average
    2. Above average
    3. Average
    4. Below average
    5. Well below average
    6. Does not know (do not read)
    7. Refused to answer (do not read)

- D2 – Imagine that 5 brothers are given a gift of 1000 euros in total. If the brothers have to share the money equally how much does each one get?

    1. Record answer: _____
    2. Does not know (do not read)
    3. Refused to answer (do not read)

- D3 – Now imagine that the brothers have to wait for one year to get their share of the 1000 euros and inflation stays at 2%. In one year's time will they be able to buy:

    1. More than they could today
    2. The same amount
    3. Less than they could buy today
    4. It depends on the types of things that they want to buy (do not read)
    5. Does not know (do not read)
    6. Refused to answer (do not read)

- D4 – You lend 25 euros to a friend one evening and he gives you 25 euros back the next day. How much interest has he paid on this loan?

    1. Amount: _____
    2. Does not know (do not read)

3. Refused to answer (do not read)

- D5 – Imagine that someone puts 100 Euros into a savings account with a interest rate of 2% per year (assume that no fees or taxes apply). How much would be in the account at the end of the first year, once the interest payment is made?

    1. Amount: _____
    2. Does not know (do not read)
    3. Refused to answer (do not read)

- D6 – And how much would be in the account at the end of five years? (Assume that no fees or taxes are charged and that at the end of each year you leave the amount of interest in that same savings account).

    1. More than 110 Euros
    2. Exactly 110 Euros
    3. Less than 110 Euros
    4. Impossible to tell from the information given
    5. Does not know (do not read)
    6. Refused to answer (do not read)

- D7 – Please tell me if the following statements are true or false (T or F).

	T	**F**	**Refused to answer**
1. High inflation means that the cost of living is increasing rapidly.	1	2	3
2. An investment with a high return is likely to be high risk.	1	2	3
3. It is usually possible to reduce the risk of investing in the stock market by buying a wide range of shares.	1	2	3
4. A digital contract requires the signature of a paper contract to be considered valid.	1	2	3
5. The personal data I share publicly online can be used to target me with personalised commercial or financial offers.	1	2	3
6. Cryptocurrencies have the same legal tender as banknotes and coins.	1	2	3

I am going to ask you, please, to look at the following statement of a current account.

- D8 – According to this statement, what is the balance of the current account that can be used on 20 April 2022 without resorting to a bank overdraft?

    1. 110 euros
    2. 100 euros

Bank ABC, S. A.

Current account – Bank statement on 20 April 2022		EUR	
Date	Description	Amount	Balance
	Previous balance		110.00
24-03-2022	ATM withdrawal	-60.00	50.00
30-03-2022	Salary transfer	1,200.00	1,250.00
01-04-2022	Transfer to a time deposit	-120.00	1,130.00
02-04-2022	Home loan instalment	-525.00	605.00
03-04-2022	Mobile phone	-40.00	565.00
08-04-2022	Supermarket	-210.00	355.00
12-04-2022	Electricity	-60.00	295.00
13-04-2022	Restaurant	-40.00	255.00
16-04-2022	Cheque	-70.00	185.00
18-04-2022	ATM withdrawal	-50.00	135.00
20-04-2022	XPT petrol station	-35.00	100.00
	Available balance		100.00
	Authorised balance		1,060.00

3. 1,060 euros
4. 1,160 euros
5. Does not know (do not read)
6. Refused to answer (do not read)

- D9 – Suppose that on 21 April 2022 your car insurance of €250 will be debited. Does your account has sufficient balance to cover this payment?

1. No
2. Yes, but the account will be overdrawn by €150
3. Yes, the account has enough money and there is no need to resort to an overdraft
4. Yes, but the account will be overdrawn by €250
5. Does not know (do not read)
6. Refused to answer (do not read)

- D10 – [If 'Yes' to question A8] In the last 12 months, how often have you done the following?

	Very often	**Often**	**Sometimes**	**Never**	**Does not know**
1. Written a document on a personal computer (desktop or laptop)	1	2	3	4	5
2. Sent or received emails	1	2	3	4	5
3. Made calls with a mobile phone	1	2	3	4	5

4. Made calls via the internet (including video calls)	1	2	3	4	5
5. Participated in social networks (e.g. Facebook, Twitter, Instagram, LinkedIn, Snapchat, TikTok, etc.)	1	2	3	4	5
6. Used instant messaging applications (e.g. WhatsApp, Messenger, Skype, Telegram, Signal, Viber)	1	2	3	4	5
7. Searched for information online (such as reading the news or looking for information about goods and services)	1	2	3	4	5

- D11 – Could you tell me in which of these categories your household net monthly income usually falls into?

    1. No income
    2. Up to €500
    3. Between €500 and €1000
    4. Between €1001 and €2500
    5. More than €2500
    6. Does not know (do not read)
    7. Refused to answer (do not read)

Appendix B

Correspondences between the surveys questions and variables

Question	Variable 2015 Survey	Variable 2020 Survey	Variable 2023 Survey	Type of Variable
Profile of the interviewee				
Region	A1	A1	A1	Nominal Categorical
Place	A1.1	A1.1	A1.1	Nominal Categorical
Gender	A2	A2	A2	Nominal Categorical
Age	A3	A3	A3	Numerical
Age (age group)	A3.1	-	-	Ordinal Categorical
What is your level of schooling?	A4	A4	A4	Nominal Categorical
What is your current work or occupational situation?	A5	A5	A5	Nominal Categorical
What is your nationality?	-	-	A6	Nominal Categorical
Who do you usually live with in your household? Ans.: Alone	A6_1	A6_1	A7_1	Binary
Who do you usually live with in your household? Ans.: With spouse/partner	A6_2	A6_2	A7_2	Binary
Who do you usually live with in your household? Ans.: With children under the age of 18 (yours or your spouse's/partner's)	A6_3	A6_3	A7_3	Binary
Who do you usually live with in your household? Ans.: With children over the age of 18 (yours or your spouse's/partner's)	A6_4	A6_4	A7_4	Binary

Who do you usually live with in your household? Ans.: With parents or parents-in-law	A6_5	A6_6	A7_5	Binary
Who do you usually live with in your household? Ans.: With other family members	A6_6	A6_7	A7_6	Binary
Who do you usually live with in your household? Ans.: With friends, colleagues or students	A6_7	A6_8	A7_7	Binary
Who do you usually live with in your household? Ans.: In some other type of household	A6_8	A6_9	A7_8	Binary
Who do you usually live with in your household? Ans.: Does not answer	A6_9	A6_10	A7_9	Binary
Who do you usually live with in your household? Ans.: With other young people under the age of 18	-	A6_5	-	Binary
Who is responsible for making day-to-day decisions about money in your household?	A7	D2	B2	Nominal Categorical
How many adults (aged 18 or over) live in your household, including yourself?	-	A6.1	A7.1	Numerical
How many children under the age of 18 live in your household, including yourself?	-	A6.2	A7.2	Numerical
Do you have access to the internet?	-	-	A8	Nominal Categorical
Inclusion in the banking system				
Do you hold one or more current accounts?	B1	B1	-	Nominal Categorical
How many current accounts do you hold, in total?	B2.1	B2.a	-	Numerical
How often do you use your main bank account, including payments by ATM?	B3	B3	-	Nominal Categorical
So, please tell me if: 1. You have never had a bank account; 2.You have had one in the past, but no longer have a bank account; 3.Does not answer	B4	-	-	Nominal Categorical
Why do you not have a bank account?	B5	B4	-	Nominal Categorical
Planning of household budget and savings				
Does your household have a budget? How frequently do you plan it?	C1			Nominal Categorical
Do you make day-to-day decisions about your own money?	-	D1	B1	Nominal Categorical
Who is responsible for making decisions regarding investments in your household?	-	-	B3	Nominal Categorical

Do you do any of the following for yourself or your household? Ans.: Make a plan to manage your income and expenses	-	D3_1	B4_1	Binary
Do you do any of the following for yourself or your household? Ans.: Keep a note of your spending	-	D3_2	B4_2	Binary
Do you do any of the following for yourself or your household? Ans.: Keep money for bills separate from day-to-day spending money	-	D3_3	B4_3	Binary
Do you do any of the following for yourself or your household? Ans.: Make a note of upcoming bills to make sure you don't miss them	-	D3_4	B4_4	Binary
Do you do any of the following for yourself or your household? Ans.: Use a banking app or a money management tool to keep track of your outgoings	-	D3_5	B4_5	Binary
Do you do any of the following for yourself or your household? Ans.: Arrange automatic payments for regular outgoings	-	D3_6	B4_6	Binary
Do you do any of the following for yourself or your household? Ans.: None of the above	-	D3_7	-	Binary
Do you do any of the following for yourself or your household? Ans.: Does not reply	-	D3_8	B4_7	Binary
Do you save?	C2	D4	-	Nominal Categorical
What is the main reason that leads you to save?	C3	D5		Nominal Categorical
Why do you not save?	C4	D6		Nominal Categorical
In the past 12 months have you been saving money in any of the following ways, whether or not you still have the money. Ans.: Building up a balance of money in your bank account	C5_1	D7_1	B5_1	Binary
In the past 12 months have you been saving money in any of the following ways, whether or not you still have the money. Ans.: Paying money into a savings account	C5_2	D7_2	B5_2	Binary

In the past 12 months have you been saving money in any of the following ways, whether or not you still have the money. Ans.: Buying financial investment products, other than pension funds (shares, bonds, investment funds...)	C5_3	-	-	Binary
In the past 12 months have you been saving money in any of the following ways, whether or not you still have the money. Ans.: Buying bonds	-	D7_3	B5_3	Binary
In the past 12 months have you been saving money in any of the following ways, whether or not you still have the money. Ans.: Investing in stocks or investment funds	-	D7_4	B5_4	Binary
In the past 12 months have you been saving money in any of the following ways, whether or not you still have the money. Ans.: Investing in crypto-assets or ICOs	-	D7_5	B5_5	Binary
In the past 12 months have you been saving money in any of the following ways, whether or not you still have the money. Ans.: Applying the money in another way (transfers to family overseas, purchase of gold, purchase of property, purchase of art, …)	C5_4	D7_6	B5_6	Binary
In the past 12 months have you been saving money in any of the following ways, whether or not you still have the money. Ans.: Giving money to family to save on your behalf	C5_5	D7_8	B5_8	Binary
In the past 12 months have you been saving money in any of the following ways, whether or not you still have the money. Ans.: Saving cash at home or in your wallet	C5_6	D7_7	B5_7	Binary
In the past 12 months have you been saving money in any of the following ways, whether or not you still have the money. Ans.: I did not save	C5_7	D7_9	B5_9	Binary
In the past 12 months have you been saving money in any of the following ways, whether or not you still have the money. Ans.: Does not know	C5_8	-	-	Binary

In the past 12 months have you been saving money in any of the following ways, whether or not you still have the money. Ans.: Does not answer	C5_9	D7_10	B5_11	Binary
In the past 12 months have you been saving money in any of the following ways, whether or not you still have the money. Ans.: Other	-	-	B5_10	Binary
If you, personally, faced a major expense today - equivalent to your own monthly income – would you be able to pay it without borrowing the money or asking family or friends to help?	C6	D8	B6	Nominal Categorical
Some people set themselves financial goals, such as paying university fees, buying a car or becoming debt free. Do you have any financial goal?	-	D9	-	Nominal Categorical
What actions have you taken to meet your most important goal? Ans.: Prepared a plan of action	-	D10_1	-	Binary
What actions have you taken to meet your most important goal? Ans.: Increased your credit card or loan repayments	-	D10_2	-	Binary
What actions have you taken to meet your most important goal? Ans.: Saved or invested money	-	D10_3	-	Binary
What actions have you taken to meet your most important goal? Ans.: Looked for new/different/additional source of income	-	D10_4	-	Binary
What actions have you taken to meet your most important goal? Ans.: Identified a source of credit	-	D10_5	-	Binary
What actions have you taken to meet your most important goal? Ans.: Cut-back on spending	-	D10_6	-	Binary
What actions have you taken to meet your most important goal? Ans.: Something else	-	D10_7	-	Binary
What actions have you taken to meet your most important goal? Ans.: Nothing	-	D10_8	-	Binary
What actions have you taken to meet your most important goal? Ans.: Does not know	-	D10_9	-	Binary
What actions have you taken to meet your most important goal? Ans.: Does not reply	-	D10_10	-	Binary

Sometimes people find that their income does not quite cover their living costs. In the last 12 months, has this happened to you, personally?	C7	D11	B7	Nominal Categorical
What did you do to make ends meet the last time this happened? Ans.: Draw money out of savings or transfer savings into current account	C7.1_1	D11.1_1	B8_1	Binary
What did you do to make ends meet the last time this happened? Ans.: Cut back on spending, spend less, do without	C7.1_2	D11.1_2	B8_2	Binary
What did you do to make ends meet the last time this happened? Ans.: Sell something that you own	C7.1_3	D11.1_3	B8_3	Binary
What did you do to make ends meet the last time this happened? Ans.: Work overtime, earn extra money	C7.1_4	D11.1_4	B8_4	Binary
What did you do to make ends meet the last time this happened? Ans.: Claim support from the government	-	D11.1_5	B8_5	Binary
What did you do to make ends meet the last time this happened? Ans.: Ask for help from family or friends	-	D11.1_6	B8_6	Binary
What did you do to make ends meet the last time this happened? Ans.: Borrow from family or friends	C7.1_5	D11.1_7	B8_7	Binary
What did you do to make ends meet the last time this happened? Ans.:Borrow from employer (e.g.: loan, salary advance…)	C7.1_6	D11.1_8	B8_8	Binary
What did you do to make ends meet the last time this happened? Ans.: Pawn something that you own	C7.1_7	D11.1_9	B8_9	Binary
What did you do to make ends meet the last time this happened? Ans.: Use overdraft or line of credit	C7.1_8	D11.1_10	B8_10	Binary
What did you do to make ends meet the last time this happened? Ans.: Use credit card for a cash advance or to pay bills/buy food	C7.1_9	D11.1_11	B8_11	Binary
What did you do to make ends meet the last time this happened? Ans.: Take out a personal loan from a bank or financial institution	C7.1_10	D11.1_12	B8_12	Binary
What did you do to make ends meet the last time this happened? Ans.: Take out a loan from another entity (informal)	C7.1_11	D11.1_13	B8_13	Binary

What did you do to make ends meet the last time this happened? Ans.: Use an overdraft on current account higher than the authorised amount	C7.1_12	D11.1_14	B8_14	Binary
What did you do to make ends meet the last time this happened? Ans.: Pay my bills late/miss payments	C7.1_13	D11.1_15	B8_15	Binary
What did you do to make ends meet the last time this happened? Ans.: Other	C7.1_14	D11.1_16	B8_16	Binary
What did you do to make ends meet the last time this happened? Ans.: Does not know	C7.1_15	D11.1_17	B8_17	Binary
What did you do to make ends meet the last time this happened? Ans.: Does not answer	C7.1_16	D11.1_18	B8_18	Binary
If you lost your main source of household income, how long could your household continue to cover living expenses, without borrowing any money or moving house?	C8	D12	B9	Binary
Tell me to what extent you agree with the statements I am going to read: Before I buy something I carefully consider whether I can afford it	C9.1	D14.3	B13.3	Nominal Categorical
Tell me to what extent you agree with the statements I am going to read: I tend to live for today and let tomorrow take care of itself	C9.2	D15.1	B14.1	Nominal Categorical
Tell me to what extent you agree with the statements I am going to read: I find it more satisfying to spend money than to save it for the long term	C9.3	D13.1	B12.1	Nominal Categorical
Tell me to what extent you agree with the statements I am going to read: I pay my bills on time	C9.4	D14.5	B13.5	Nominal Categorical
Tell me to what extent you agree with the statements I am going to read: I am prepared to risk some of my own money when saving or making investment	C9.5	D13.2	B12.2	Nominal Categorical
Tell me to what extent you agree with the statements I am going to read: I keep a close watch on my financial affairs	C9.6	D13.5	B12.5	Nominal Categorical
Tell me to what extent you agree with the statements I am going to read: I set long-term financial goals and strive to achieve them	C9.7	D13.8	B12.7	Nominal Categorical

Tell me to what extent you agree with the statements I am going to read: Money is there to be spent	C9.8	D13.3	B12.3	Nominal Categorical
Tell me to what extent you agree with the statements I am going to read: My financial situation limits my ability to do the things that are important to me	C9.9	D13.7	B12.6	Nominal Categorical
Tell me to what extent you agree with the statements I am going to read: I tend to worry about paying my normal living expenses	C9.10	D14.1	B13.1	Nominal Categorical
Tell me to what extent you agree with the statements I am going to read: I have too much debt right now	C9.11	D13.9	B12.8	Nominal Categorical
Tell me to what extent you agree with the statements I am going to read: I am satisfied with my present financial situation	C9.12	D13.4	B12.4	Nominal Categorical
Tell me to what extent you agree with the statements I am going to read: To buy something, I would rather save first	C9.13	-	-	Nominal Categorical
Tell me to what extent you agree with the statements I am going to read: When I want to buy something, I immediately resort to credit	C9.14	-	-	Nominal Categorical
Tell me to what extent you agree with the statements I am going to read: I tend to buy things in an impulsive manner	C9.15	D14.6	B13.6	Nominal Categorical
Tell me to what extent you agree with the statements I am going to read: I use my mobile phone to make or receive payments	-	D13.6	B13.6	Nominal Categorical
Tell me to what extent you agree with the statements I am going to read: If I borrow money I have a responsibility to pay it back	-	D13.10	B12.9	Nominal Categorical
Tell me to what extent you agree with the statements I am going to read: My finances control my life	-	D14.2	B13.2	Nominal Categorical
Tell me to what extent you agree with the statements I am going to read: have money left over at the end of the month	-	D14.4	B13.4	Nominal Categorical
Tell me to what extent you agree with the statements I am going to read: I am just getting by financially	-	D15.2	B14.2	Nominal Categorical
Tell me to what extent you agree with the statements I am going to read: I am concerned that my money won't last	-	D15.3	B14.3	Nominal Categorical

Tell me to what extent you agree with the statements I am going to read: Because of my money situation, I feel like I will never have the things I want in life	-	D15.4	B14.4	Nominal Categorical
Tell me to what extent you agree with the statements I am going to read: I share passwords and PINs of my bank account with my close friends	-	-	B13.7	Nominal Categorical
Tell me to what extent you agree with the statements I am going to read: Before buying a financial product online I check if the institution is regulated in my country	-	-	B13.8	Nominal Categorical
Tell me to what extent you agree with the statements I am going to read: I share information about my personal finances online (e.g. on social networks)	-	-	B13.9	Nominal Categorical
Tell me to what extent you agree with the statements I am going to read: I regularly change the passwords on the websites that I use for online shopping and my personal finances	-	-	B14.5	Nominal Categorical
How confident are you that you are doing (or have done) a good job of making financial plans for your retirement?	C10	D16	B10	Binary
How will you – or do you – fund your retirement? Ans.: Draw a government pension (social security or another compulsory scheme)	C10.1_1	D17_1	B11_1	Binary
How will you – or do you – fund your retirement? Draw an occupational or workplace pension plan	C10.1_2	D17_2	B11_2	Binary
How will you – or do you – fund your retirement? Draw a pension fund set up by the interviewee	-	-	B11_3	Binary
How will you – or do you – fund your retirement? Draw a private pension plan	C10.1_3	D17_3	B11_4	Binary
How will you – or do you – fund your retirement? Sell your financial assets (such as stocks, bonds or investment funds)	C10.1_4	D17_4	B11_5	Binary
How will you – or do you – fund your retirement? Sell your non-financial assets (such as a car, property, art, jewels, antiques)	C10.1_5	D17_5	B11_6	Binary

How will you – or do you – fund your retirement? From income generated by your financial or non-financial assets (such as dividends or rental income)	C10.1_6	D17_6	B11_7	Binary
How will you – or do you – fund your retirement? Rely on a spouse or partner to support you	C10.1_7	D17_7	B11_8	Binary
How will you – or do you – fund your retirement? Rely on your children or other family members to support you	C10.1_8	D17_8	B11_9	Binary
How will you – or do you – fund your retirement? Draw on your savings	-	D17_9	B11_10	Binary
How will you – or do you – fund your retirement? Continue to work	-	D17_10	B11_11	Binary
How will you – or do you – fund your retirement? From the revenues of a business that you own	-	D17_11	B11_12	Binary
How will you – or do you – fund your retirement? Other	C10.1_9	D17_12	B11_13	Binary
How will you – or do you – fund your retirement? Does not know	C10.1_10	D17_13	B11_14	Binary
How will you – or do you – fund your retirement? Does not answer	C10.1_11	D17_14	B11_15	Binary
How much you agree or disagree with each of the statements: I think that it safe to shop online using public Wi-Fi networks (e.g. in cafés, airports, shopping malls)	-	-	B15.1	Nominal Categorical
How much you agree or disagree with each of the statements: It is important to pay attention to the security of a website before making a transaction online (e.g. https sites, safety logo)	-	-	B15.2	Nominal Categorical
How much you agree or disagree with each of the statements: I think it is not important to read the terms and conditions when buying something online	-	-	B15.3	Nominal Categorical
How much you agree or disagree with each of the statements: I trust the financial services provided by online banks and FinTechs	-	-	B15.4	Nominal Categorical

How much you agree or disagree with each of the statements: I believe that financial institutions should use a wide range of non-financial personal data, including from social networks, in decisions about granting credit	-	-	B15.5	Nominal Categorical
How much you agree or disagree with each of the statements: I am more likely to buy impulsively when I buy online than in person in a shop	-	-	B15.6	Nominal Categorical
How much you agree or disagree with each of the statements: It is more likely that I read the terms and conditions of a contract if it is on paper than if it is online	-	-	B15.7	Nominal Categorical
How much you agree or disagree with each of these statements: It is more important to invest in companies that are making a profit than in companies that strive to minimise their negative impact on the environment	-	-	B16.1	Nominal Categorical
How much you agree or disagree with each of these statements: It is more important to invest in companies that are making a profit than in companies that strive to improve their social impact	-	-	B16.2	Nominal Categorical
How much you agree or disagree with each of these statements: It is more important to invest in companies that are making a profit than in companies that strive to improve their risk management, ethics and accountability	-	-	B16.3	Nominal Categorical
How much you agree or disagree with each of these statements: I am afraid of getting a low financial return if I invest in sustainable investments	-	-	B16.4	Nominal Categorical
How much you agree or disagree with each of these statements: I do not know enough about this subject to invest in sustainable investments	-	-	B16.5	Nominal Categorical
How much you agree or disagree with each of these statements: I have never been offered the chance to invest in sustainable investments	-	-	B16.6	Nominal Categorical
Choice and management of financial products				

Can you tell me whether you have heard of the following financial products? Current account	D1.1_1	E1.1_1	C1.1_1	Binary
Can you tell me whether you have heard of the following financial products? Time deposits	D1.1_2	E1.1_2	C1.1_2	Binary
Can you tell me whether you have heard of the following financial products? Saving certificates/Treasury bills	D1.1_3	E1.1_3	C1.1_3	Binary
Can you tell me whether you have heard of the following financial products? Stocks and shares	D1.1_4	E1.1_4	C1.1_4	Binary
Can you tell me whether you have heard of the following financial products? Bonds	D1.1_5	E1.1_5	C1.1_5	Binary
Can you tell me whether you have heard of the following financial products? Commercial paper	D1.1_6	-	-	Binary
Can you tell me whether you have heard of the following financial products? Investment funds	D1.1_7	E1.1_6	C1.1_6	Binary
Can you tell me whether you have heard of the following financial products? Complex financial products	D1.1_8	-	-	Binary
Can you tell me whether you have heard of the following financial products? Pension or retirement product (Do not consider compulsory contributions to social security or other compulsory contribution schemes)	D1.1_9	E1.1_7	-	Binary
Retirement savings plans (do not consider compulsory social security contributions or other compulsory contributory schemes)	-	-	C1.1_7	Binary
Can you tell me whether you have heard of the following financial products? Pension funds (exclude retirement savings plans and do not take into account compulsory social security contributions or other compulsory contribution schemes)	-	-	C1.1_8	Binary
Can you tell me whether you have heard of the following financial products? Insurance	D1.1_10	E1.1_8	C1.1_9	Binary
Can you tell me whether you have heard of the following financial products? Credit card	D1.1_11	E1.1_9	C1.1_10	Binary
Can you tell me whether you have heard of the following financial products? Bank overdraft	D1.1_12	E1.1_10	C1.1_11	Binary

Can you tell me whether you have heard of the following financial products? Home loan or mortgage	D1.1_13	E1.1_11	C1.1_12	Binary
Can you tell me whether you have heard of the following financial products? Car loan	-	-	C1.1_13	Binary
Can you tell me whether you have heard of the following financial products? Other loans (e.g.: personal loan, home)	D1.1_14	E1.1_12	C1.1_14	Binary
Can you tell me whether you have heard of the following financial products? Micro-finance loan (for professional/commercial financing)	D1.1_15	E1.1_13	C1.1_15	Binary
Can you tell me whether you have heard of the following financial products? Micro-finance loan (for professional/commercial financing)	D1.1_15	E1.1_13	C1.1_15	Binary
Can you tell me whether you have heard of the following financial products? MBWay	-	E1.1_14	C1.1_16	Binary
Can you tell me whether you have heard of the following financial products? Cryptoassets (such as cryptocurrencies or virtual currencies) or ICOs	-	E1.1_15	C1.1_17	Binary
Can you tell me whether you have heard of the following financial products? Crowd-funding	-	E1.1_16	C1.1_18	Binary
Can you tell me whether you have heard of the following financial products? Financial products labelled as sustainable, ESG or green	-	-	C1.1_19	Binary
Can you tell me whether you have heard of the following financial products? Others	D1.1_16	E1.1_17	C1.1_20	Binary
Can you tell me whether you have heard of the following financial products? None	D1.1_17	E1.1_18	C1.1_21	Binary
Can you tell me whether you have heard of the following financial products? Does not know	D1.1_18	E1.1_19	C1.1_22	Binary
Can you tell me whether you have heard of the following financial products? Does not answer	D1.1_19	E1.1_20	C1.1_23	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? Current account	D1.2_1	E1.2_1	C1.2_1	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? Time deposits	D1.2_2	E1.2_2	C1.2_2	Binary

Can you tell me whether you (personally or jointly) currently hold any of these types of products? Saving certificates/Treasury bills	D1.2_3	E1.2_3	C1.2_3	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? Stocks and shares	D1.2_4	E1.2_4	C1.2_4	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? Bonds	D1.2_5	E1.2_5	C1.2_5	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? Commercial paper	D1.2_6	-	-	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? Investment funds	D1.2_7	E1.2_6	C1.2_6	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? Complex financial products	D1.2_8	-	-	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? Pension or retirement product (Do not consider compulsory contributions to social security or other compulsory contribution schemes)	D1.2_9	E1.2_7	-	Binary
Retirement savings plans (do not consider compulsory social security contributions or other compulsory contributory schemes)	-	-	C1.2_7	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? Pension funds (exclude retirement savings plans and do not take into account compulsory social security contributions or other compulsory contribution schemes)	-	-	C1.2_8	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? Insurance	D1.2_10	E1.2_8	C1.2_9	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? Credit card	D1.2_11	E1.2_9	C1.2_10	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? Bank overdraft	D1.2_12	E1.2_10	C1.2_11	Binary

Can you tell me whether you (personally or jointly) currently hold any of these types of products? Home loan or mortgage	D1.2_13	E1.2_11	C1.2_12	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? Car loan	-	-	C1.2_13	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? Other loans (e.g.: personal loan, home)	D1.2_14	E1.2_12	C1.2_14	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? Microfinance loan (for professional/commercial financing)	D1.2_15	E1.2_13	C1.2_15	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? Microfinance loan (for professional/commercial financing)	D1.2_15	E1.2_13	C1.2_15	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? MBWay	-	E1.2_14	C1.2_16	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? Cryptoassets (such as cryptocurrencies or virtual currencies) or ICOs	-	E1.2_15	C1.2_17	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? Crowdfunding	-	E1.2_16	C1.2_18	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? Financial products labelled as sustainable, ESG or green	-	-	C1.2_19	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? Others	D1.2_16	E1.2_17	C1.2_20	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? None	D1.2_17	E1.2_18	C1.2_21	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? Does not know	D1.2_18	E1.2_19	C1.2_22	Binary
Can you tell me whether you (personally or jointly) currently hold any of these types of products? Does not answer	D1.2_19	E1.2_20	C1.2_23	Binary

In the last two years, which of the following financial products have you purchased? Current account	D1.3_1	E1.3_1	C1.3_1	Binary
In the last two years, which of the following financial products have you purchased? Time deposits	D1.3_2	E1.3_2	C1.3_2	Binary
In the last two years, which of the following financial products have you purchased? Saving certificates/Treasury bills	D1.3_3	E1.3_3	C1.3_3	Binary
In the last two years, which of the following financial products have you purchased? Stocks and shares	D1.3_4	E1.3_4	C1.3_4	Binary
In the last two years, which of the following financial products have you purchased? Bonds	D1.3_5	E1.3_5	C1.3_5	Binary
In the last two years, which of the following financial products have you purchased? Commercial paper	D1.3_6	-	-	Binary
In the last two years, which of the following financial products have you purchased? Investment funds	D1.3_7	E1.3_6	C1.3_6	Binary
In the last two years, which of the following financial products have you purchased? Complex financial products	D1.3_8	-	-	Binary
In the last two years, which of the following financial products have you purchased? Pension or retirement product (Do not consider compulsory contributions to social security or other compulsory contribution schemes)	D1.3_9	E1.3_7	-	Binary
Retirement savings plans (do not consider compulsory social security contributions or other compulsory contributory schemes)	-	-	C1.3_7	Binary
In the last two years, which of the following financial products have you purchased? Pension funds (exclude retirement savings plans and do not take into account compulsory social security contributions or other compulsory contribution schemes)	-	-	C1.3_8	Binary
In the last two years, which of the following financial products have you purchased? Insurance	D1.3_10	E1.3_8	C1.3_9	Binary
In the last two years, which of the following financial products have you purchased? Credit card	D1.3_11	E1.3_9	C1.3_10	Binary

In the last two years, which of the following financial products have you purchased? Bank overdraft	D1.3_12	E1.3_10	C1.3_11	Binary
In the last two years, which of the following financial products have you purchased? Home loan or mortgage	D1.3_13	E1.3_11	C1.3_12	Binary
In the last two years, which of the following financial products have you purchased? Car loan	-	-	C1.3_13	Binary
In the last two years, which of the following financial products have you purchased? Other loans (e.g.: personal loan, home)	D1.3_14	E1.3_12	C1.3_14	Binary
In the last two years, which of the following financial products have you purchased? Microfinance loan (for professional/commercial financing)	D1.3_15	E1.3_13	C1.3_15	Binary
In the last two years, which of the following financial products have you purchased? Microfinance loan (for professional/commercial financing)	D1.3_15	E1.3_13	C1.3_15	Binary
In the last two years, which of the following financial products have you purchased? MBWay	-	E1.3_14	C1.3_16	Binary
In the last two years, which of the following financial products have you purchased? Cryptoassets (such as cryptocurrencies or virtual currencies) or ICOs	-	E1.3_15	C1.3_17	Binary
In the last two years, which of the following financial products have you purchased? Crowdfunding	-	E1.3_16	C1.3_18	Binary
In the last two years, which of the following financial products have you purchased? Financial products labelled as sustainable, ESG or green	-	-	C1.3_19	Binary
In the last two years, which of the following financial products have you purchased? Others	D1.3_16	E1.3_17	C1.3_20	Binary
In the last two years, which of the following financial products have you purchased? None	D1.3_17	E1.3_18	C1.3_21	Binary
In the last two years, which of the following financial products have you purchased? Does not know	D1.3_18	E1.3_19	C1.3_22	Binary

In the last two years, which of the following financial products have you purchased? Does not answer	D1.3_19	E1.3_20	C1.3_23	Binary
Which of these have you purchased most recently?	-	E1.4	C1.4	Nominal Categorical
Which of these have you purchased most recently? Current account	D1.4_1	-	-	Binary
Which of these have you purchased most recently? Time deposits	D1.4_2	-	-	Binary
Which of these have you purchased most recently? Saving certificates/Treasury bills	D1.4_3	-	-	Binary
Which of these have you purchased most recently? Stocks and shares	D1.4_4	-	-	Binary
Which of these have you purchased most recently? Bonds	D1.4_5	-	-	Binary
Which of these have you purchased most recently? Commercial paper	D1.4_6	-	-	Binary
Which of these have you purchased most recently? Investment funds	D1.4_7	-	-	Binary
Which of these have you purchased most recently? Complex financial products	D1.4_8	-	-	Binary
Which of these have you purchased most recently? Pension or retirement product (Do not consider compulsory contributions to social security or other compulsory contribution schemes)	D1.4_9	-	-	Binary
Which of these have you purchased most recently? Insurance	D1.4_10	-	-	Binary
Which of these have you purchased most recently? Credit card	D1.4_11	-	-	Binary
Which of these have you purchased most recently? Bank overdraft	D1.4_12	-	-	Binary
Which of these have you purchased most recently? Home loan or mortgage	D1.4_13	-	-	Binary
Which of these have you purchased most recently? Other loans (e.g.: personal loan, home)	D1.4_14	-	-	Binary
Which of these have you purchased most recently? Microfinance loan (for professional/commercial financing)	D1.4_15	-	-	Binary
Which of these have you purchased most recently? Others	D1.4_16	-	-	Binary
Which of these have you purchased most recently? None	D1.4_17	-	-	Binary

Which of these have you purchased most recently? Does not know	D1.4_18	-	-	Binary
Which of these have you purchased most recently? Does not answer	D1.4_19	-	-	Binary
Which of the following statements best describes how you made your choice?	D2	E2	C2	Nominal Categorical
Which sources of information do you feel most influenced your decision? Ans.: Advice from sales staff of the institution where you acquired the product	D3_1	E3_1	C3_1	Binary
Which sources of information do you feel most influenced your decision? Ans.: Advice of friends/relatives	D3_2	E3_2	C3_2	Binary
Which sources of information do you feel most influenced your decision? Ans.: Recommendation from independent financial adviser or broker	D3_3	E3_3	-	Binary
Which sources of information do you feel most influenced your decision? Ans.: Specialist magazines/publication	D3_4	E3_4	C3_5	Binary
Which sources of information do you feel most influenced your decision? Ans.: Information picked up in a branch of the institution (e.g.: leaflets, flyers,...)	D3_5	E3_5	-	Binary
Which sources of information do you feel most influenced your decision? Ans.: Product specific information found on the internet	D3_6	E3_6	-	Binary
Which sources of information do you feel most influenced your decision? Ans.: Unsolicited information sent through the post	D3_7	-	-	Binary
Which sources of information do you feel most influenced your decision? Ans.: Advertising on TV, radio, newspapers…	D3_8	E3_7	C3_7	Binary
Which sources of information do you feel most influenced your decision? Ans.: Television or radio programmes, newspaper articles…	D3_9	-	-	Binary
Which sources of information do you feel most influenced your decision? Ans.: My own previous experience	D3_10	E3_8	-	Binary
Which sources of information do you feel most influenced your decision? Ans.: Recommendation found in social networks (for example, influencers)	-	-	C3_3	Binary

Which sources of information do you feel most influenced your decision? Ans.: Recommendation from specialised entities (other than the bank where the product was taken out)	-	-	C3_4	Binary
Which sources of information do you feel most influenced your decision? Ans.: Information on product comparison websites	-	-	C3_6	Binary
Which sources of information do you feel most influenced your decision? Ans.: Others	D3_11	E3_9	C3_8	Binary
Which sources of information do you feel most influenced your decision? Ans.: Does not know	D3_12	E3_10	C3_9	Binary
Which sources of information do you feel most influenced your decision? Ans.: Does not answer	D3_13	E3_11	C3_10	Binary
Before you take out a financial product (e.g. savings applications, investments, loans, insurance…) do you read the information which the institution gives you on the conditions of the products?	D4	E4	-	Nominal Categorical
Do you read the contracts of the financial products (e.g. savings applications, investments, loans, insurance …) you take out?	D5	E5	-	Nominal Categorical
What is the main reason why you chose the bank where you have your main current account?	D6	C1	-	Nominal Categorical
With what frequency do you monitor the movements and balance of your main bank account?	D7	C2	-	Nominal Categorical
Do you know the maintenance fee your bank charges for your current account?	D8	C3	-	Nominal Categorical
Do you know the value of the interest rates of the savings applications or loans you have?	D9	E6	-	Nominal Categorical
And do you compare the interest rates before taking out a savings application or a loan?	D10	E7	-	Nominal Categorical
How often do you consult information on the profitability of your investments in financial products?	-	E8	-	Nominal Categorical
What is the main reason for the choice of your loans (mortgage loan or consumer credit)?	D11	E9	-	Nominal Categorical

Do you have an idea of how much the service of loans represent on your monthly income?	D12	E10	-	Nominal Categorical
How did you choose the insurance you have associated to your loans?	D13	-	-	Nominal Categorical
What payment scheme do you normally use with your credit card?	D14	E11	-	Nominal Categorical
How would you rate your level of risk in relation to investments in financial products?	D15	-	-	Nominal Categorical
What attitude best describes your behaviour in relation to investments in financial products?	D16	-	-	Nominal Categorical
How would you rate your knowledge on securities markets and products?	D17	-	-	Nominal Categorical
Do you currently have investments in any security (including individual portfolio management services)?	D18	-	-	Nominal Categorical
What percentage of your total assets does your current securities portfolio represent?	D19	-	-	Nominal Categorical
How do you normally finance your investments in securities?	D20	-	-	Nominal Categorical
As a rule, what would you do in the case of a sharp drop in the price of a security held by you?	D21	-	-	Nominal Categorical
What reasons would make you decide to invest in securities? Ans.: Tax reasons	D22_1	-	-	Binary
What reasons would make you decide to invest in securities? Ans.: The return is higher than bank deposits	D22_2	-	-	Binary
What reasons would make you decide to invest in securities? Ans.: I like the risk	D22_3	-	-	Binary
What reasons would make you decide to invest in securities? Ans.: Out of habit	D22_4	-	-	Binary
What reasons would make you decide to invest in securities? Ans.: Friends/acquaintances/family members also invest	D22_5	-	-	Binary
What reasons would make you decide to invest in securities? Ans.: Advised by the account/bank manager	D22_6	-	-	Binary
What reasons would make you decide to invest in securities? Ans.: Earn capital gains	D22_7	-	-	Binary
What reasons would make you decide to invest in securities? Ans.: Other reasons	D22_8	-	-	Binary
What reasons would make you decide to invest in securities? Ans.: Does not know	D22_9	-	-	Binary

What reasons would make you decide to invest in securities? Ans.: Does not answer	D22_10	-	-	Binary
What is most important when choosing your investments in securities?	D23	-	-	Nominal Categorical
If you lost money with investments made in the securities markets, why would you say you lost the money?	D24	-	-	Nominal Categorical
How often do you carry out transactions involving securities?	D25	-	-	Nominal Categorical
What was most important when choosing your investments in securities?	D26	-	-	Nominal Categorical
If you lost money with investments made in the securities markets, why would you say you lost the money?	D27	-	-	Nominal Categorical
How often did you carry out transactions involving securities?	D28	-	-	Nominal Categorical
What was the main reason why you stopped investing in securities?	D29	-	-	Nominal Categorical
What is the main reason why you do not have securities at present?	D30	-	-	Nominal Categorical
What would have to happen for you to decide to invest in securities once again? Ans.: Have more money	D31_1	-	-	Binary
What would have to happen for you to decide to invest in securities once again? Ans.: Higher return on securities	D31_2	-	-	Binary
What would have to happen for you to decide to invest in securities once again? Ans.: Low interest rates on term deposits	D31_3	-	-	Binary
What would have to happen for you to decide to invest in securities once again? Ans.: Have more information on securities	D31_4	-	-	Binary
What would have to happen for you to decide to invest in securities once again? Ans.: Have more trust in the securities market	D31_5	-	-	Binary
What would have to happen for you to decide to invest in securities once again? Ans.: There must be greater stability in the economy	D31_6	-	-	Binary
What would have to happen for you to decide to invest in securities once again? Ans.: Not thinking of investing or investing once again	D31_7	-	-	Binary

What would have to happen for you to decide to invest in securities once again? Ans.: Other	D31_8	-	-	Binary
What would have to happen for you to decide to invest in securities once again? Ans.: Does not know	D31_9	-	-	Binary
What would have to happen for you to decide to invest in securities once again? Ans.: Does not answer	D31_10	-	-	Binary
What is the main reason why you do not have securities?	D32	-	-	Nominal Categorical
What would have to happen for you to start investing in securities? Ans.: Have more money	D33_1	-	-	Binary
What would have to happen for you to start investing in securities? Ans.: Higher return on securities	D33_2	-	-	Binary
What would have to happen for you to start investing in securities? Ans.: Low interest rates on term deposits	D33_3	-	-	Binary
What would have to happen for you to start investing in securities? Ans.: Have more information on securities	D33_4	-	-	Binary
What would have to happen for you to start investing in securities? Ans.: Have more trust in the securities market	D33_5	-	-	Binary
What would have to happen for you to start investing in securities? Ans.: There must be greater stability in the economy	D33_6	-	-	Binary
What would have to happen for you to start investing in securities? Ans.: Not thinking of investing or investing once again	D33_7	-	-	Binary
What would have to happen for you to start investing in securities? Ans.: Other	D33_8	-	-	Binary
What would have to happen for you to start investing in securities? Ans.: Does not know	D33_9	-	-	Binary
What would have to happen for you to start investing in securities? Ans.: Does not answer	D33_10	-	-	Binary
What is your biggest fear in relation to the securities market?	D34	-	-	Nominal Categorical
Do you currently have any insurance? (car, fire, life, health, accidents at work insurance)	D35	-	-	Nominal Categorical

Then please tell me if: 1. You have never had insurance; 2.You had insurance in the past but you no longer have insurance; 3. Does not answer	D36	-	-	Nominal Categorical
What is the main reason why you do not have insurance?	D37	-	-	Nominal Categorical
Did you buy or subscribe any of the following products in the last two years? Ans.: Life insurance	D38_1	-	-	Binary
Did you buy or subscribe any of the following products in the last two years? Ans.: Car loan insurance	D38_2	-	-	Binary
Did you buy or subscribe any of the following products in the last two years? Ans.: Fire/multi-risk home insurance	D38_3	-	-	Binary
Did you buy or subscribe any of the following products in the last two years? Ans.: Health insurance	D38_4	-	-	Binary
Did you buy or subscribe any of the following products in the last two years? Ans.: Capitalisation operation	D38_5	-	-	Binary
Did you buy or subscribe any of the following products in the last two years? Ans.: Retirement Savings Plan	D38_6	-	-	Binary
Did you buy or subscribe any of the following products in the last two years? Ans.: Other	D38_7	-	-	Binary
Did you buy or subscribe any of the following products in the last two years? Ans.: Did not subscribe insurance	D38_8	-	-	Binary
Did you buy or subscribe any of the following products in the last two years? Ans.: Does not know	D38_9	-	-	Binary
Did you buy or subscribe any of the following products in the last two years? Ans.: Does not answer	D38_10	-	-	Binary
What was the main reason that led you to take out insurance?	D39	-	-	Nominal Categorical
What was the main reason that led you to choose the insurance company where you have your insurance?	D40	-	-	Nominal Categorical
In the last 3 years did you think of changing your insurance to another insurance company?	D41	-	-	Nominal Categorical

Why did you not change to another insurance company?	D42	-	-	Nominal Categorical
Why did you change insurance companies?	D43	-	-	Nominal Categorical
Have you ever benefitted from insurance (for example, after a car accident, theft or fire)?	D44	-	-	Nominal Categorical
Does your retirement savings plan: Have guaranteed capital	D45.1	-	-	Nominal Categorical
Does your retirement savings plan: Have guaranteed income	D45.2	-	-	Nominal Categorical
How often do you read information regarding the profitability of your applications in financial products?	D46	-	-	Nominal Categorical
Banks provide access to the account and other banking products and services on digital channels, for example through home banking or mobile applications (apps). Which do you use?	-	C4	-	Nominal Categorical
On average, how often do you use home banking or apps? Home banking	-	C5.1	-	Nominal Categorical
On average, how often do you use home banking or apps? Apps	-	C5.2	-	Nominal Categorical
Which services did you use in digital channels in the last 2 years? Home banking Ans.: Checking of account movements and balance	-	C6.1_1	-	Binary
Which services did you use in digital channels in the last 2 years? Home banking Ans.: Payment of services	-	C6.1_2	-	Binary
Which services did you use in digital channels in the last 2 years? Home banking Ans.: Transfers	-	C6.1_3	-	Binary
Which services did you use in digital channels in the last 2 years? Home banking Ans.: Taking out a time deposit	-	C6.1_4	-	Binary
Which services did you use in digital channels in the last 2 years? Home banking Ans.: Subscribing insurance	-	C6.1_5	-	Binary
Which services did you use in digital channels in the last 2 years? Home banking Ans.: Investing in bonds, shares or investment funds	-	C6.1_6	-	Binary

Which services did you use in digital channels in the last 2 years? Home banking Ans.: Taking out consumer credit	-	C6.1_7	-	Binary
Which services did you use in digital channels in the last 2 years? Home banking Ans.: Opening of a current account	-	C6.1_8	-	Binary
Which services did you use in digital channels in the last 2 years? Home banking Ans.: Does not reply	-	C6.1_9	-	Binary
Which services did you use in digital channels in the last 2 years? Apps Ans.: Checking of account movements and balance	-	C6.2_1	-	Binary
Which services did you use in digital channels in the last 2 years? Apps Ans.: Payment of services	-	C6.2_2	-	Binary
Which services did you use in digital channels in the last 2 years? Apps Ans.: Transfers	-	C6.2_3	-	Binary
Which services did you use in digital channels in the last 2 years? Apps Ans.: Taking out a time deposit	-	C6.2_4	-	Binary
Which services did you use in digital channels in the last 2 years? Apps Ans.: Subscribing insurance	-	C6.2_5	-	Binary
Which services did you use in digital channels in the last 2 years? Apps Ans.: Investing in bonds, shares or investment funds	-	C6.2_6	-	Binary
Which services did you use in digital channels in the last 2 years? Apps Ans.: Taking out consumer credit	-	C6.2_7	-	Binary
Which services did you use in digital channels in the last 2 years? Apps Ans.: Opening of a current account	-	C6.2_8	-	Binary
Which services did you use in digital channels in the last 2 years? Apps Ans.: Does not reply	-	C6.2_9	-	Binary
What is the main reason why you do not use digital channels?	-	C7	-	Nominal Categorical
In the last 2 years, have you experienced any of the following issues? Ans.: Accepted advice to invest in a financial product that you later found to be a scam (such as a pyramid scheme)	-	E12_1	-	Binary

In the last 2 years, have you experienced any of the following issues? Ans.: Accidently provided financial information in response to an email or phone call that you later found out was not genuine	-	E12_2	-	Binary
In the last 2 years, have you experienced any of the following issues? Ans.: Discovered that someone has used your credit card details to pay for goods without your authorisation	-	E12_3	-	Binary
In the last 2 years, have you experienced any of the following issues? Ans.: Queried the bank about a transaction listed on your bank statement that you did not recognise	-	E12_4	-	Binary
In the last 2 years, have you experienced any of the following issues? Ans.: Made a formal complaint about the service you have received from a bank or other financial institution	-	E12_5	-	Binary
In the last 2 years, have you experienced any of the following issues? Ans.: Tried to open a bank account and it was refused for some reason	-	E12_6	-	Binary
In the last 2 years, have you experienced any of the following issues? Ans.: A claim on an insurance product that you expected to cover you was refused	-	E12_7	-	Binary
In the last 2 years, have you experienced any of the following issues? Ans.: Complained to a remittance provider about high charges when sending or receiving money	-	E12_8	-	Binary
In the last 2 years, have you experienced any of the following issues? Ans.: Lost money as a result of hackers or phishing schemes	-	E12_9	-	Binary
In the last 2 years, have you experienced any of the following issues? Ans.: None of these things happened to you	-	E12_10	-	Binary
In the last 2 years, have you experienced any of the following issues? Ans.: Does not know	-	E12_11	-	Binary
In the last 2 years, have you experienced any of the following issues? Ans.: Does not reply	-	E12_12	-	Binary

Have you ever done any of the following things? Ans.: Opened a current account completely online	-	-	C4_1	Nominal Categorical
Have you ever done any of the following things? Ans.: Requested a debit or credit card completely online	-	-	C4_2	Nominal Categorical
Have you ever done any of the following things? Ans.: Took out insurance completely online	-	-	C4_3	Nominal Categorical
Have you ever done any of the following things? Ans.: Took out a loan completely online	-	-	C4_4	Nominal Categorical
Have you ever done any of the following things? Ans.: Made an investment completely online	-	-	C4_5	Nominal Categorical
In the last 12 months, how often have you done the following? Ans.: Online consultation of my bank account movements and balance	-	-	C5_1	Nominal Categorical
In the last 12 months, how often have you done the following? Ans.: Online shopping or goods and services	-	-	C5_2	Nominal Categorical
In the last 12 months, how often have you done the following? Ans.: Online transfers	-	-	C5_3	Nominal Categorical
In the last 12 months, how often have you done the following? Ans.: Online management of financial products and services (e.g, deposits, investments, credits, insurance)	-	-	C5_4	Nominal Categorical
Choice and knowledge of the sources of information				
What type of information do you follow regularly? General news on the economy	E1.1	F1.1	-	Nominal Categorical
What type of information do you follow regularly? News on the real-estate market	E1.2	F1.2	-	Nominal Categorical
What type of information do you follow regularly? News on the stock market	E1.3	F1.3	-	Nominal Categorical
What type of information do you follow regularly? Changes in interest rates	E1.4	F1.4	-	Nominal Categorical
What type of information do you follow regularly? Legislation and regulations on financial products	E1.5	F1.5	-	Nominal Categorical
What type of information do you follow regularly? Other	E1.6	F1.6	-	Nominal Categorical

What other sources of information do you normally resort to when you want to obtain information on financial products? Ans.: Account/bank manager	E2_1	F2_1	-	Binary
What other sources of information do you normally resort to when you want to obtain information on financial products? Ans.: Financial intermediary/insurance broker	E2_2	F2_2	-	Binary
What other sources of information do you normally resort to when you want to obtain information on financial products? Ans.: Friends/family members/colleagues	E2_3	F2_3	-	Binary
What other sources of information do you normally resort to when you want to obtain information on financial products? Ans.: Speciality newspapers (paper or online)	E2_4	F2_4	-	Binary
What other sources of information do you normally resort to when you want to obtain information on financial products? Ans.: Other press (paper or online)	E2_5	F2_5	-	Binary
What other sources of information do you normally resort to when you want to obtain information on financial products? Ans.: Television/radio	E2_6	F2_6	-	Binary
What other sources of information do you normally resort to when you want to obtain information on financial products? Ans.: Internet (except the press)	E2_7	F2_7	-	Binary
What other sources of information do you normally resort to when you want to obtain information on financial products? Ans.: Others	E2_8	F2_8	-	Binary
What other sources of information do you normally resort to when you want to obtain information on financial products? Ans.: Does not know	E2_9	F2_9	-	Binary
What other sources of information do you normally resort to when you want to obtain information on financial products? Ans.: Does not answer	E2_10	F2_10	-	Binary

What entity would you consult, or have you consulted, in the event of disagreement/misunderstanding about a financial product? Ans.: To the supervisory body (Banco de Portugal, Comissão do Mercado de Valores Mobiliários or Autoridade de Supervisão de Seguros former Instituto de Seguros de Portugal)	E3_1	F3_1	-	Binary
What entity would you consult, or have you consulted, in the event of disagreement/misunderstanding about a financial product? Ans.: Courts	E3_2	F3_2	-	Binary
What entity would you consult, or have you consulted, in the event of disagreement/misunderstanding about a financial product? Ans.: Consumer associations (e.g.: Deco, etc.)	E3_3	F3_3	-	Binary
What entity would you consult, or have you consulted, in the event of disagreement/misunderstanding about a financial product? Ans.: Ministry of Finance	E3_4	F3_4	-	Binary
What entity would you consult, or have you consulted, in the event of disagreement/misunderstanding about a financial product? Ans.: Other	E3_5	F3_5	-	Binary
What entity would you consult, or have you consulted, in the event of disagreement/misunderstanding about a financial product? Ans.: Does not know	E3_6	F3_6	-	Binary
What entity would you consult, or have you consulted, in the event of disagreement/misunderstanding about a financial product? Ans.: Does not answer	E3_7	F3_7	-	Binary
What entity would you consult, or have you consulted, in the event of inability to pay the installments of your loans? Ans.: Family	E4_1	F4_1	-	Binary
What entity would you consult, or have you consulted, in the event of inability to pay the installments of your loans? Ans.: Your bank	E4_2	F4_2	-	Binary
What entity would you consult, or have you consulted, in the event of inability to pay the installments of your loans? Ans.: Banco de Portugal	E4_3	F4_3	-	Binary

What entity would you consult, or have you consulted, in the event of inability to pay the installments of your loans? Ans.: Consumer associations (e.g.: Deco, etc.)	E4_4	F4_4	-	Binary
What entity would you consult, or have you consulted, in the event of inability to pay the installments of your loans? Ans.: Assistance Network for Over-indebted Consumers	E4_5	F4_5	-	Binary
What entity would you consult, or have you consulted, in the event of inability to pay the installments of your loans? Ans.: Ministry of Finance	E4_6	F4_6	-	Binary
What entity would you consult, or have you consulted, in the event of inability to pay the installments of your loans? Ans.: Other	E4_7	F4_7	-	Binary
What entity would you consult, or have you consulted, in the event of inability to pay the installments of your loans? Ans.: Does not know	E4_8	F4_8	-	Binary
What entity would you consult, or have you consulted, in the event of inability to pay the installments of your loans? Ans.: Does not answer	E4_9	F4_9	-	Binary
Financial knowledge				
Could you tell me how you would rate your overall knowledge about financial matters compared with the Portuguese population?	F1	G1	D1	Nominal Categorical
Imagine that five brothers are given a gift of 1000 euros in total. If the brothers have to share the amount equally how much does each one get?	F2	G2	D2	Nominal Categorical
Imagine that five brothers are given a gift of 1000 euros in total. If the brothers have to share the amount equally how much does each one get? Record Answer	F2.a	G2a	D2a	Numerical
Now imagine that the brothers have to wait for one year to get their share of the 1000 euros and inflation stays at 2%. In one year's time will they be able to buy: (followed by multiple choice options)	F2.1	G2.1	D3	Nominal Categorical
You lend 25 euros to a friend one evening and he gives you 25 euros back the next day. How much interest has he paid on this loan?	F3	G3	D4	Nominal Categorical

You lend 25 euros to a friend one evening and he gives you 25 euros back the next day. How much interest has he paid on this loan? Record Answer	F3.a	G3a	D4a	Numerical
Imagine that someone puts 100 euros into a savings account with an interest rate of 2% per year (assume that no fees or taxes apply). How much would be in the account at the end of the first year, once the interest payment is made?	F4	G4	D5	Nominal Categorical
Imagine that someone puts 100 euros into a savings account with an interest rate of 2% per year (assume that no fees or taxes apply). How much would be in the account at the end of the first year, once the interest payment is made? Record Answer	F4.a	G4a	D5a	Numerical
How much would be in the account at the end of five years? (Assume that no fees or taxes are charged and that at the end of each year you leave the amount of interest in that same savings account).	F4.1	G4.1	D6	Nominal Categorical
I would like to know whether you think the following statements are true or false: If you pay off your credit card balance partially, you do not pay interest.	F5.1	G5_1	-	Nominal Categorical
I would like to know whether you think the following statements are true or false: If you withdraw money at the ATM with your credit card, you pay fees on that amount.	F5.2	G5_2	-	Nominal Categorical
I would like to know whether you think the following statements are true or false: The insurance premium is the price paid for the insurance.	F5.3	-	-	Nominal Categorical
I would like to know whether you think the following statements are true or false: High inflation means that the cost of living is increasing rapidly.	F5.4	G5_3	D7.1	Nominal Categorical
I would like to know whether you think the following statements are true or false: An investment with a high return is likely to be high risk.	F5.5	G5_4	D7.2	Nominal Categorical

I would like to know whether you think the following statements are true or false: It is usually possible to reduce the risk of investing in the stock market by buying a wide range of stocks and shares.	F5.6	G5_5	D7.3	Nominal Categorical
I would like to know whether you think the following statements are true or false: A digital contract requires the signature of a paper contract to be considered valid.	-	-	D7.4	Nominal Categorical
I would like to know whether you think the following statements are true or false: The personal data I share publicly online can be used to target me with personalised commercial or financial offers.	-	-	D7.5	Nominal Categorical
I would like to know whether you think the following statements are true or false: Cryptocurrencies have the same legal tender as banknotes and coins.	-	-	D7.6	Nominal Categorical
Do you know that there are basic bank accounts?	F6	G6	-	Nominal Categorical
What is necessary to have access to basic bank accounts?	F7	G7	-	Nominal Categorical
According to this statement, what is the balance of the current account that can be used as at xx April 20xx without the use of a bank overdraft?	F8	G8	D8	Nominal Categorical
Suppose that on xx April 20xx your car insurance of €xxx will be debited. Does your account has sufficient balance to cover this payment?	F9	G9	D9	Nominal Categorical
In most mortgage loans, the interest rate paid to the bank is indexed to a reference rate, which is usually Euribor. Please tell me if the Euribor:	F10	G10	-	Nominal Categorical
Do you know what the spread is?	F11	G11	-	Nominal Categorical
In an insurance contract, the deductible corresponds to:	F12	-	-	Nominal Categorical
The higher the deductible:	F13	-	-	Nominal Categorical
In an insurance contract, the grace period corresponds to:	F14	-	-	Nominal Categorical

Classify, on a scale from 1 to 3, the following financial products by degree of risk, related to the chance of getting back the money invested: Shares	F15.1	G12.1	-	Nominal Categorical
Classify, on a scale from 1 to 3, the following financial products by degree of risk, related to the chance of getting back the money invested: Bonds	F15.2	G12.2	-	Nominal Categorical
Classify, on a scale from 1 to 3, the following financial products by degree of risk, related to the chance of getting back the money invested: Saving certificates/Treasury bills	F15.3	G12.3	-	Nominal Categorical
Classify, on a scale from 1 to 3, the following financial products by degree of risk, related to the chance of getting back the money invested: Investment funds	F15.4	G12.4	-	Nominal Categorical
Classify, on a scale from 1 to 3, the following financial products by degree of risk, related to the chance of getting back the money invested: Financial derivative instruments (e.g.: CFD, warrants, Forex, Swaps)	F15.5	G12.5	-	Nominal Categorical
Classify, on a scale from 1 to 3, the following financial products by degree of risk, related to the chance of getting back the money invested: Retirement/savings plans	F15.6	G12.6	-	Nominal Categorical
Classify, on a scale from 1 to 3, the following financial products by degree of risk, related to the chance of getting back the money invested: Term deposits	F15.7	G12.7	-	Nominal Categorical
What does it mean for a security to have guaranteed capital on the maturity date?	F16	-	-	Nominal Categorical
If you had to choose a financial investment to invest in the long term, usually which of the following should give you more money at the end?	F17	-	-	Nominal Categorical
Normally, which of the assets below has greater price fluctuations over time?	F18	-	-	Nominal Categorical
If a company goes bankrupt, which of the following assets is more likely to worth close to zero?	F19	-	-	Nominal Categorical
You invested in a fixed-rate bond. In the meantime, interest rates in the market declined. If you sell that bond, the price should be:	F20	-	-	Nominal Categorical

In the last 12 months, how often have you done the following? Ans.: Written a document on a personal computer (desktop or laptop)	-	-	D10.1	Nominal Categorical
In the last 12 months, how often have you done the following? Ans.: Sent or received emails	-	-	D10.2	Nominal Categorical
In the last 12 months, how often have you done the following? Ans.: Made calls with a mobile phone	-	-	D10.3	Nominal Categorical
In the last 12 months, how often have you done the following? Ans.: Made calls via the internet (including video calls)	-	-	D10.4	Nominal Categorical
In the last 12 months, how often have you done the following? Ans.: Participated in social networks (e.g. Facebook, Twitter, Instagram, LinkedIn, Snapchat, TikTok, etc.)	-	-	D10.5	Nominal Categorical
In the last 12 months, how often have you done the following? Ans.: Used instant messaging applications (e.g. WhatsApp, Messenger, Skype, Telegram, Signal, Viber)	-	-	D10.6	Nominal Categorical
In the last 12 months, how often have you done the following? Ans.: Searched for information online (such as reading the news or looking for information about goods and services)	-	-	D10.7	Nominal Categorical
Could you tell me in which of these categories your household net monthly income usually falls into?	F21	G13	D11	Nominal Categorical

Appendix C

Clustering Results

	Cluster 1	Cluster 2	Cluster 3
Size	452	158	490
Cluster Means			
FKS	-0.3781	-0.8786	0.6321
FBS	-0.1020	-1.5763	0.6024
FAS	-0.1054	-0.8063	0.3572
GFLI	-0.3070	-1.7031	0.8323
Within-Cluster Sum of Squares			
WCSS	1093.2	645	1034.9
Explained Variance Ratio			
36,9%			

Table C.1: Results of the Ward's three cluster partition applied to the 2015 data set

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Size	375	251	406	489
Cluster Means				
FKS	-0.5877	0.7347	-0.6036	0.5980
FBS	-1.2542	0.9447	-0.0813	0.5664
FAS	-0.6213	1.1207	0.1096	-0.1975
GFLI	-1.1834	1.2489	-0.3881	0.6125
Within-Cluster Sum of Squares				
WCSS	1541.1	350.9	828.8	1122.6
Explained Variance Ratio				
36%				

Table C.2: Results of the Ward's four cluster partition applied to the 2020 data set

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Size	281	310	292	302	325
Cluster Means					
FKS	-0.6174	0.7885	-0.1741	-1.1399	0.9974
FBS	-0.1096	1.0563	0.3319	-1.2073	-0.0891
FAS	0.9906	0.6515	-0.9616	-0.3999	-0.2424
GFLI	-0.1589	1.1981	-0.1479	-1.4163	0.4435
Within-Cluster Sum of Squares					
WCSS	1088.9	469.2	925.2	1206.5	971.8
Explained Variance Ratio					
22,8%					

Table C.3: Results of the Ward's five cluster partition applied to the 2023 data set

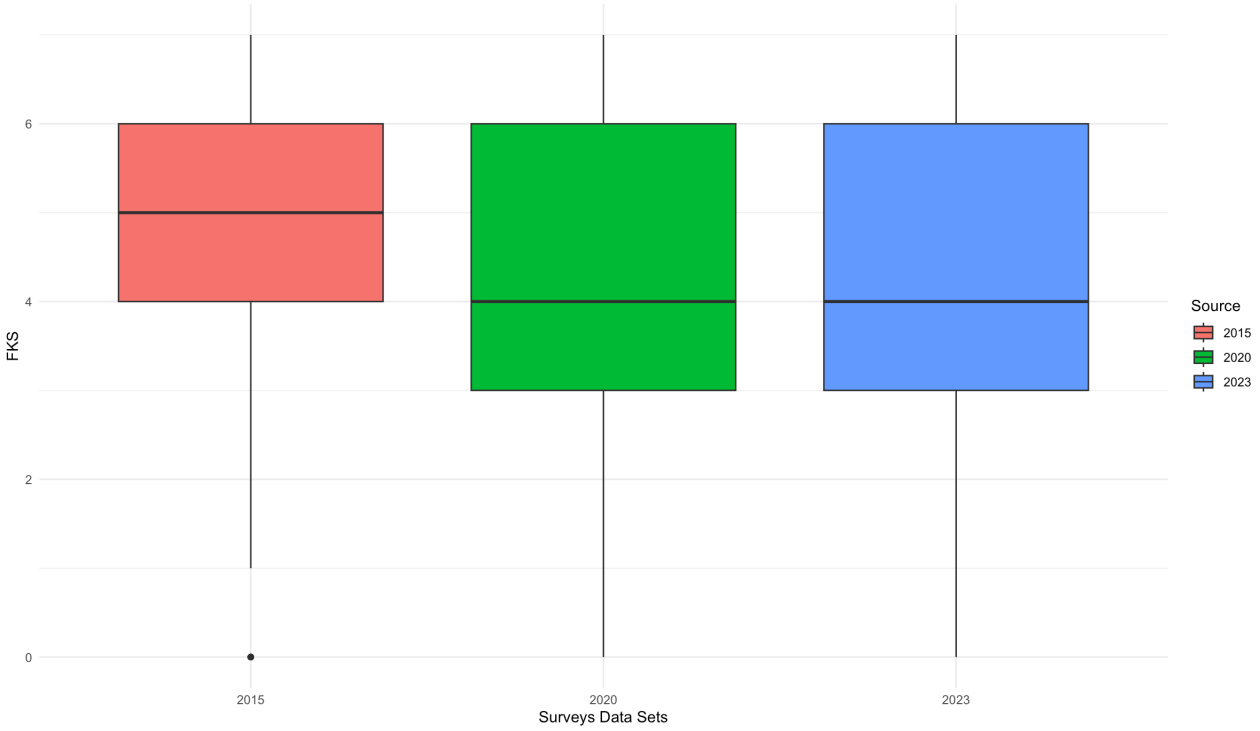


Figure C.1: Boxplot of the FKS variable in the 2015, 2020, and 2023 data sets

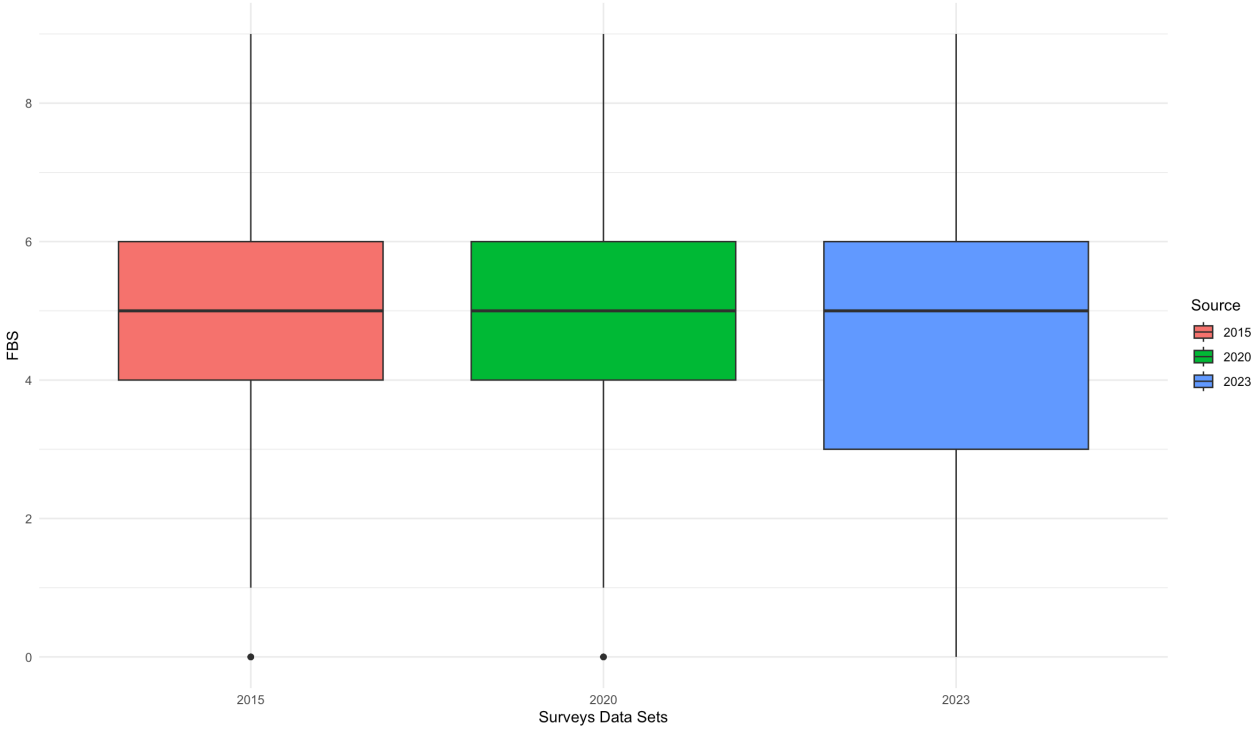


Figure C.2: Boxplot of the FBS variable in the 2015, 2020, and 2023 data sets

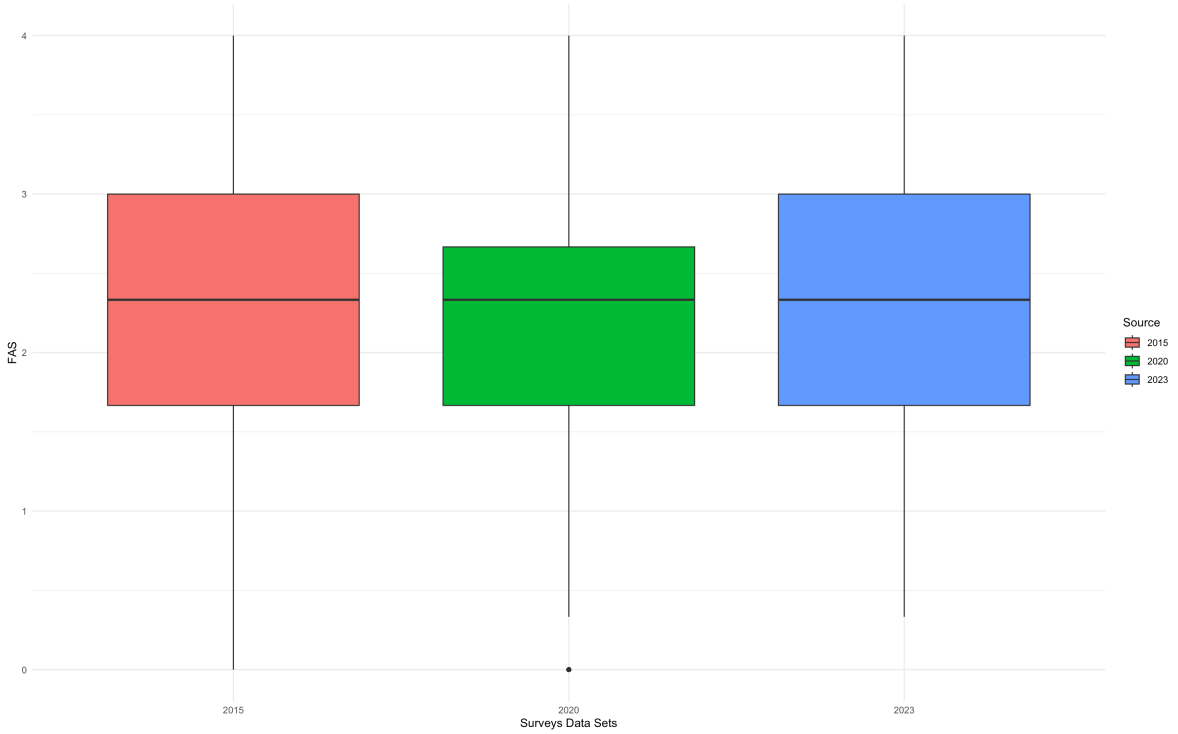


Figure C.3: Boxplot of the FAS variable in the 2015, 2020, and 2023 data sets

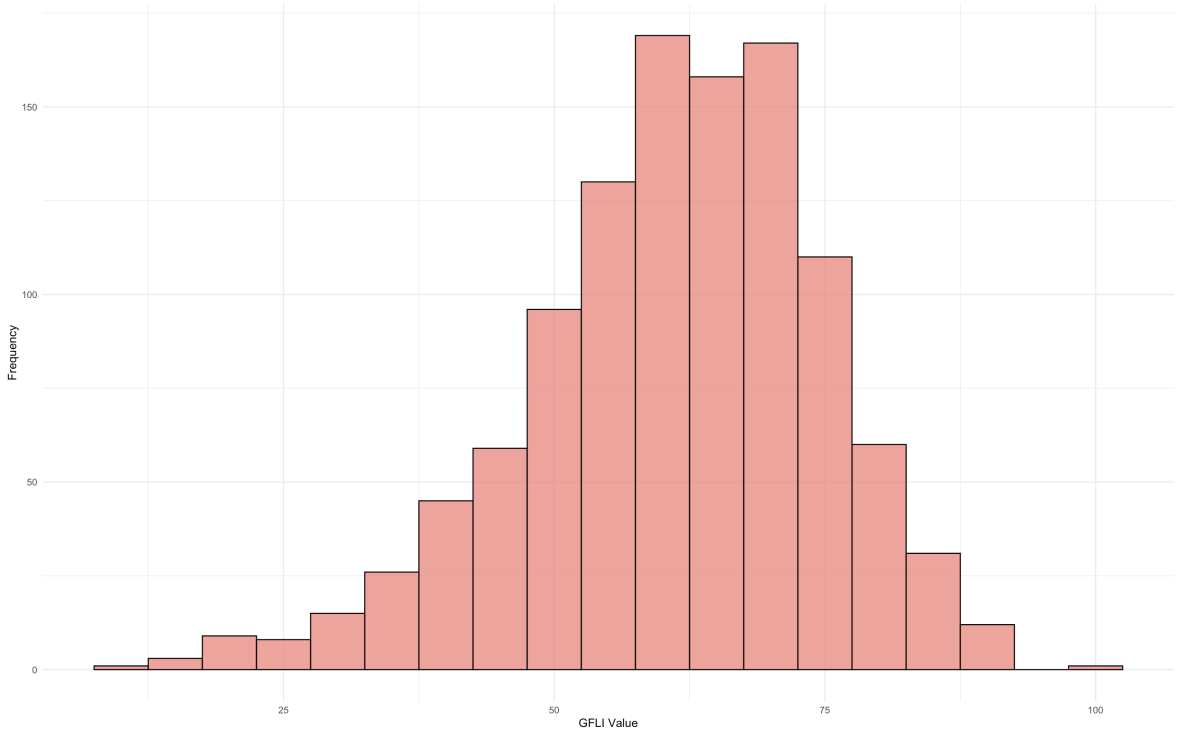


Figure C.4: Histogram of the GFLI variable in the 2015 data set

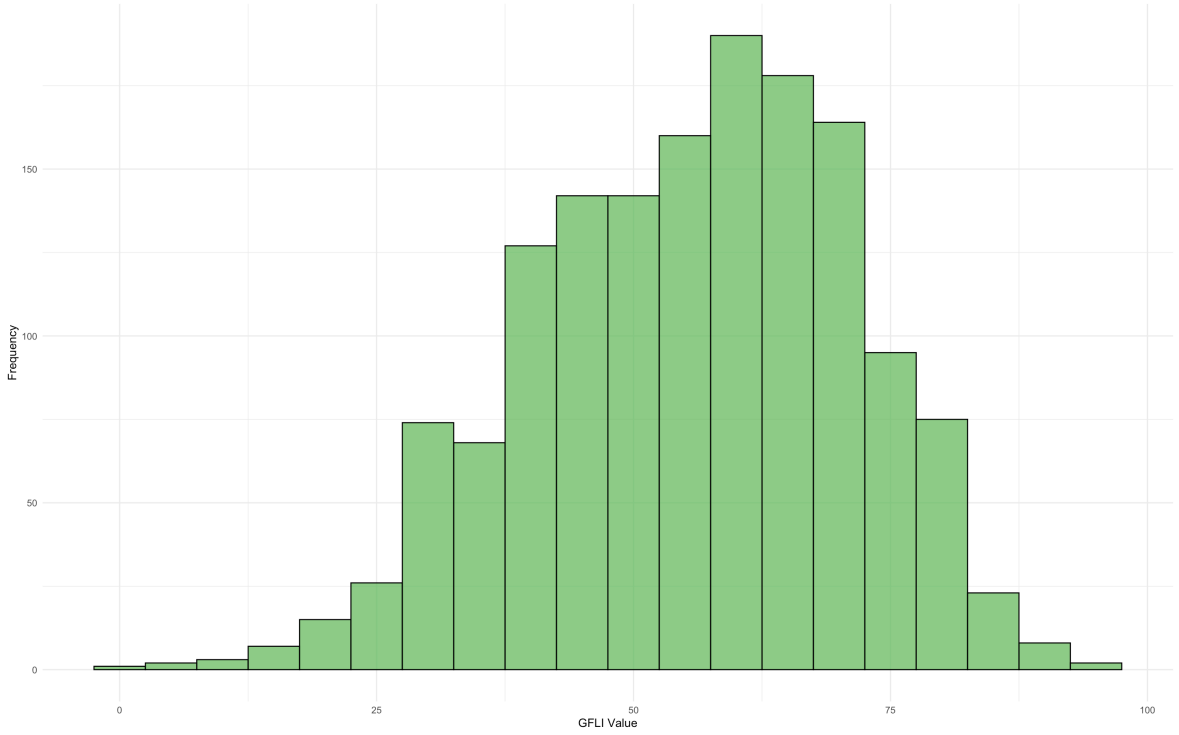


Figure C.5: Histogram of the GFLI variable in the 2020 data set

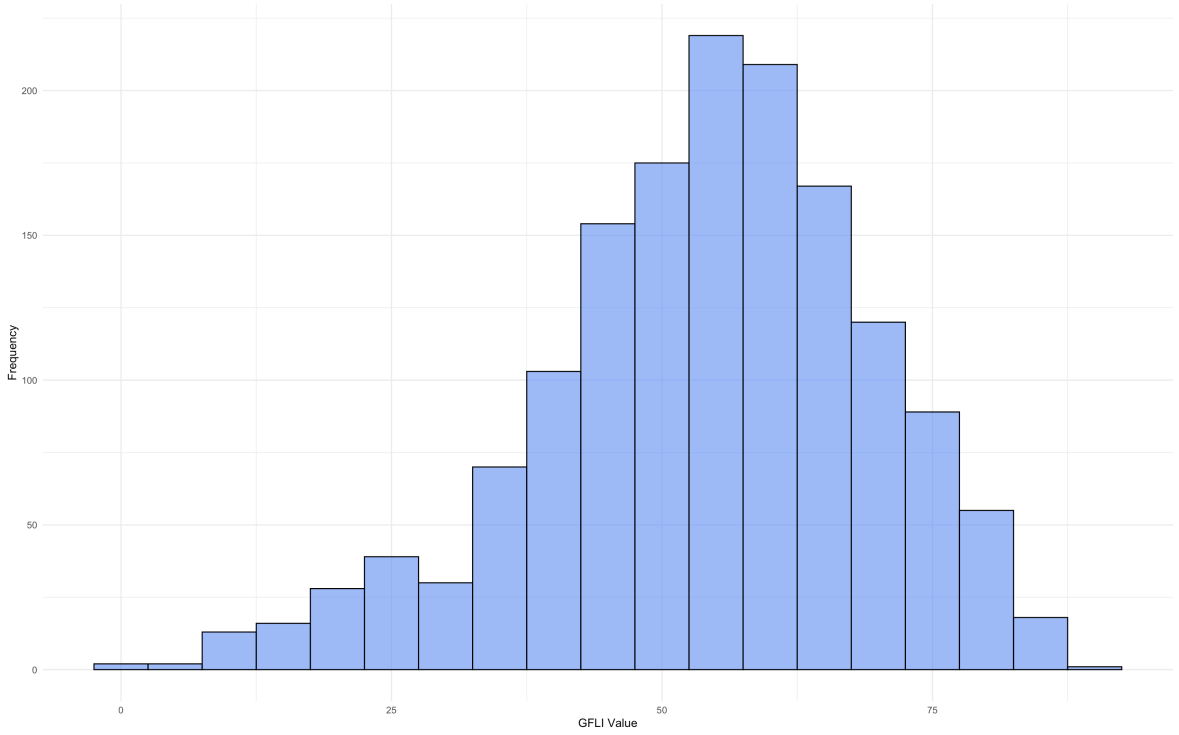


Figure C.6: Histogram of the GFLI variable in the 2023 data set

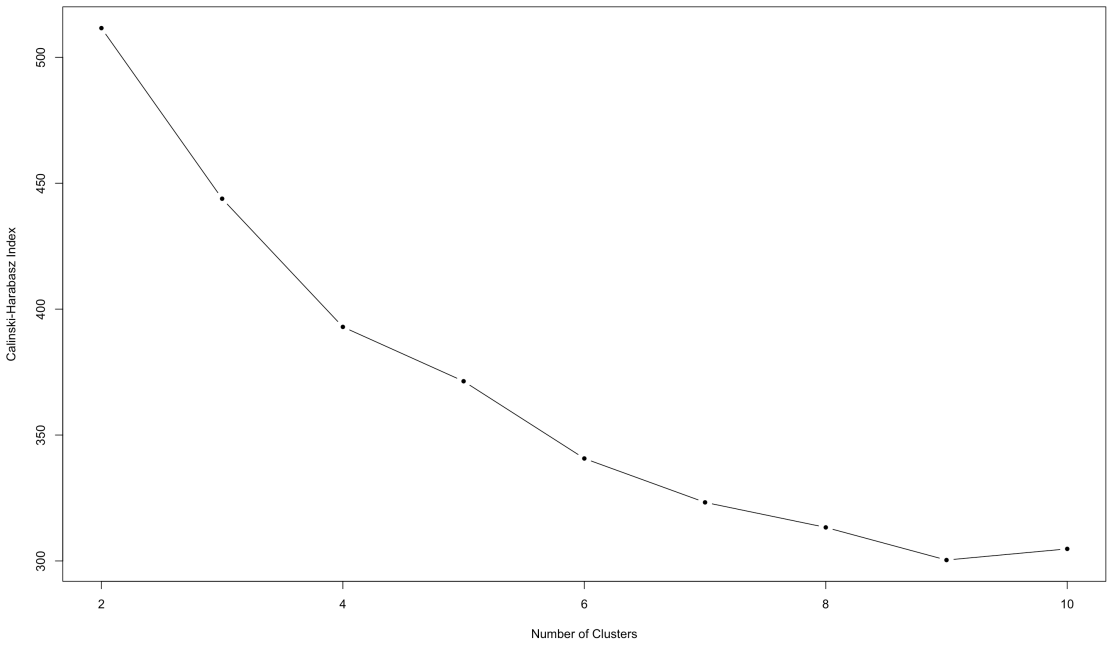


Figure C.7: Results of the Calinski-Harabasz Index for the 2015 data set

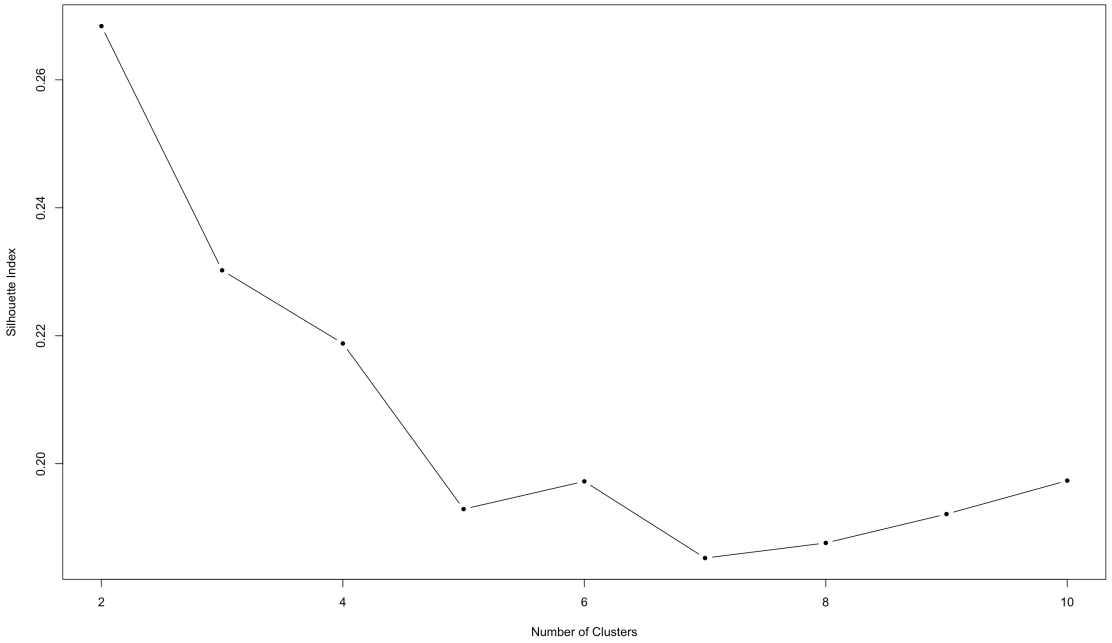


Figure C.8: Results of the Silhouette Index for the 2015 data set

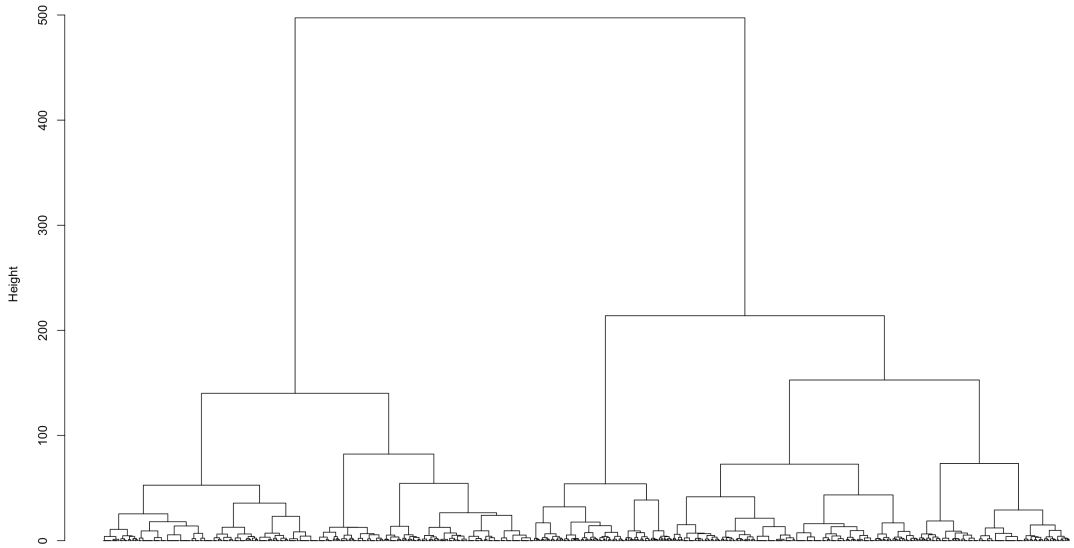


Figure C.9: Ward's Method Dendrogram for the 2015 data set

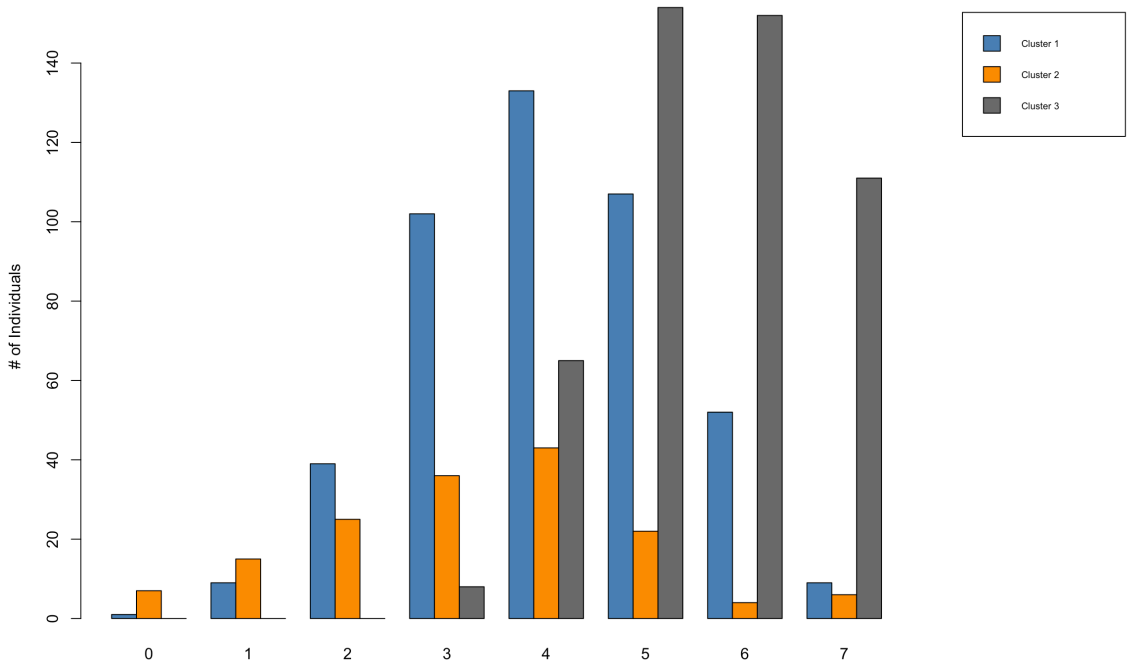


Figure C.10: Financial Knowledge Scores of Clusters 1, 2, and 3 from the 2015 data set

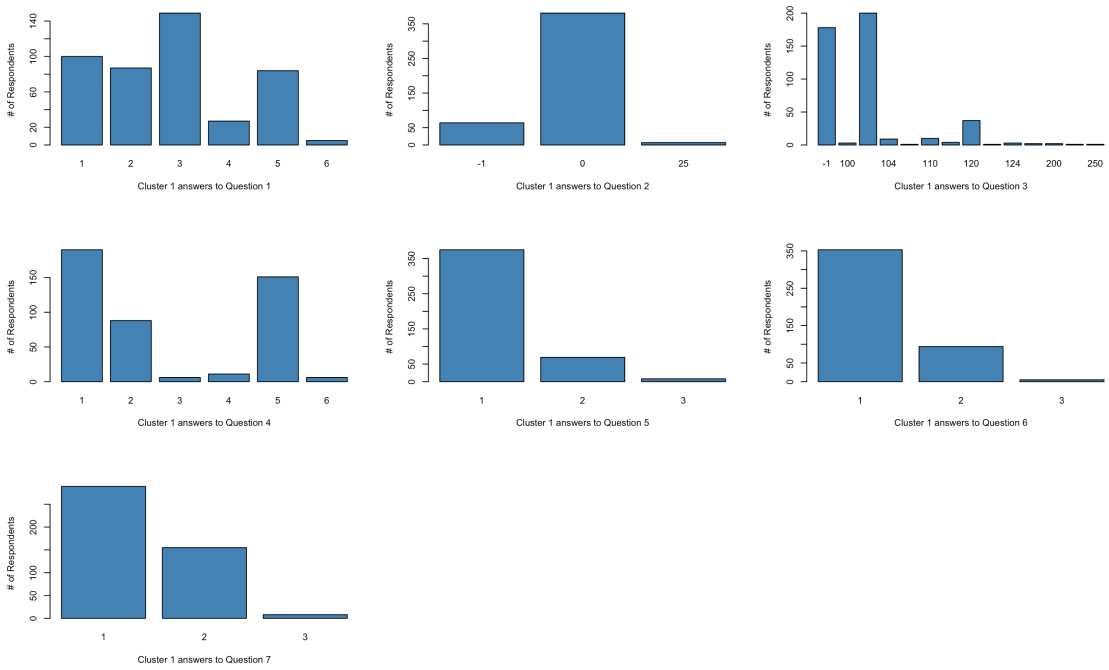


Figure C.11: Answers of the FKS variable from Cluster 1 of the 2015 data set

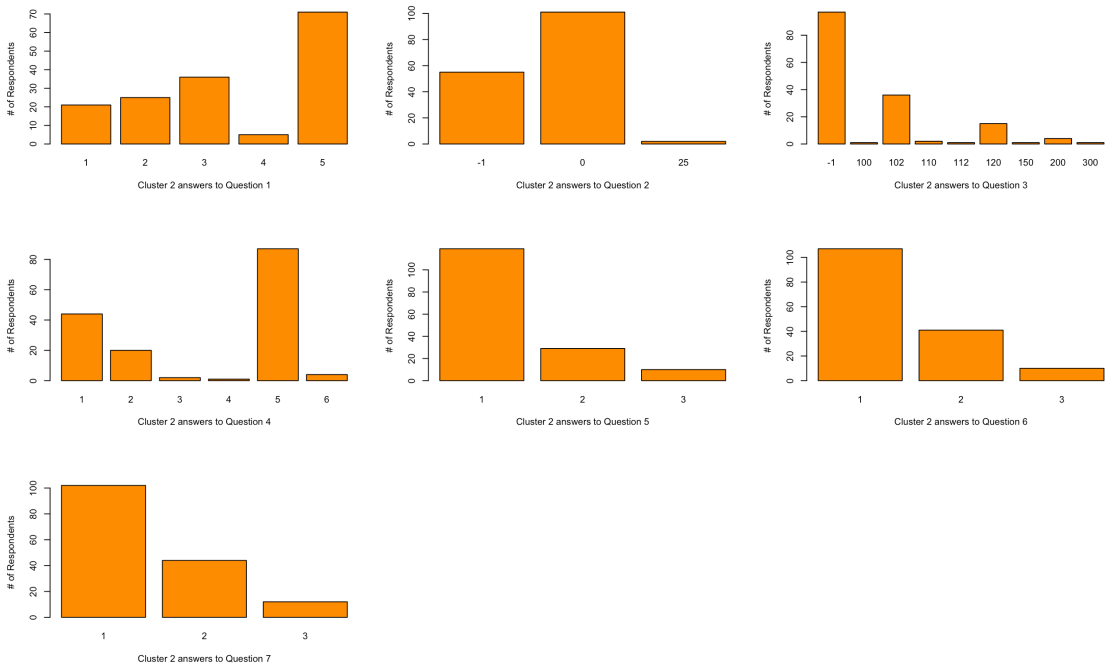


Figure C.12: Answers of the FKS variable from Cluster 2 of the 2015 data set

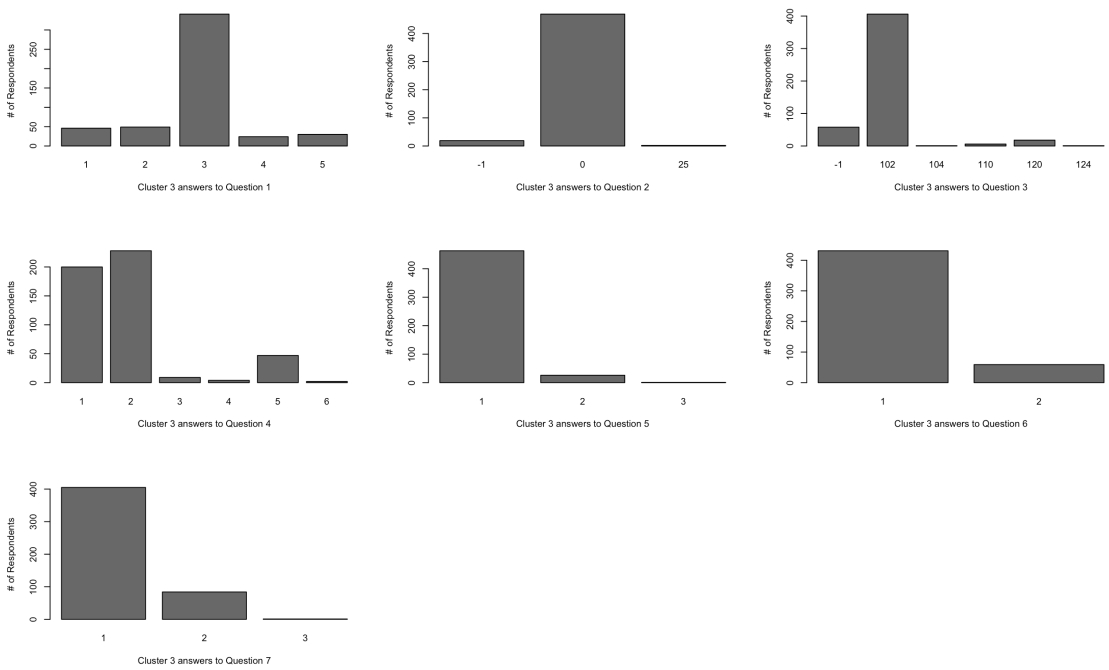


Figure C.13: Answers of the FKS variable from Cluster 3 of the 2015 data set

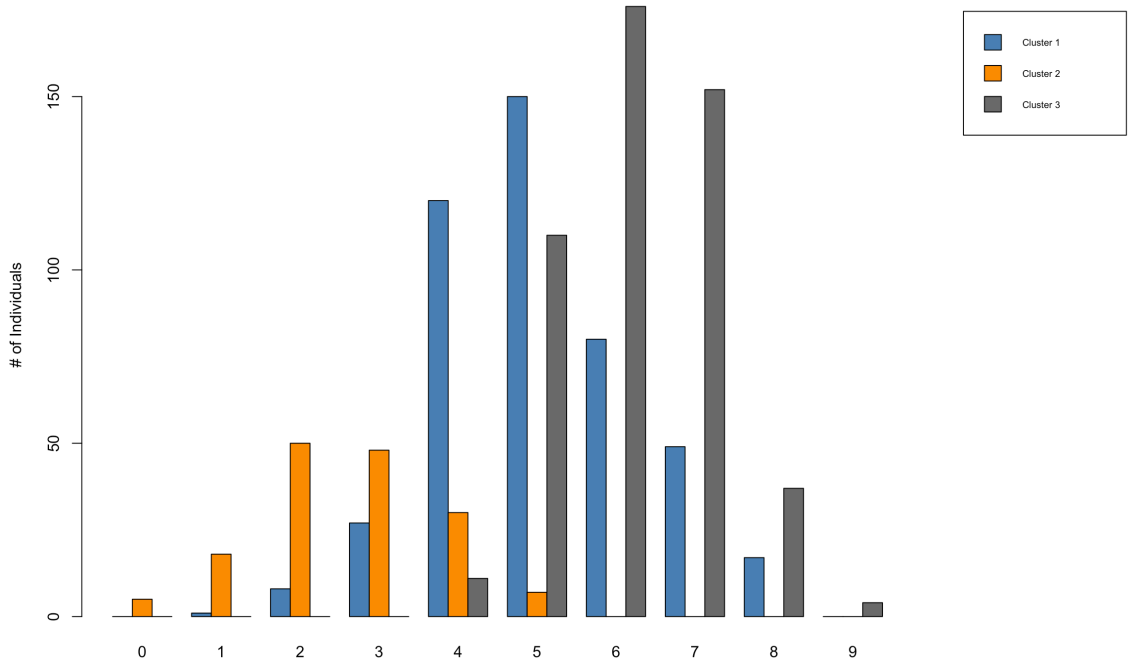


Figure C.14: Financial Behavior Scores of Clusters 1, 2, and 3 from the 2015 data set

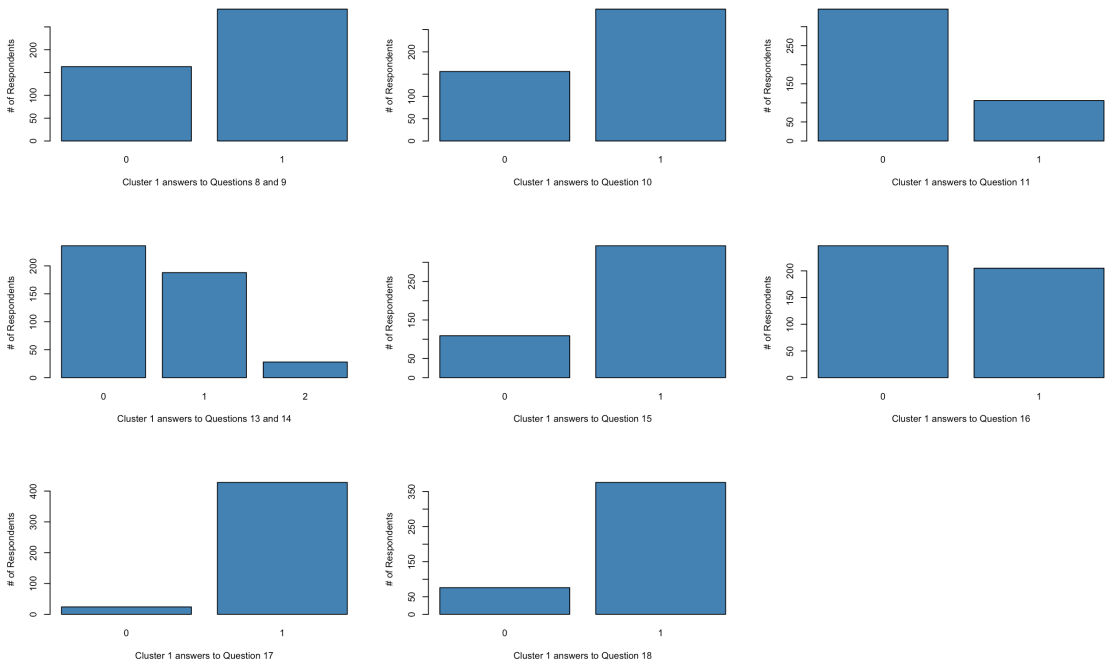


Figure C.15: Answers of the FBS variable from Cluster 1 of the 2015 data set

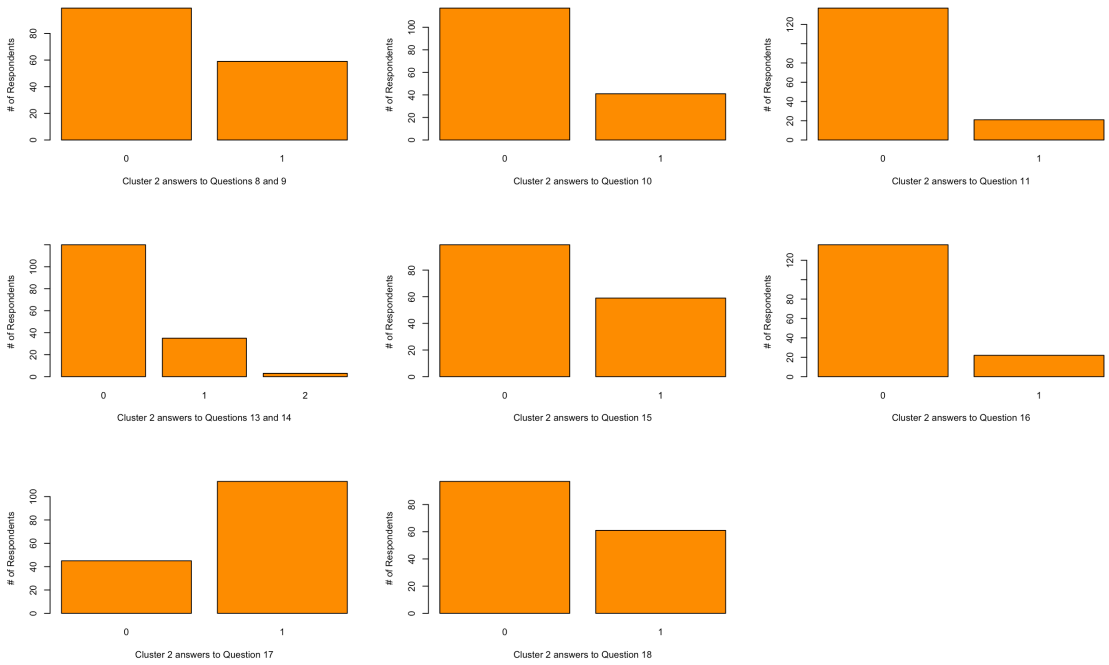


Figure C.16: Answers of the FBS variable from Cluster 2 of the 2015 data set

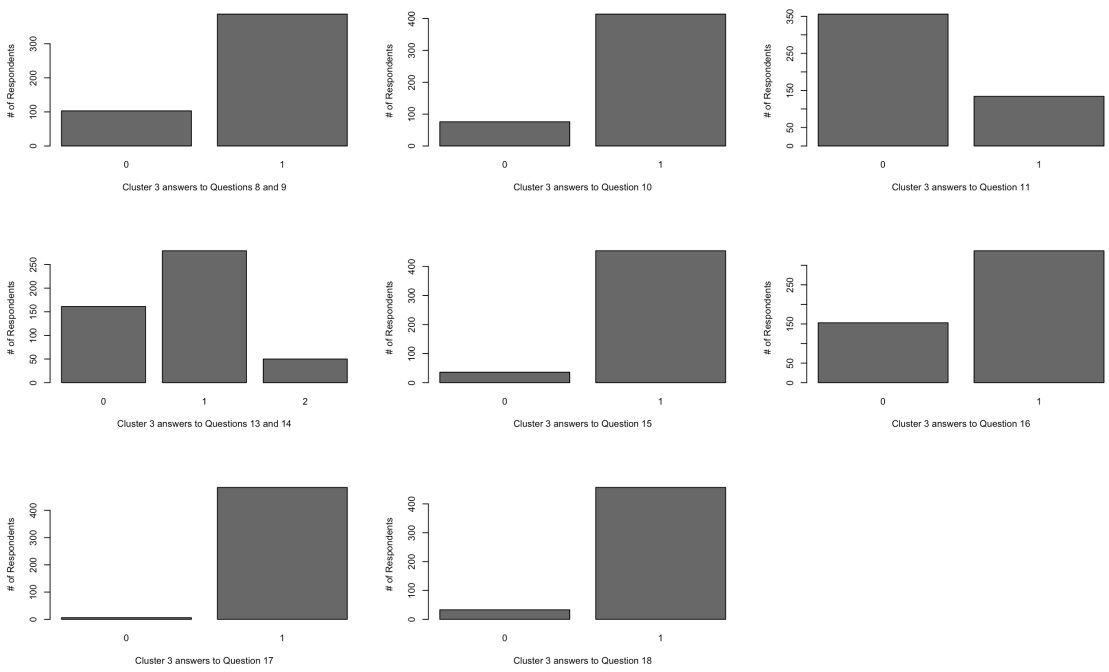


Figure C.17: Answers of the FBS variable from Cluster 3 of the 2015 data set

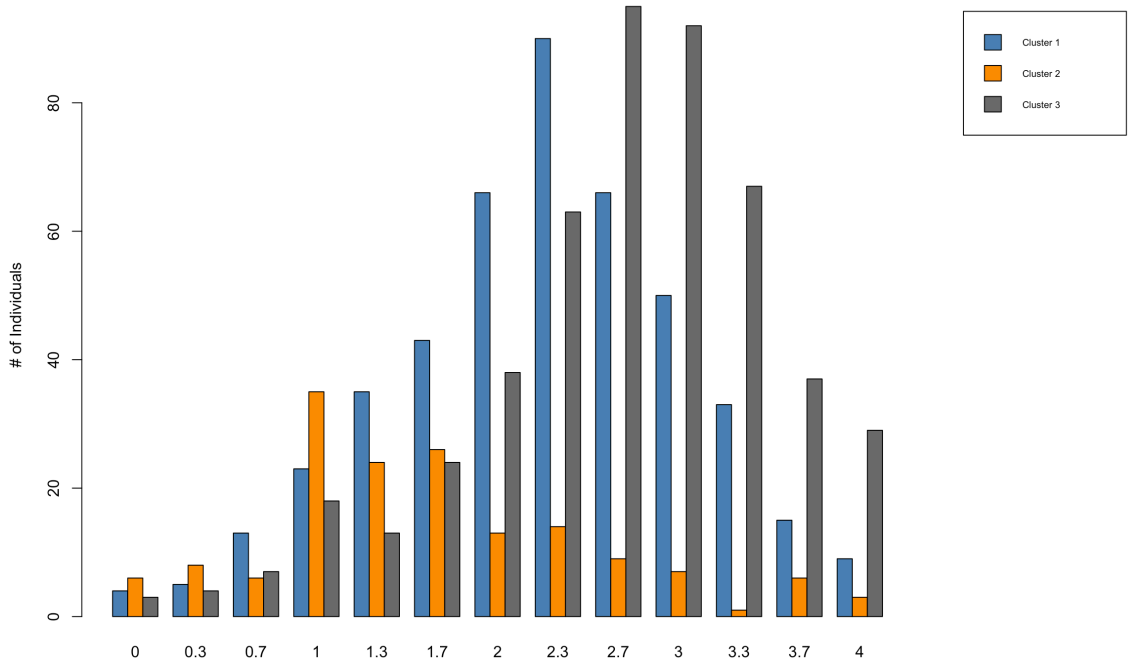


Figure C.18: Financial Attitudes Scores of Clusters 1, 2, and 3 from the 2015 data set

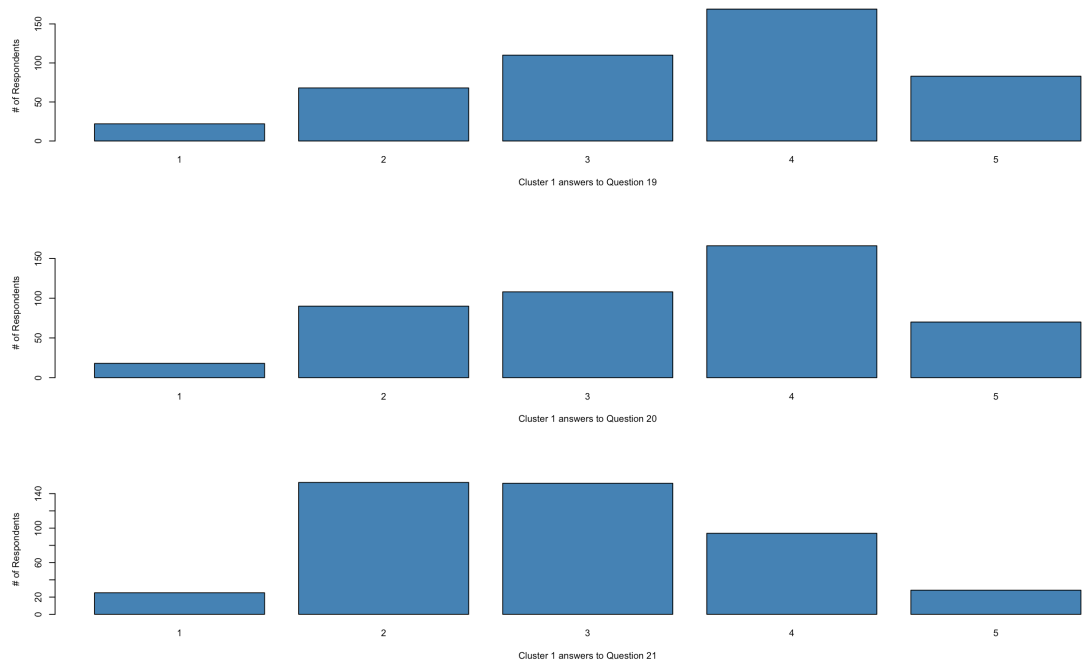


Figure C.19: Answers of the FAS variable from Cluster 1 of the 2015 data set

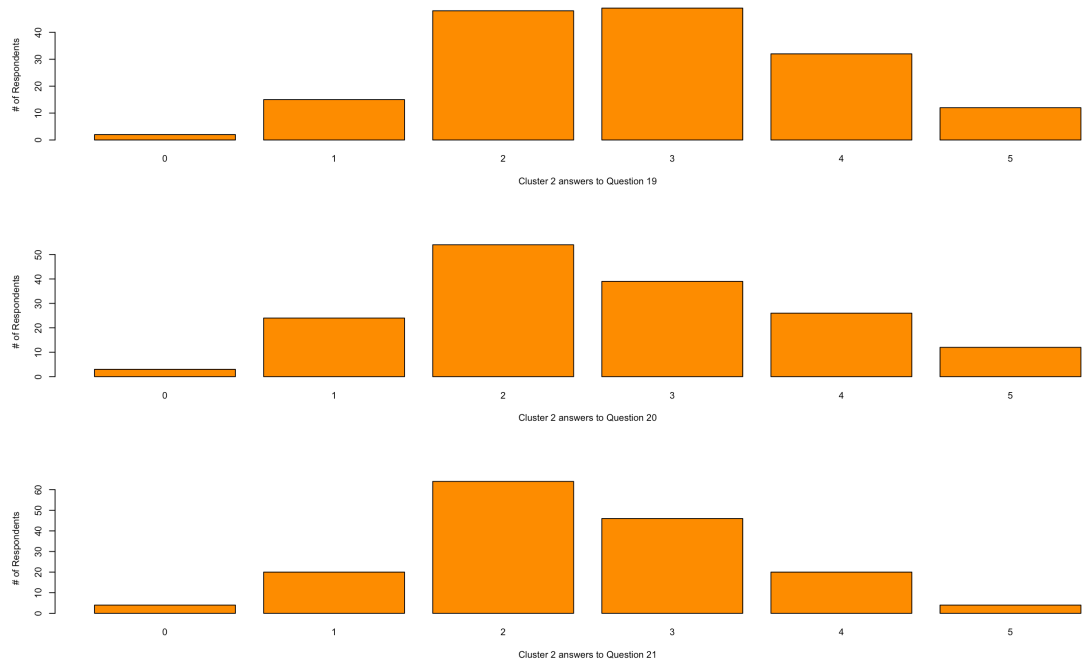


Figure C.20: Answers of the FAS variable from Cluster 2 of the 2015 data set

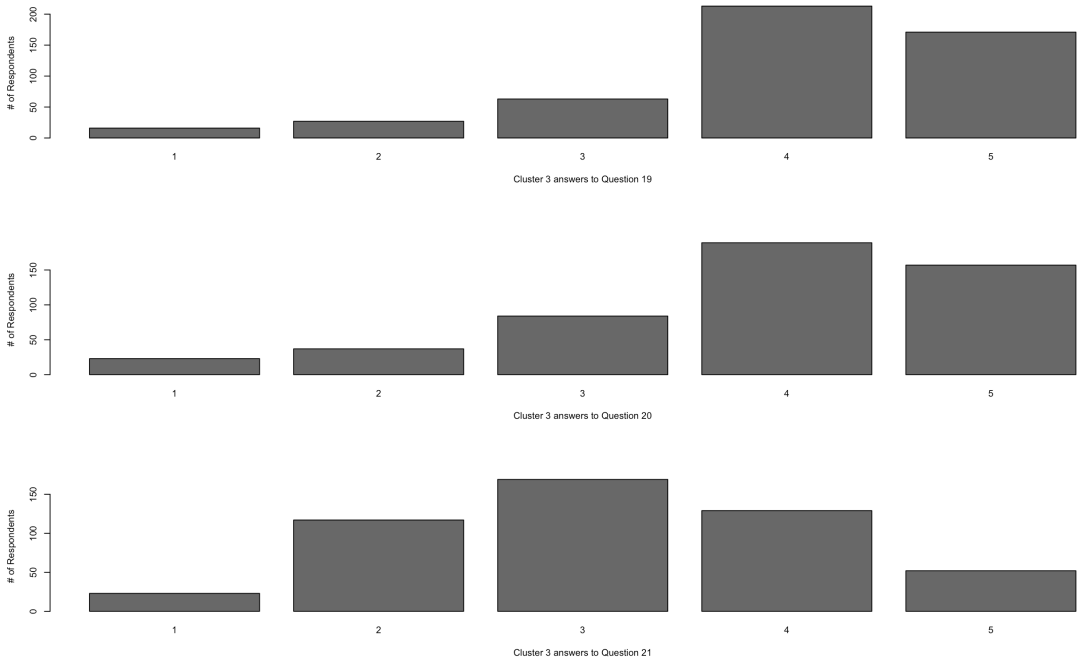


Figure C.21: Answers of the FAS variable from Cluster 3 of the 2015 data set

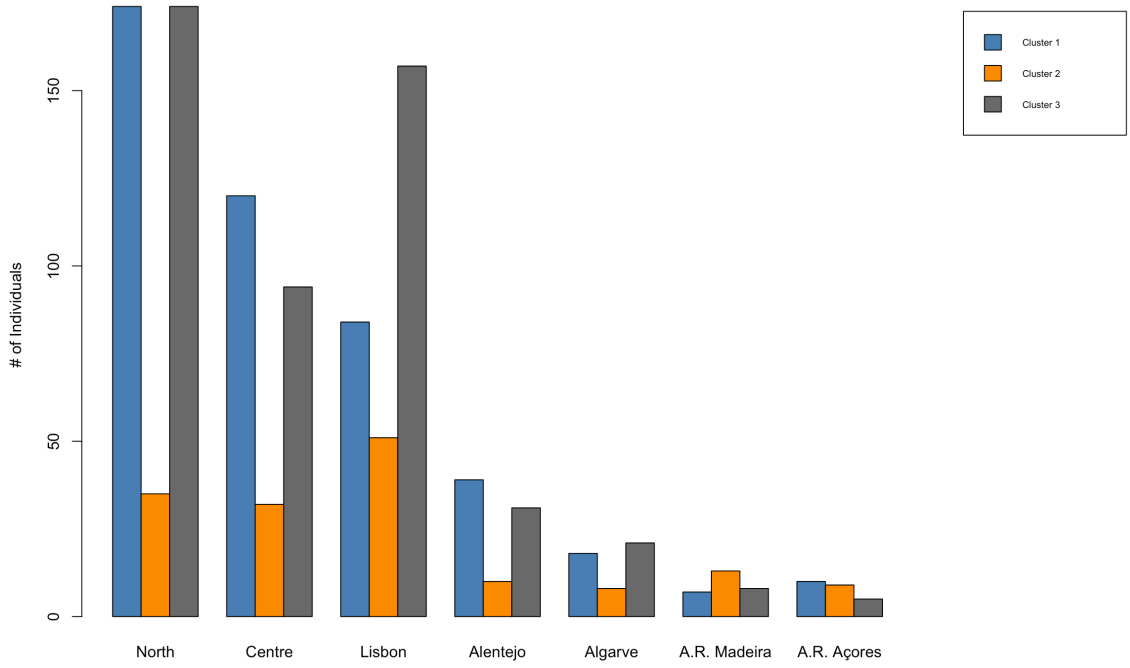


Figure C.22: Distribution of the REGION variable in Clusters 1, 2, and 3 from the 2015 data set

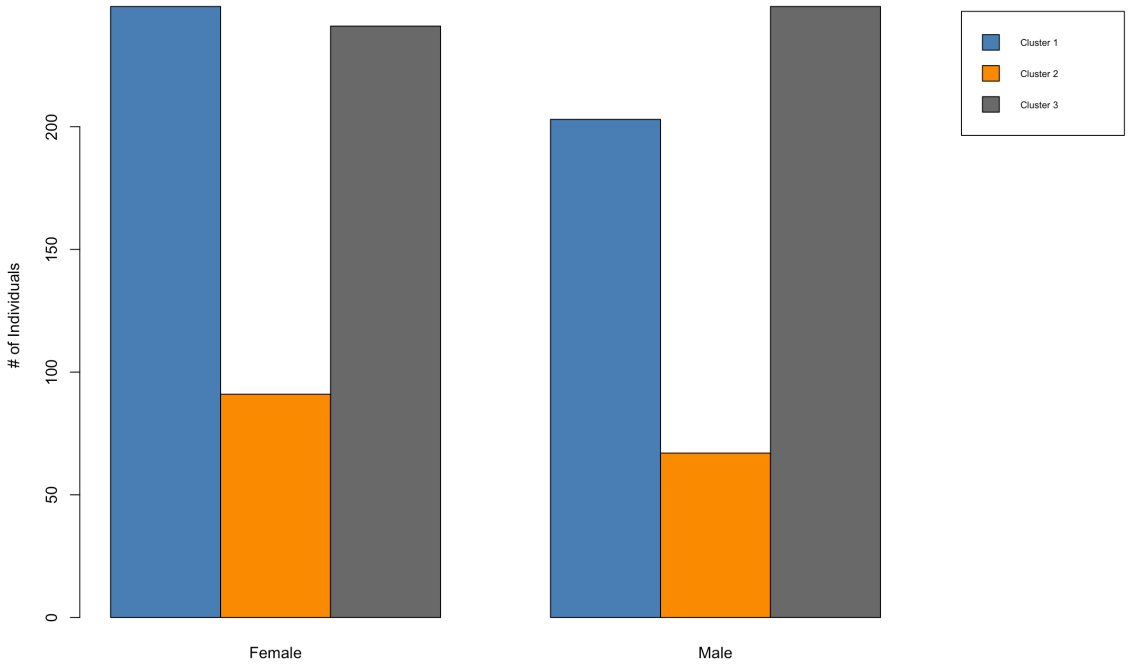


Figure C.23: Distribution of the GENDER variable in Clusters 1, 2, and 3 from the 2015 data set

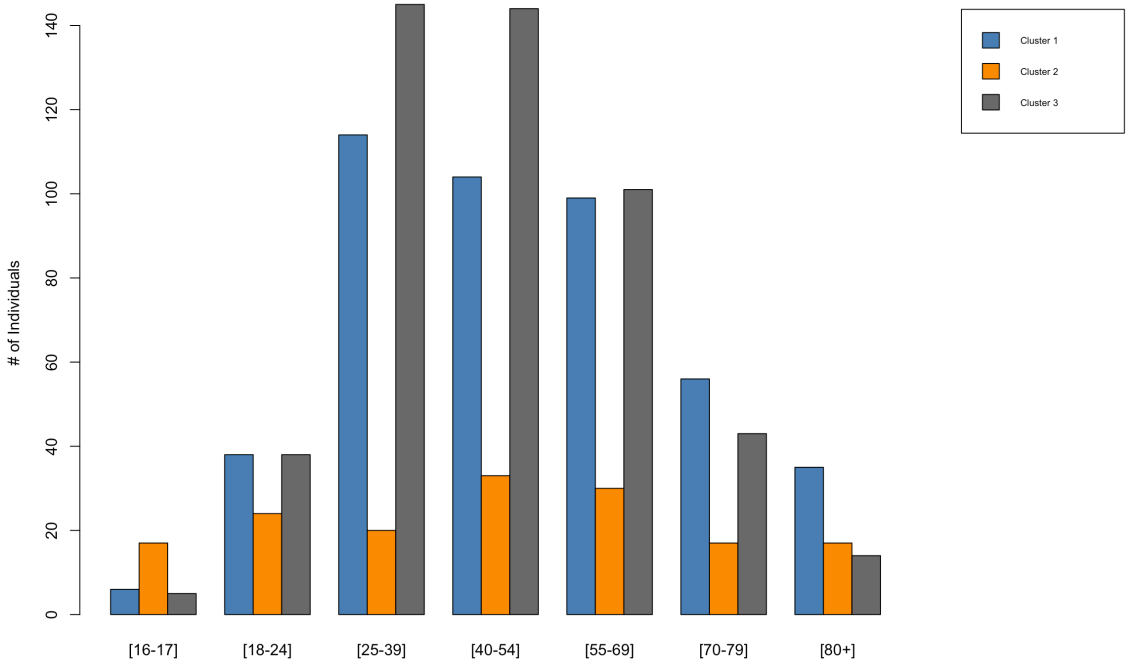


Figure C.24: Distribution of the AGE GROUP variable in Clusters 1, 2, and 3 from the 2015 data set

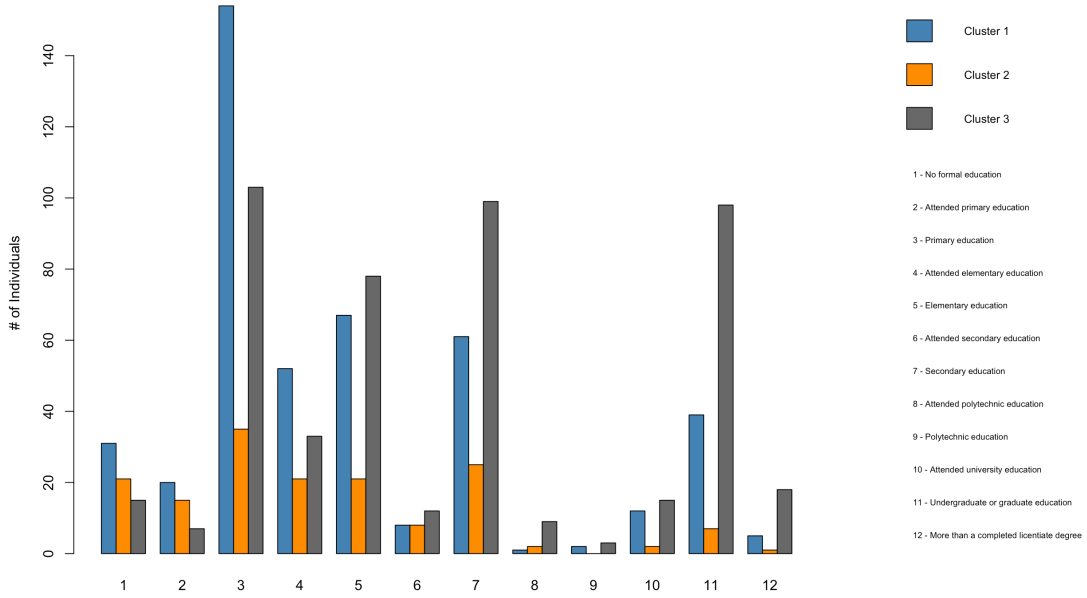


Figure C.25: Distribution of the EDUCATION variable in Clusters 1, 2, and 3 from the 2015 data set

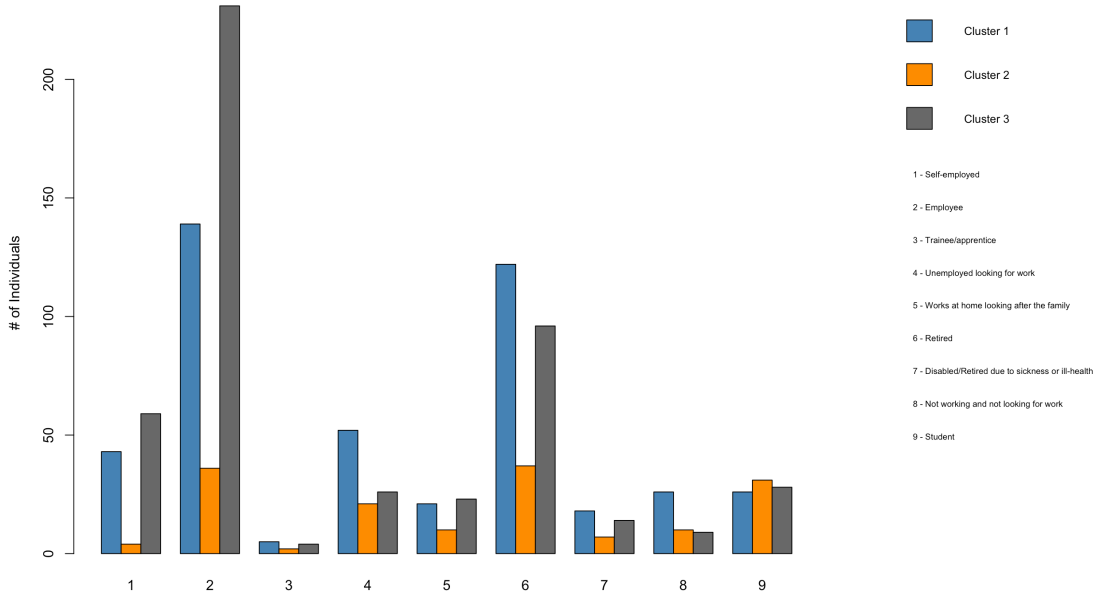


Figure C.26: Distribution of the OCCUPATION variable in Clusters 1, 2, and 3 from the 2015 data set

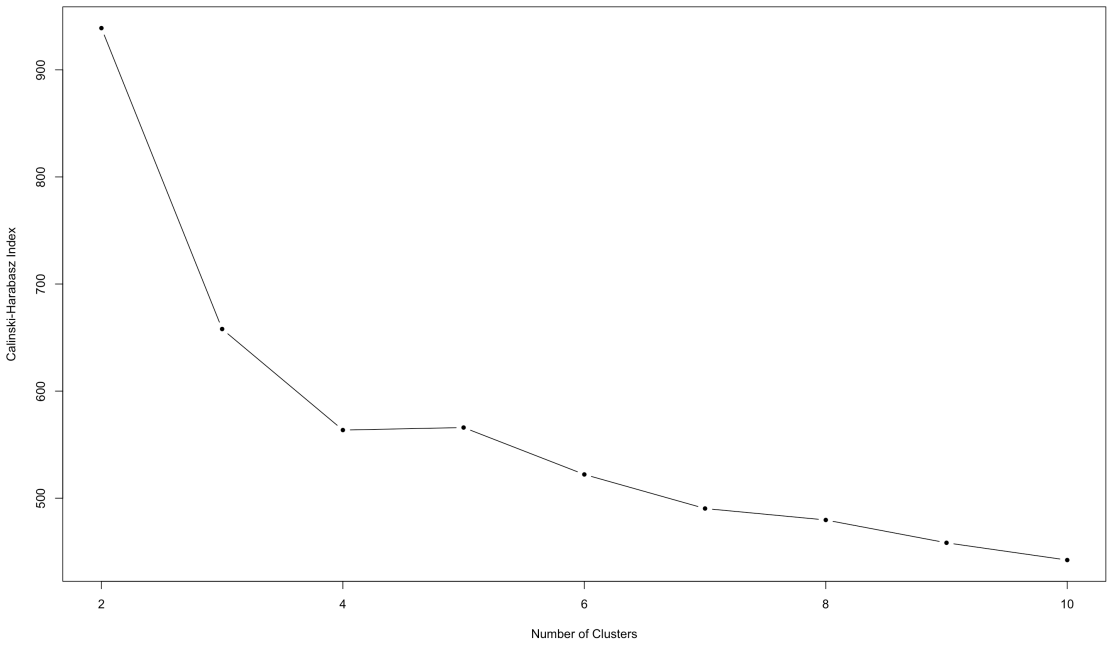


Figure C.27: Results of the Calinski-Harabasz Index for the 2020 data set

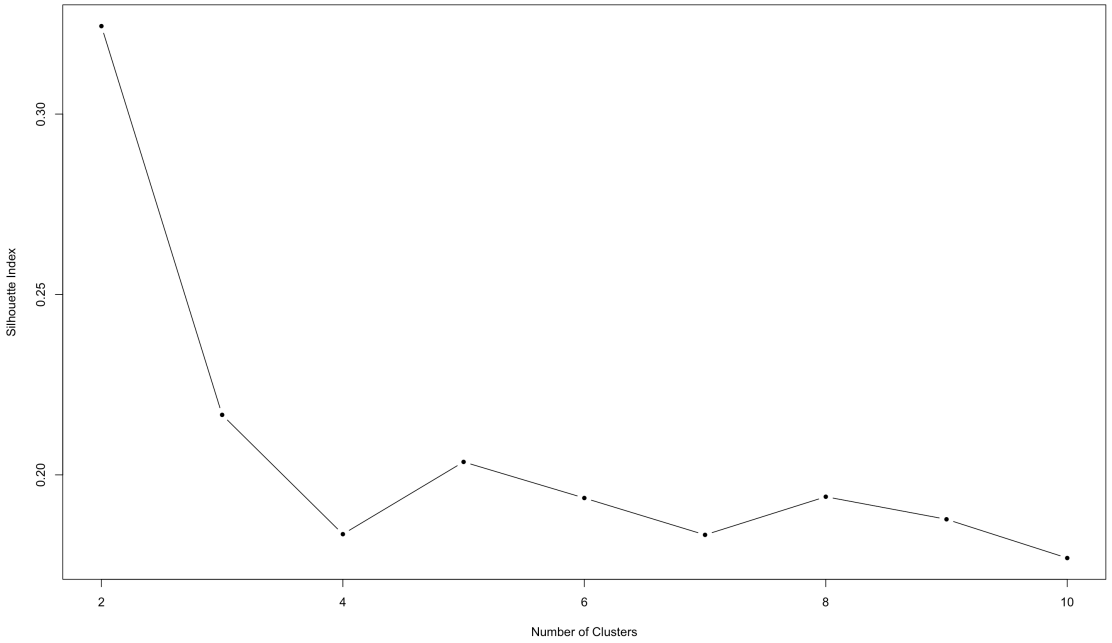


Figure C.28: Results of the Silhouette Index for the 2020 data set

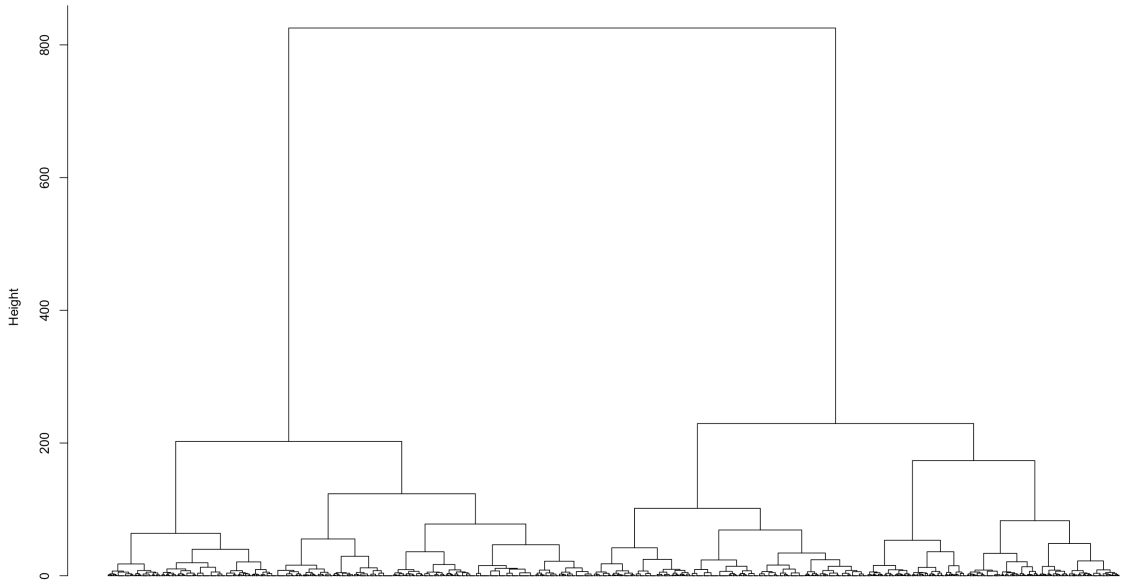


Figure C.29: Ward's Method Dendrogram for the 2020 data set

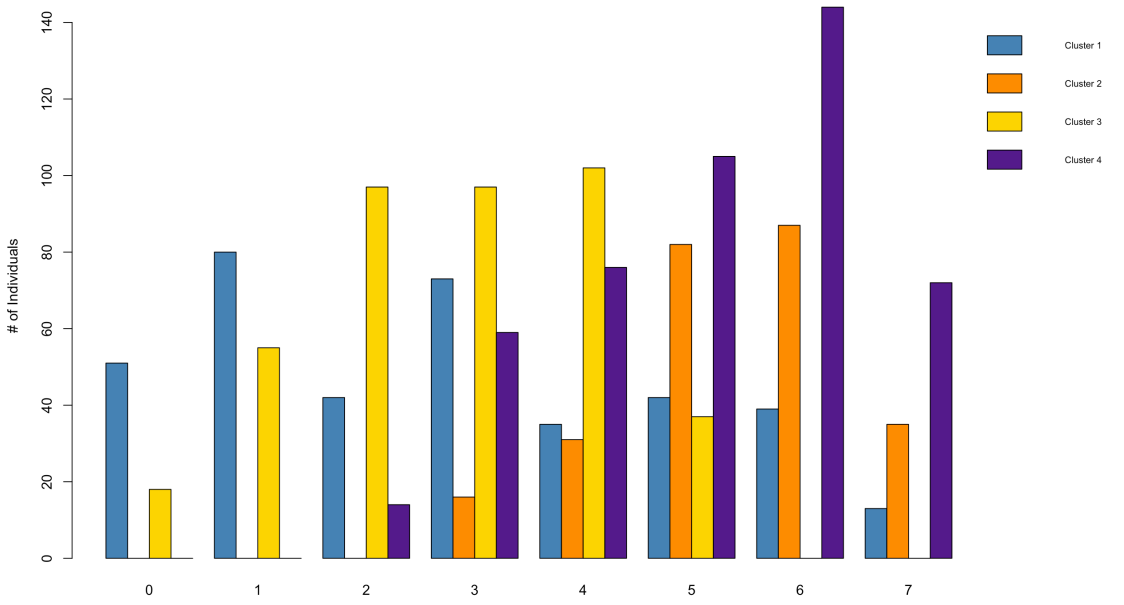


Figure C.30: Financial Knowledge Scores of Clusters 1, 2, 3 and 4 from the 2020 data set

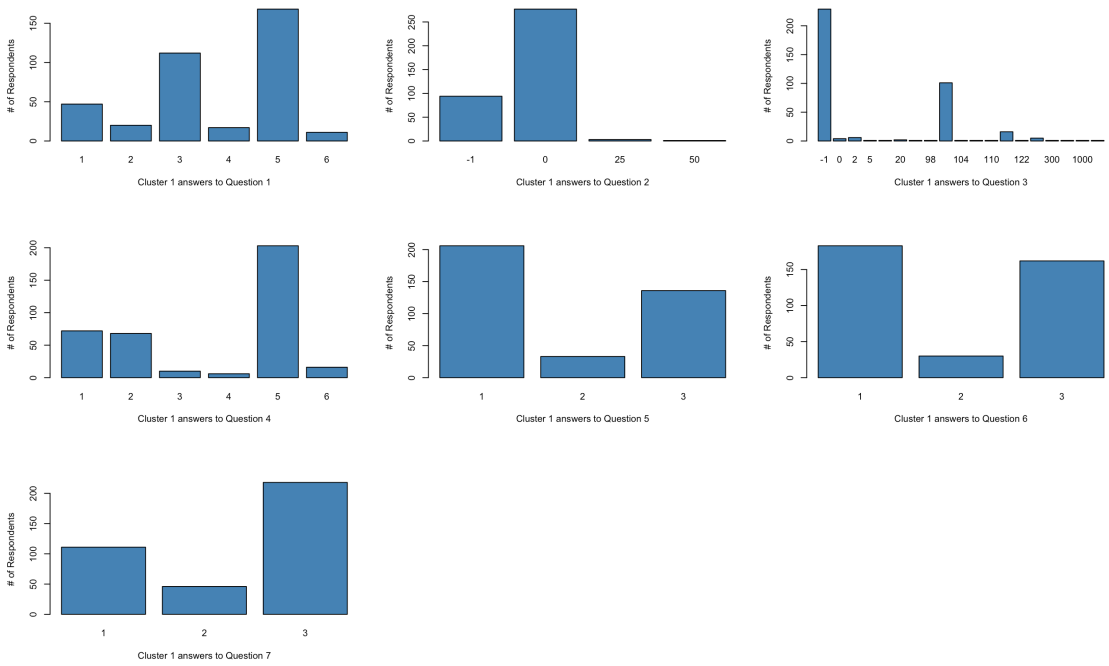


Figure C.31: Answers of the FKS variable from Cluster 1 of the 2020 data set

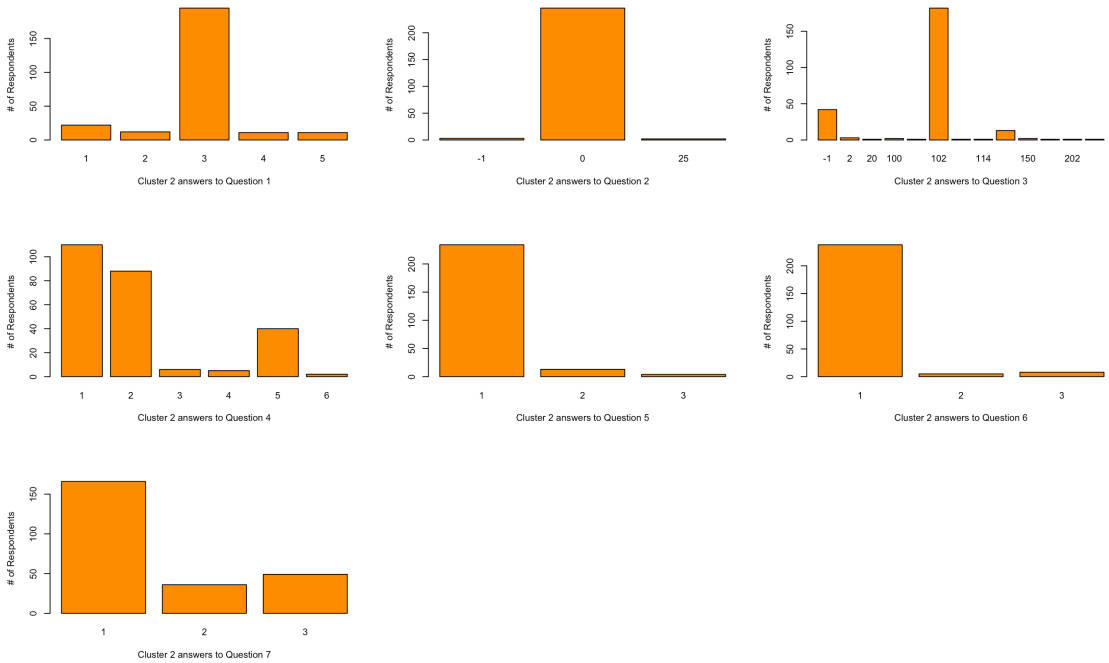


Figure C.32: Answers of the FKS variable from Cluster 2 of the 2020 data set

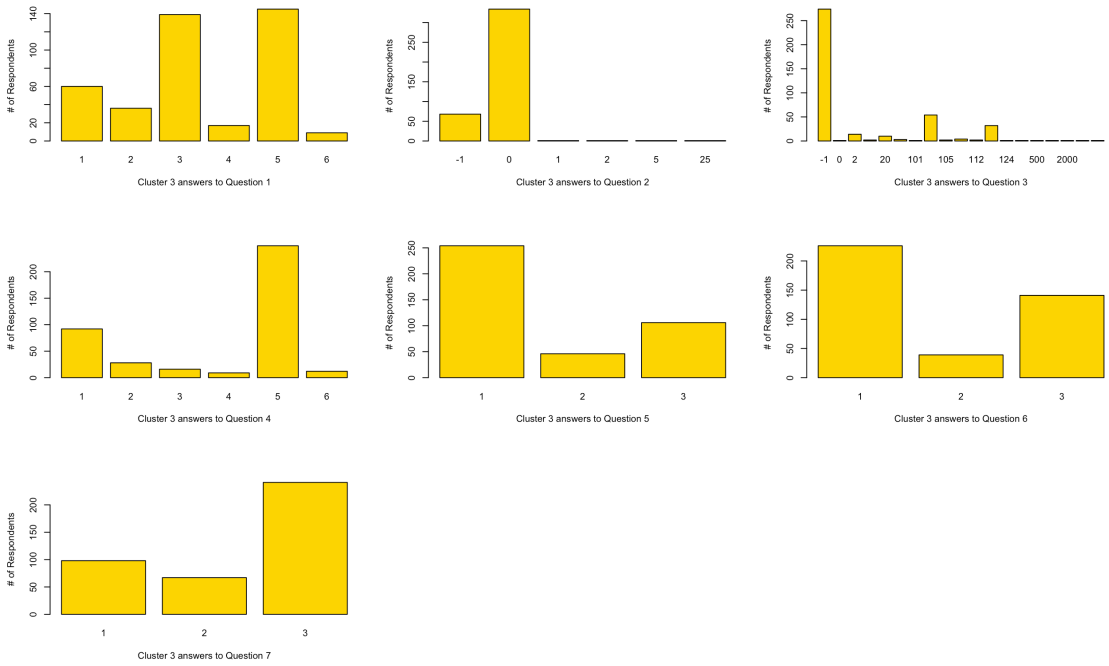


Figure C.33: Answers of the FKS variable from Cluster 3 of the 2020 data set

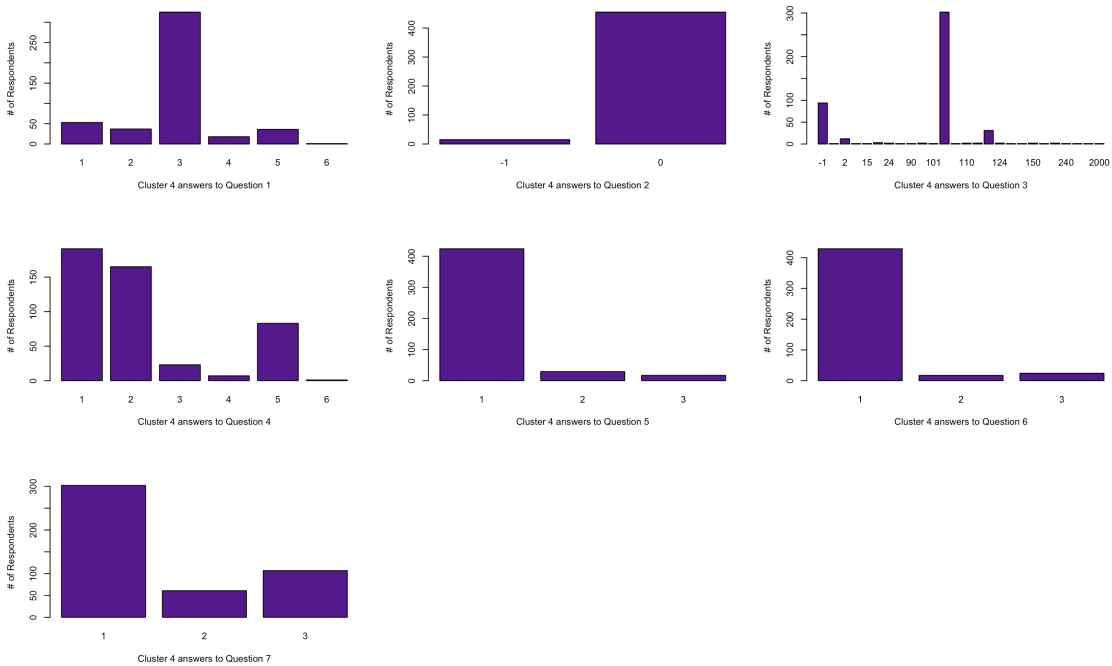


Figure C.34: Answers of the FKS variable from Cluster 4 of the 2020 data set

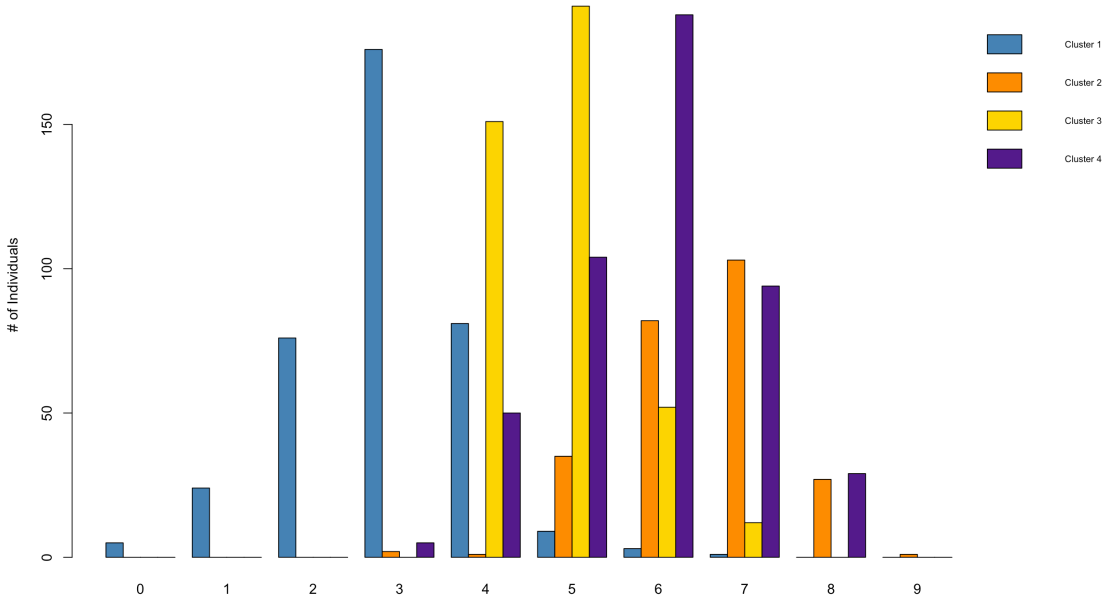


Figure C.35: Financial Behavior Scores of Clusters 1, 2, 3, and 4 from the 2020 data set

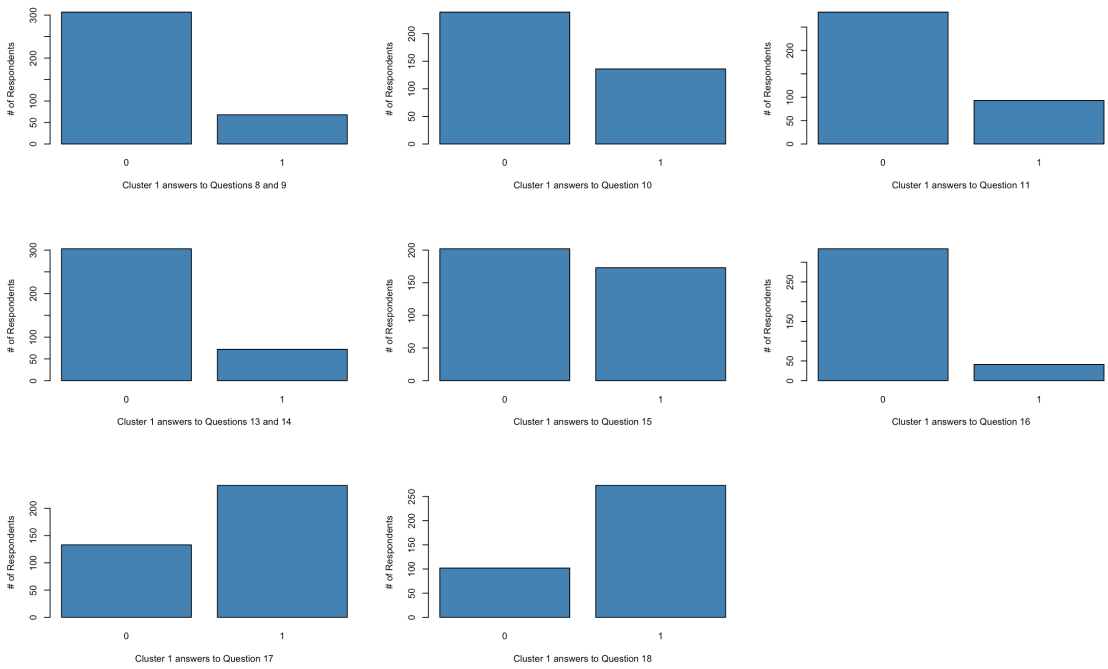


Figure C.36: Answers of the FBS variable from Cluster 1.1 of the 2020 data set

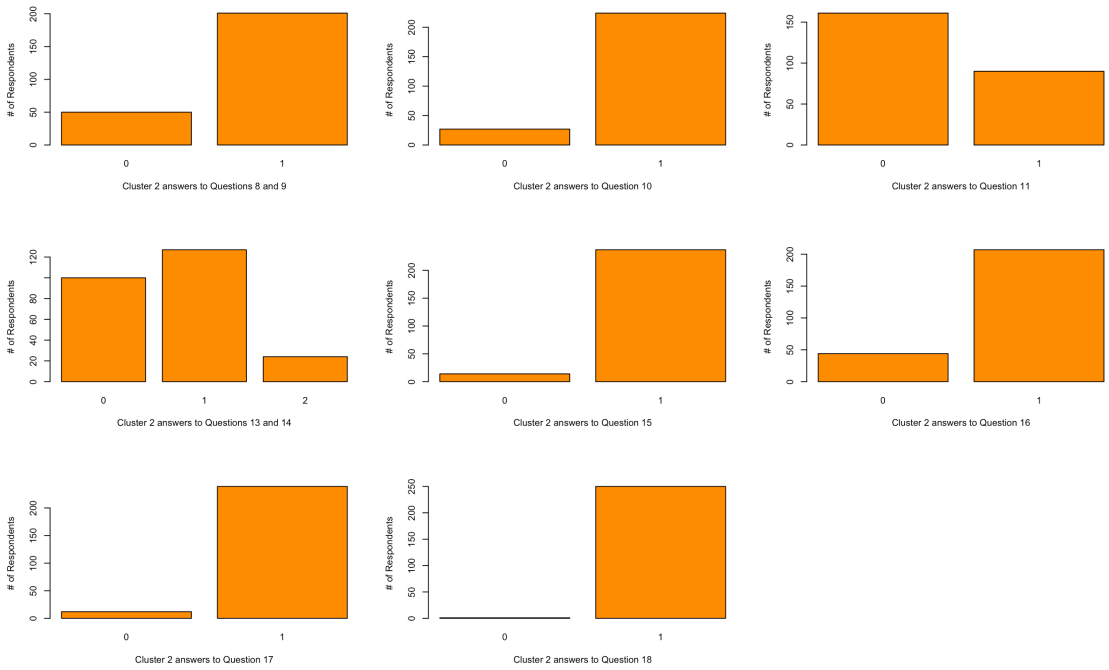


Figure C.37: Answers of the FBS variable from Cluster 2 of the 2020 data set

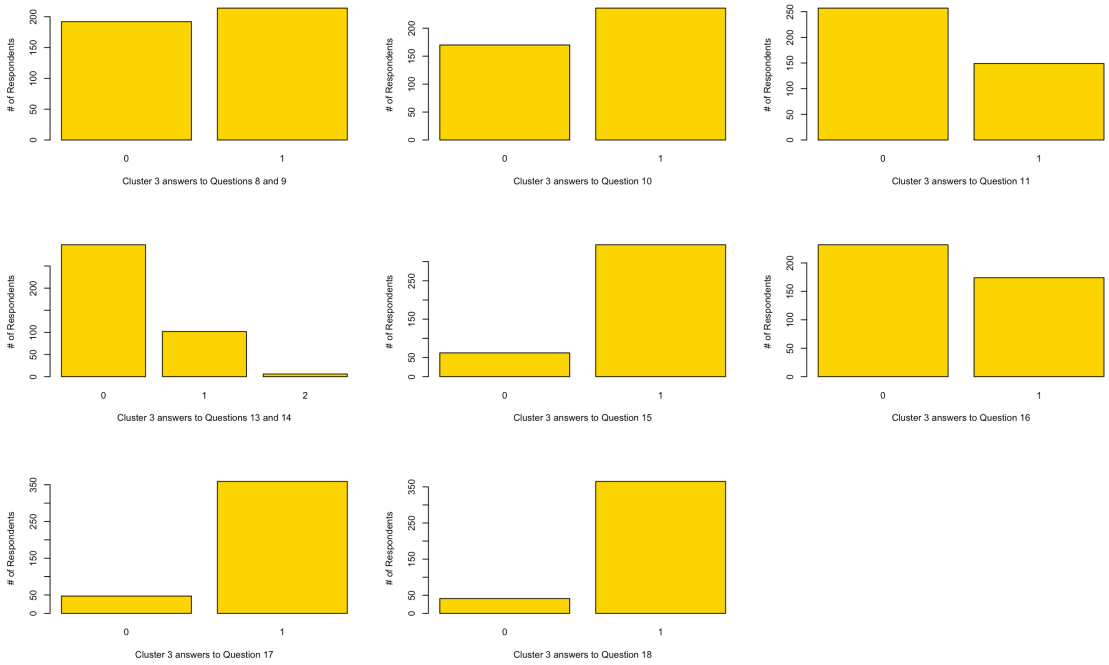


Figure C.38: Answers of the FBS variable from Cluster 3 of the 2020 data set

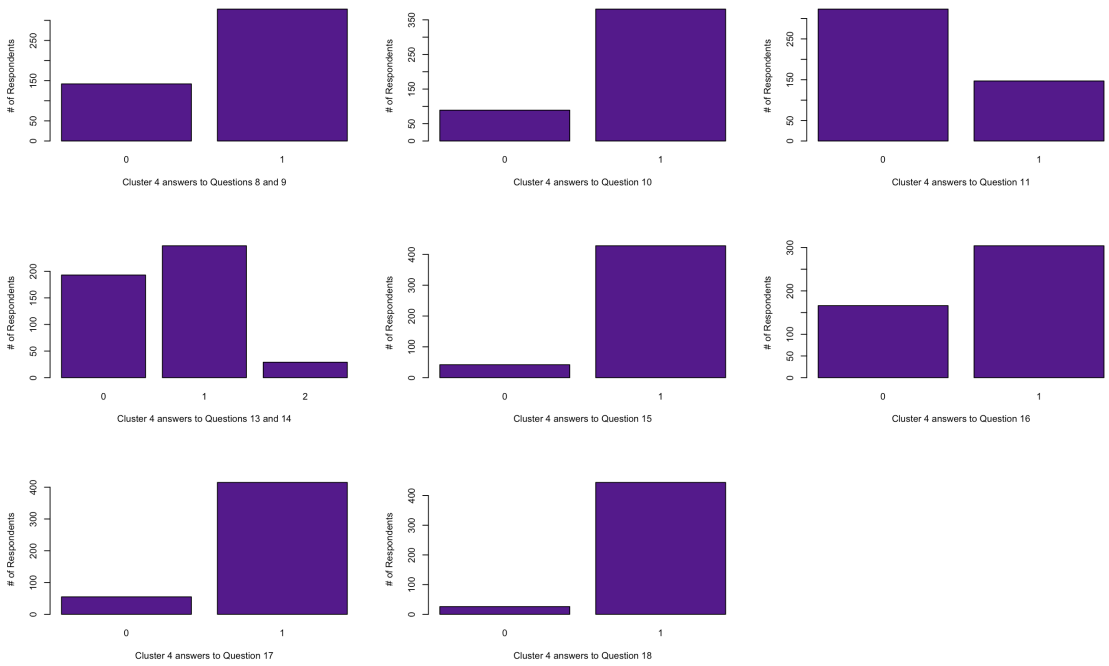


Figure C.39: Answers of the FBS variable from Cluster 4 of the 2020 data set

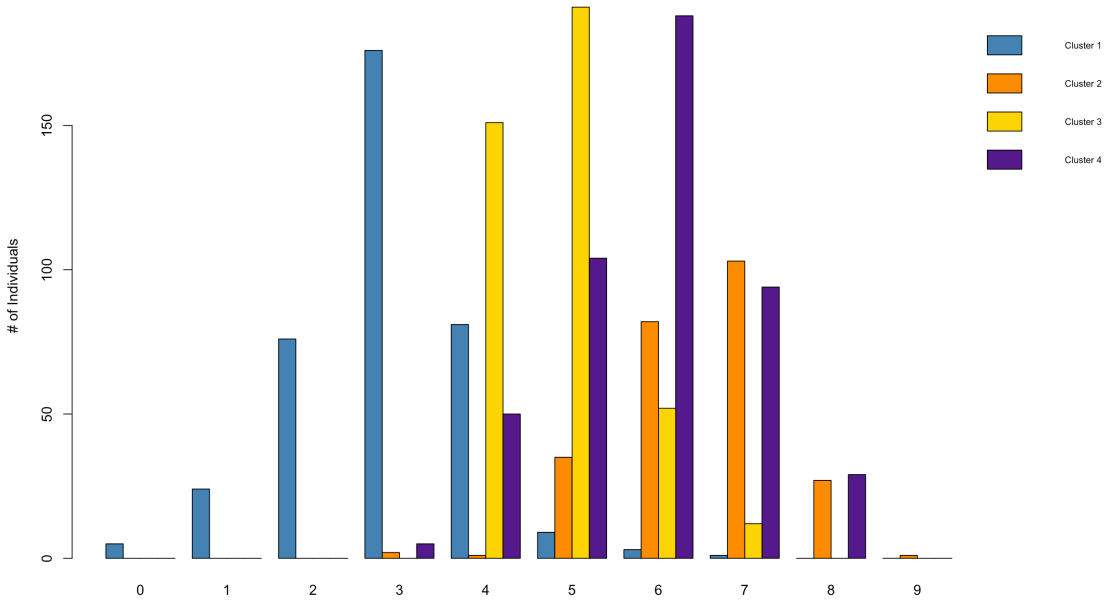


Figure C.40: Financial Attitude Scores of Clusters 1, 2, 3, and 4 from the 2020 data set

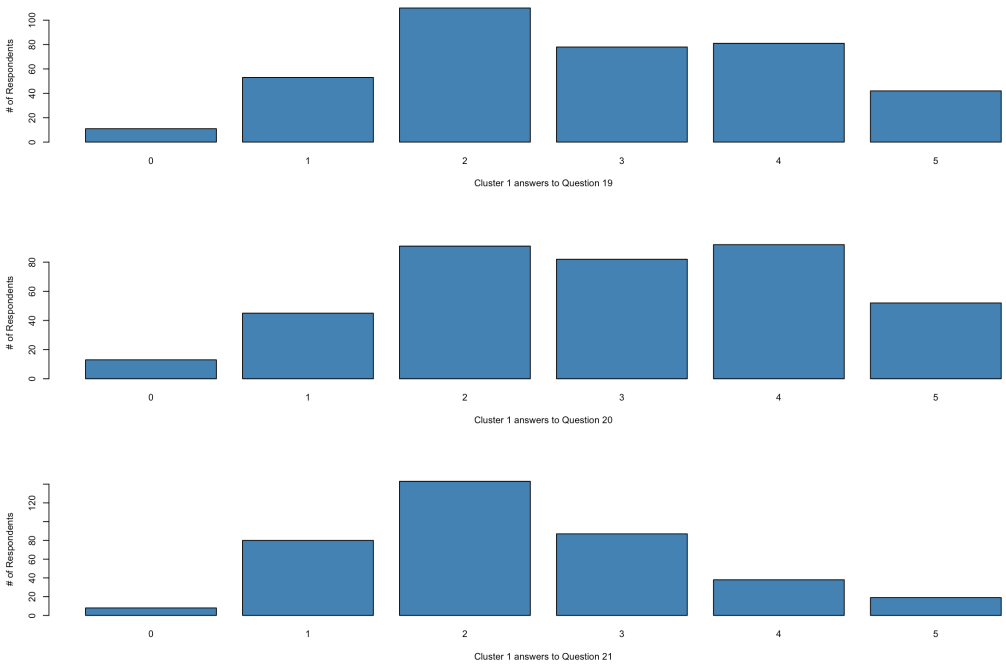


Figure C.41: Answers of the FAS variable from Cluster 1 of the 2020 data set

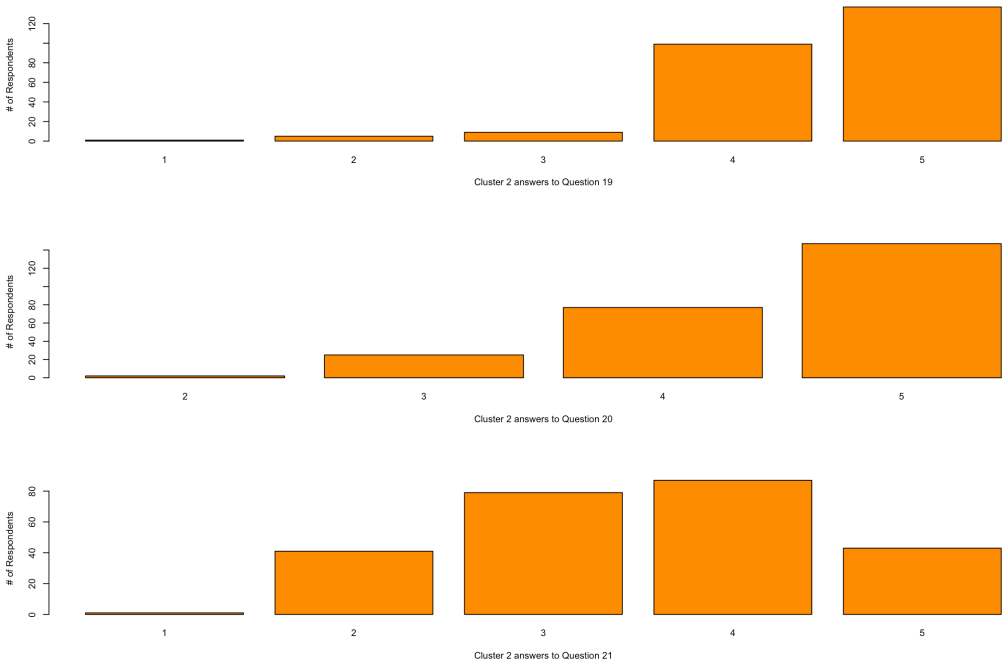


Figure C.42: Answers of the FAS variable from Cluster 2 of the 2020 data set

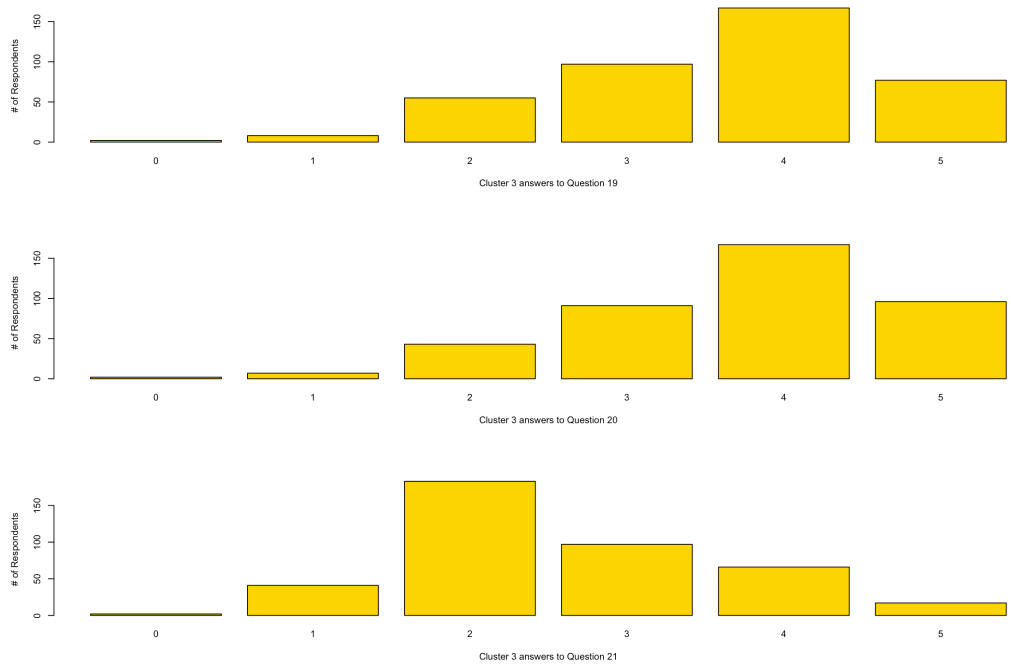


Figure C.43: Answers of the FAS variable from Cluster 3 of the 2020 data set

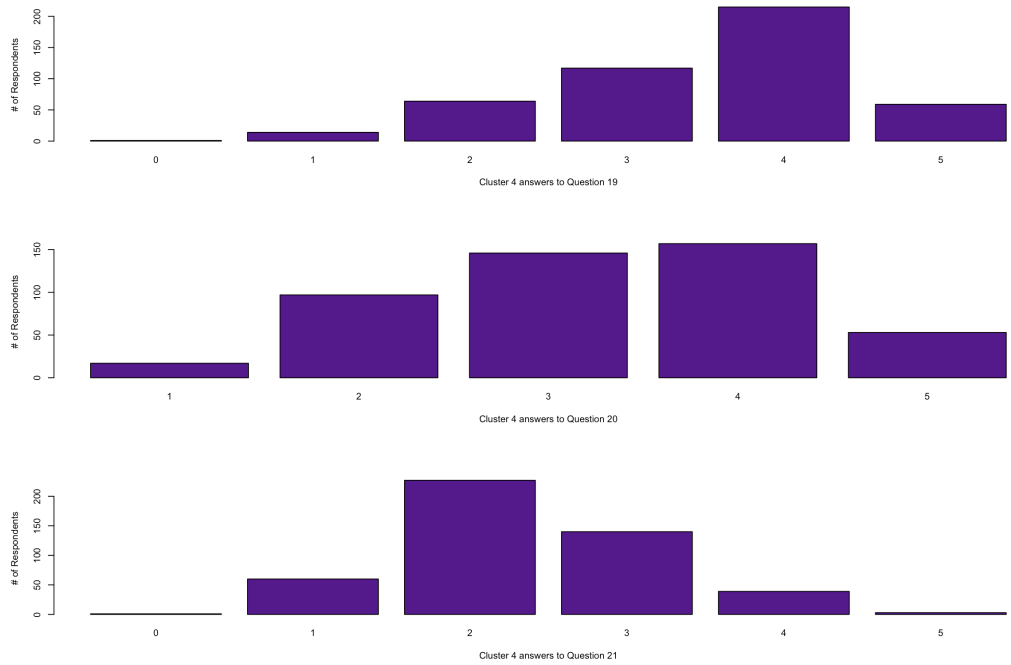


Figure C.44: Answers of the FAS variable from Cluster 4 of the 2020 data set

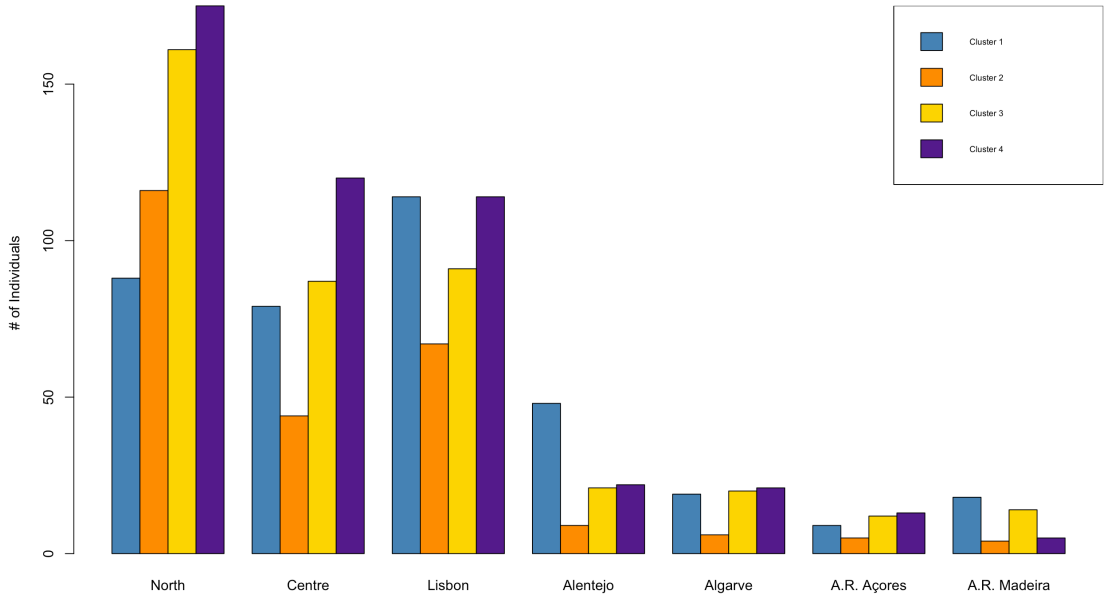


Figure C.45: Distribution of the REGION variable in Clusters 1, 2, 3, and 4 from the 2020 data set

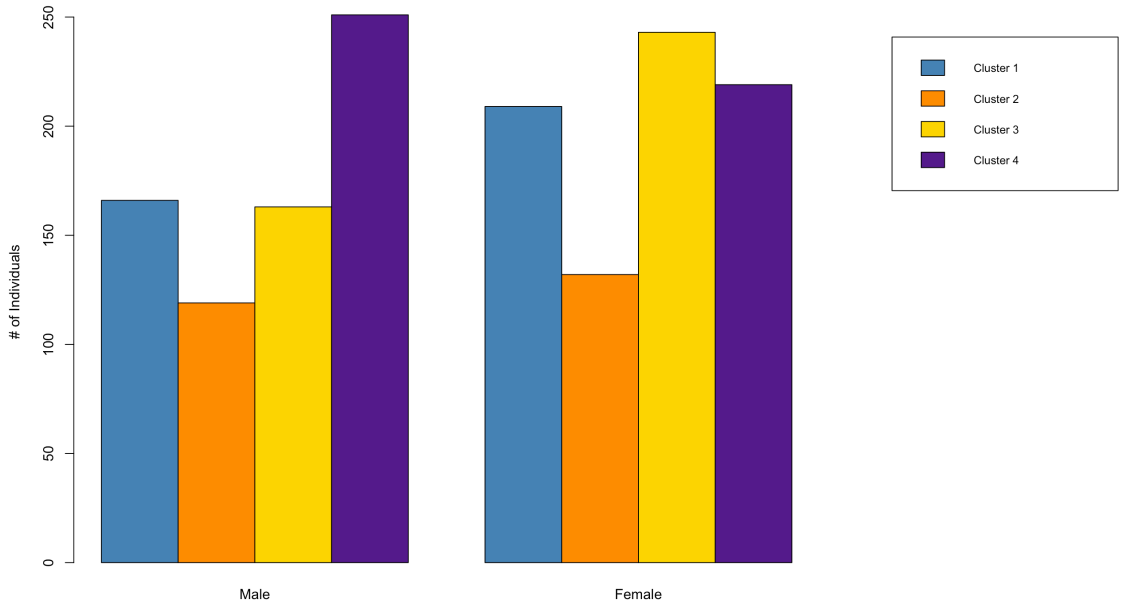


Figure C.46: Distribution of the GENDER variable in Clusters 1, 2, 3, and 4 from the 2020 data set

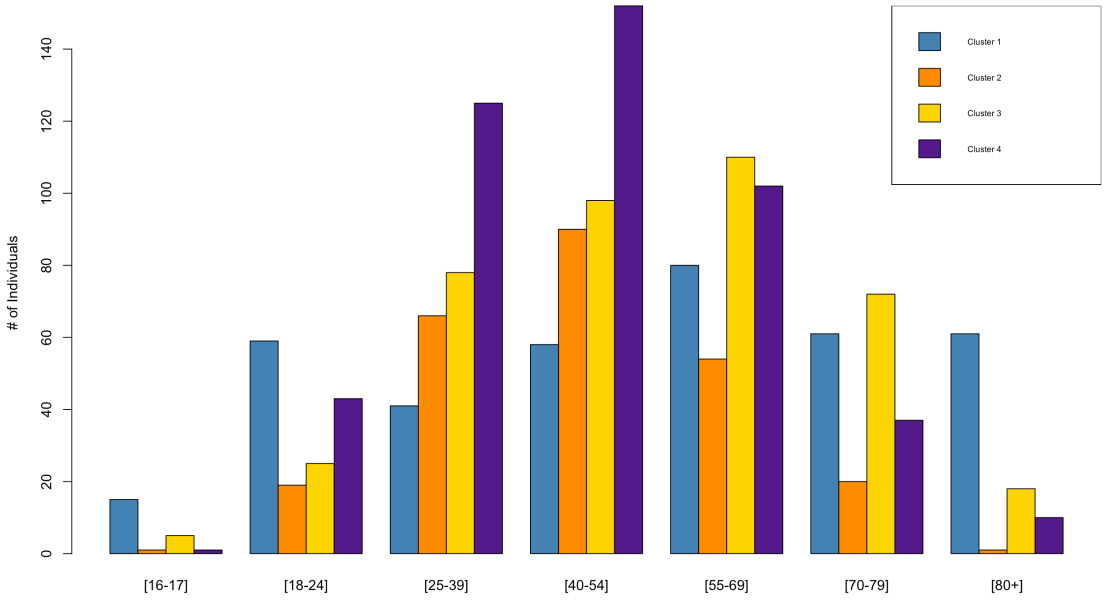


Figure C.47: Distribution of the AGE GROUP variable in Clusters 1, 2, 3, and 4 from the 2020 data set

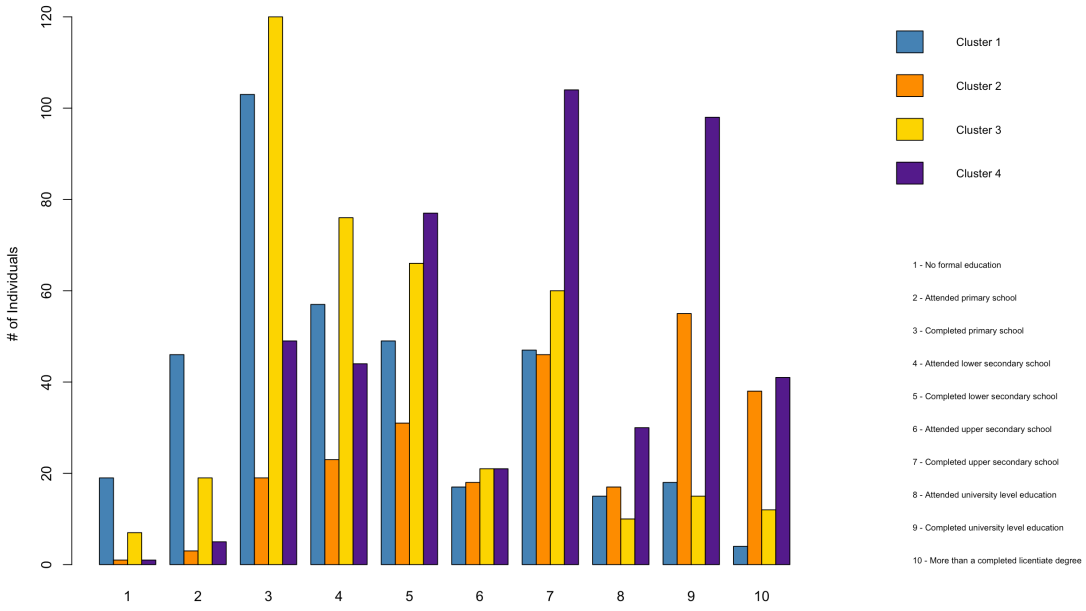


Figure C.48: Distribution of the EDUCATION variable in Clusters 1, 2, 3, and 4 from the 2020 data set

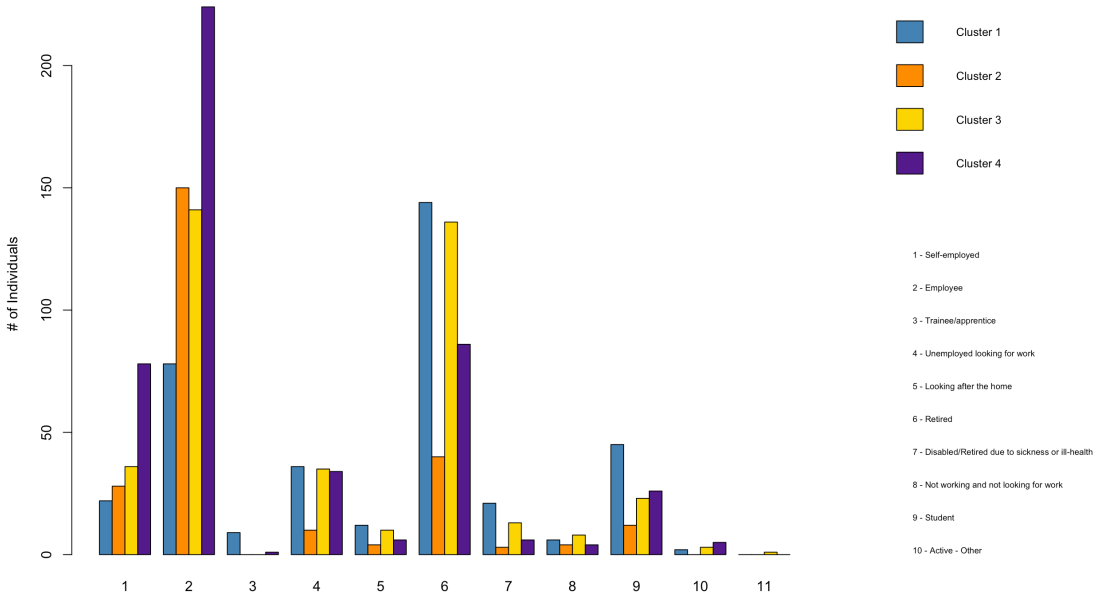


Figure C.49: Distribution of the OCCUPATION variable in Clusters 1, 2, 3, and 4 from the 2020 data set

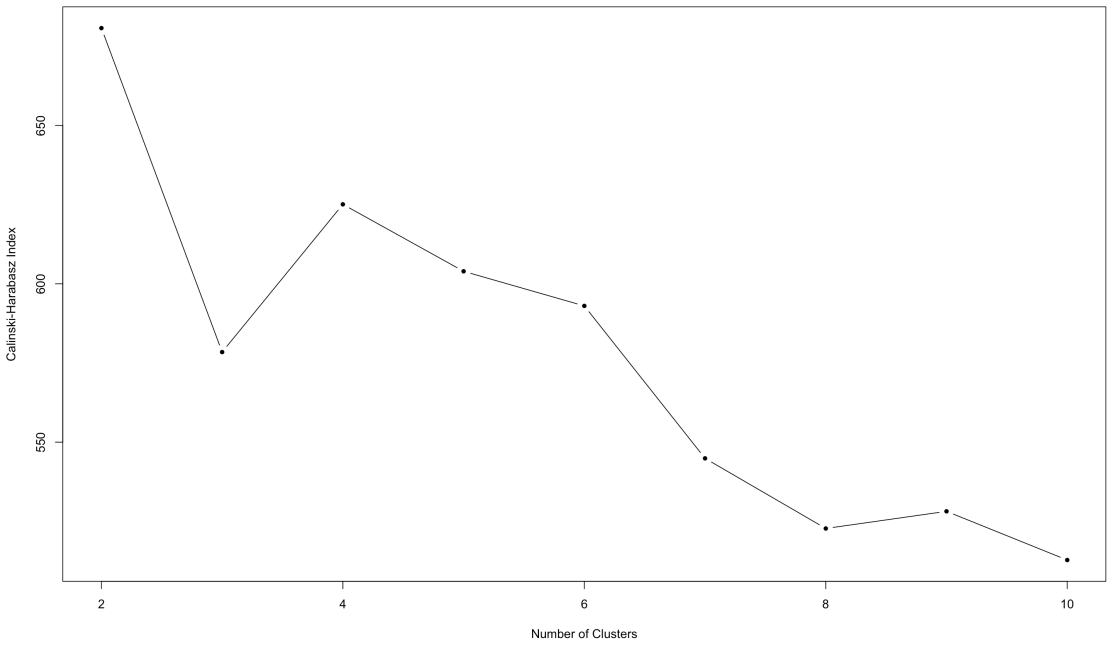


Figure C.50: Results of the Calinski-Harabasz Index for the 2023 data set

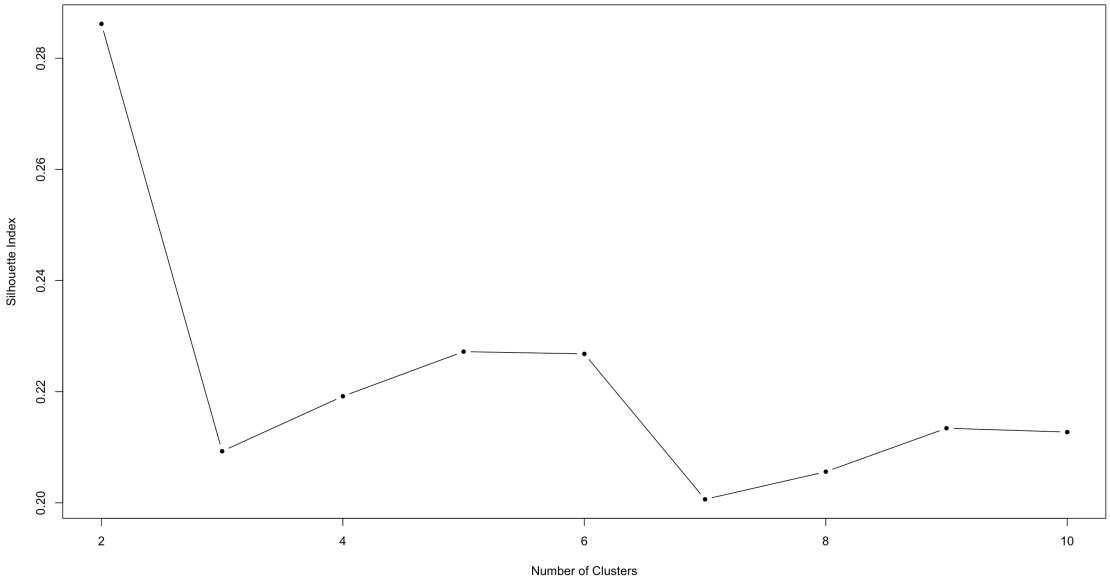


Figure C.51: Results of the Silhouette Index for the 2023 data set

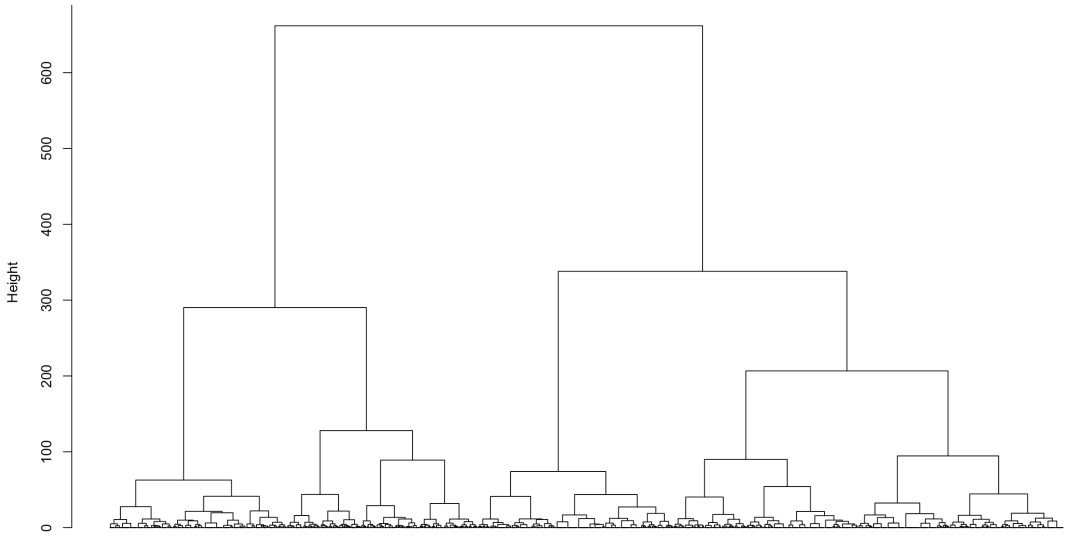


Figure C.52: Ward's Method Dendrogram for the 2023 data set

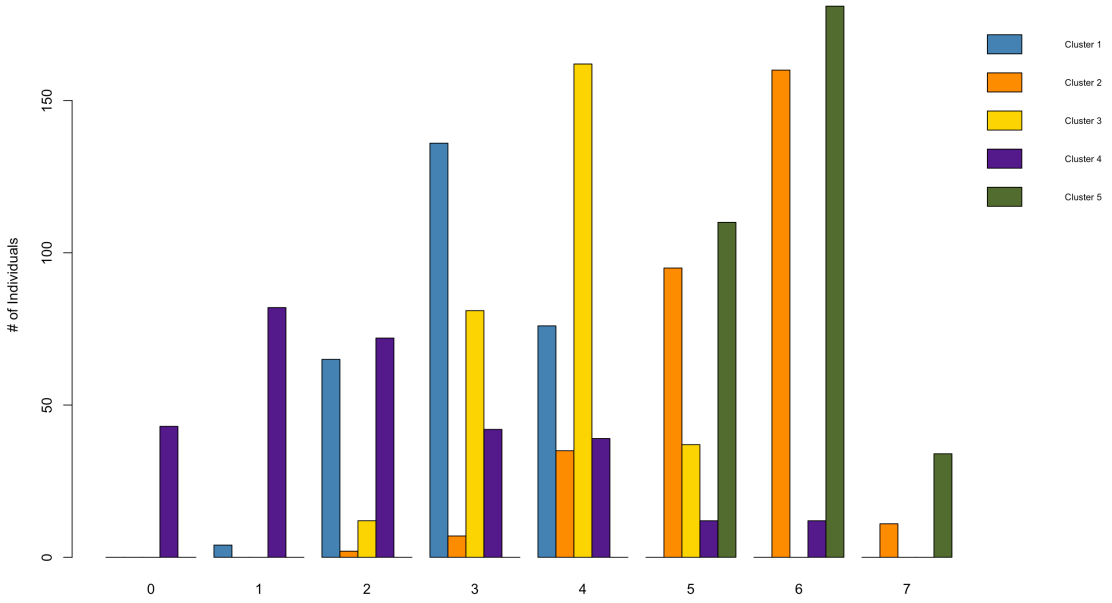


Figure C.53: Financial Knowledge Scores of Clusters 1, 2, 3, 4, and 5 from the 2023 data set

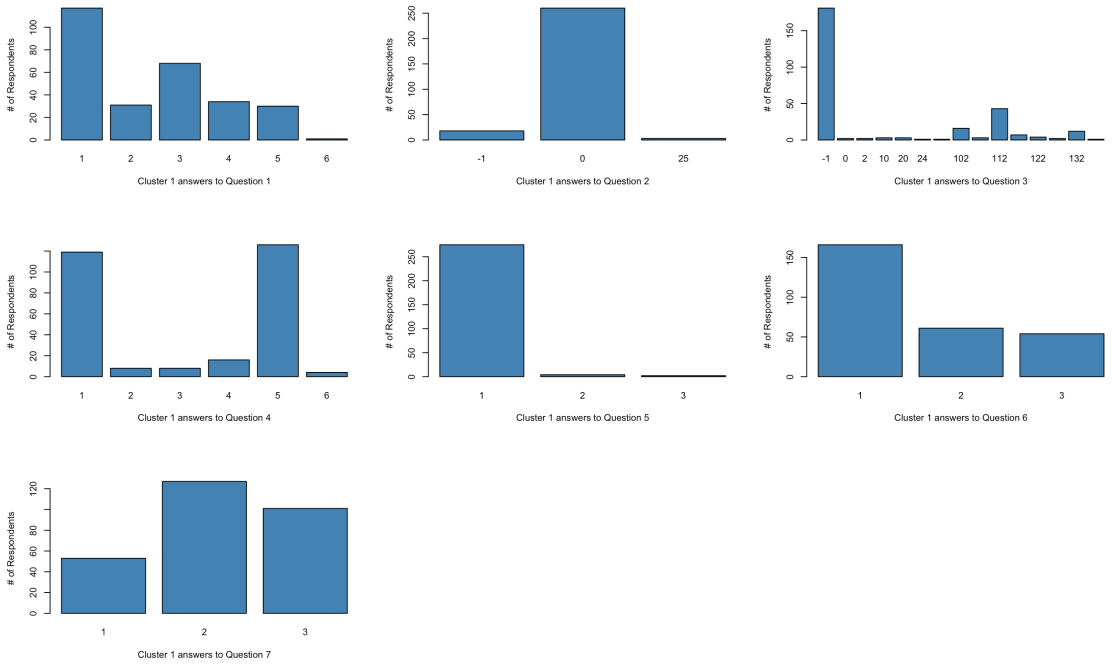


Figure C.54: Answers of the FKS variable from Cluster 1 of the 2023 data set

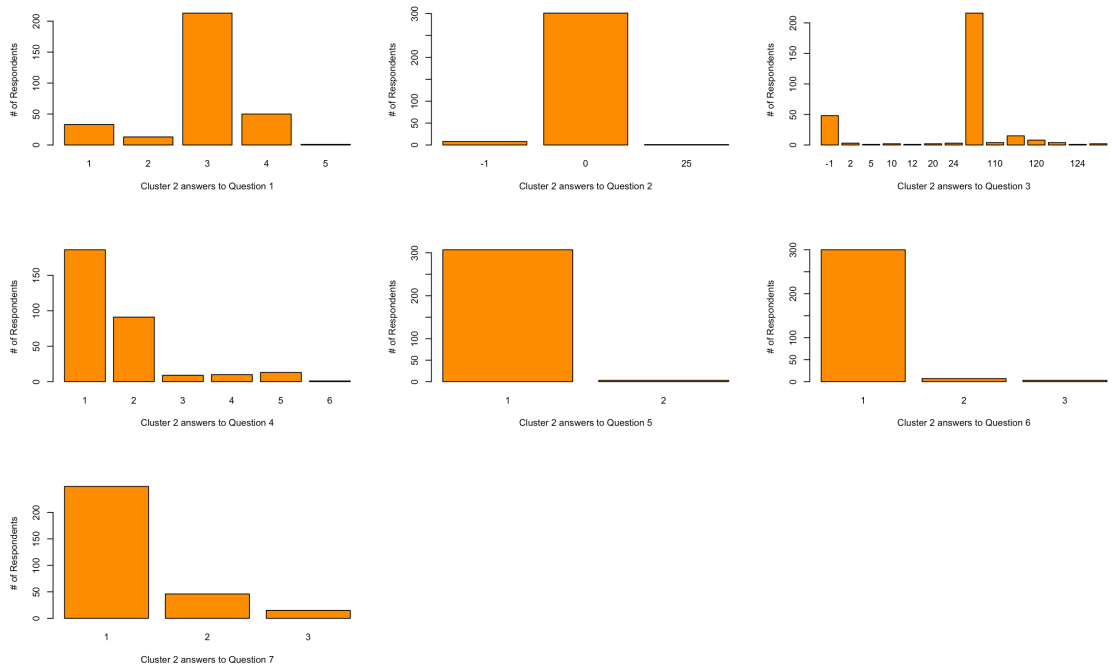


Figure C.55: Answers of the FKS variable from Cluster 2 of the 2023 data set

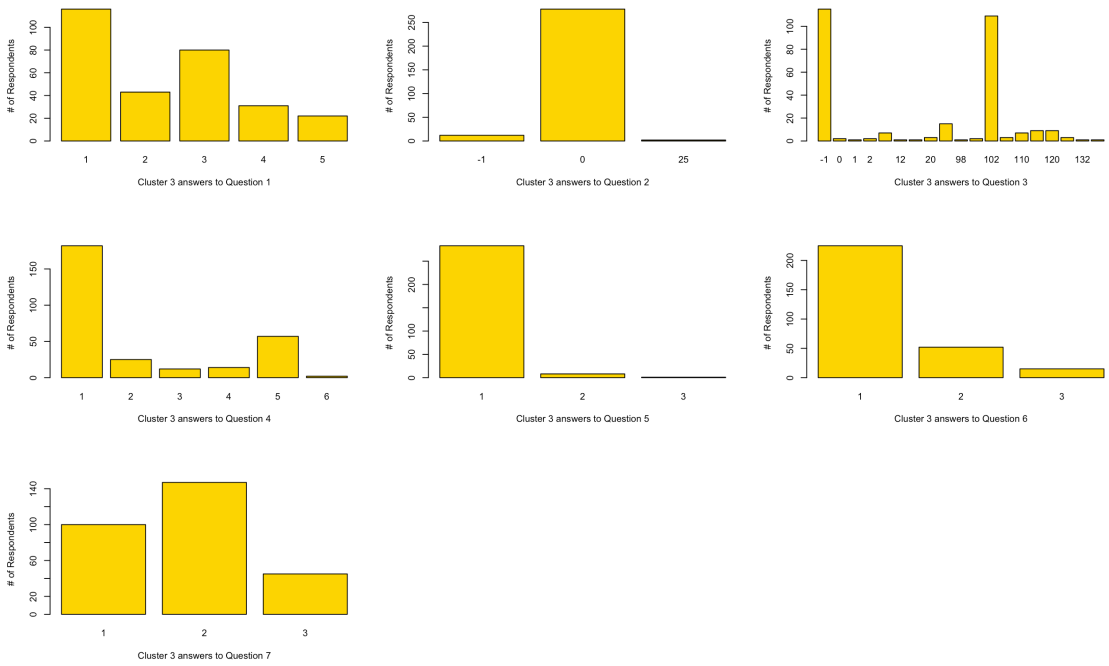


Figure C.56: Answers of the FKS variable from Cluster 3 of the 2023 data set

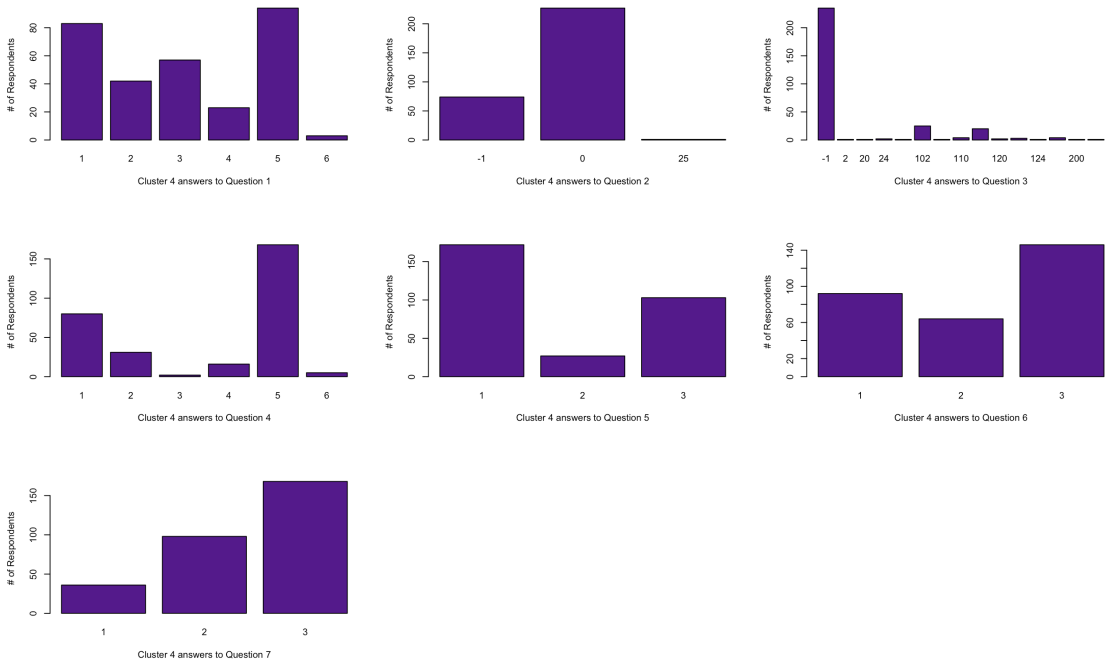


Figure C.57: Answers of the FKS variable from Cluster 4 of the 2023 data set

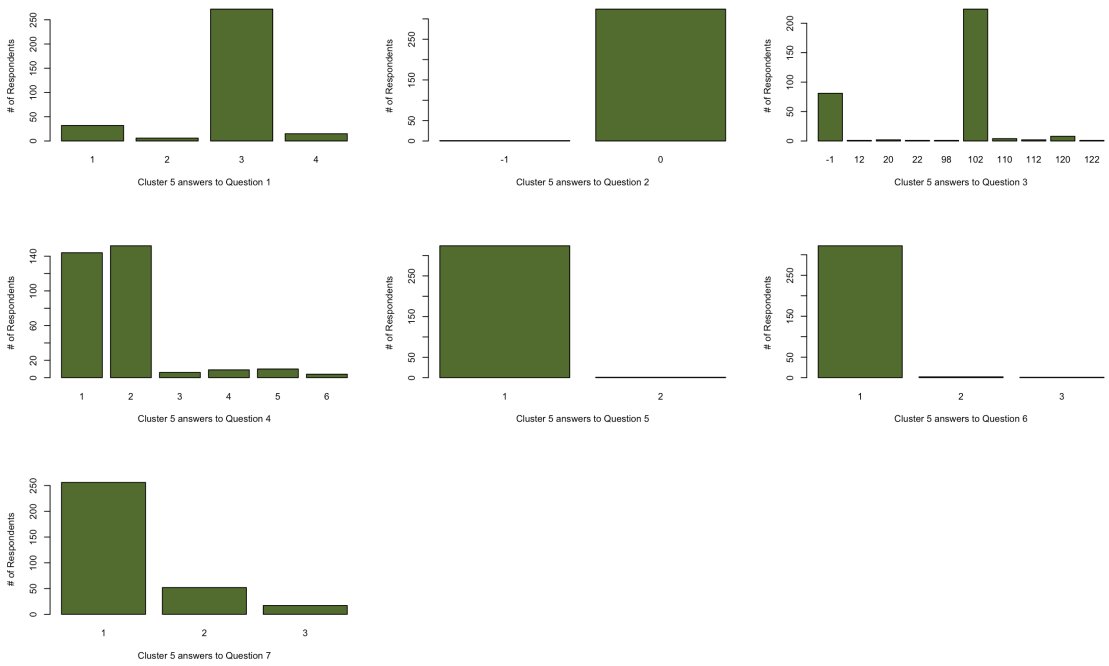


Figure C.58: Answers of the FKS variable from Cluster 5 of the 2023 data set

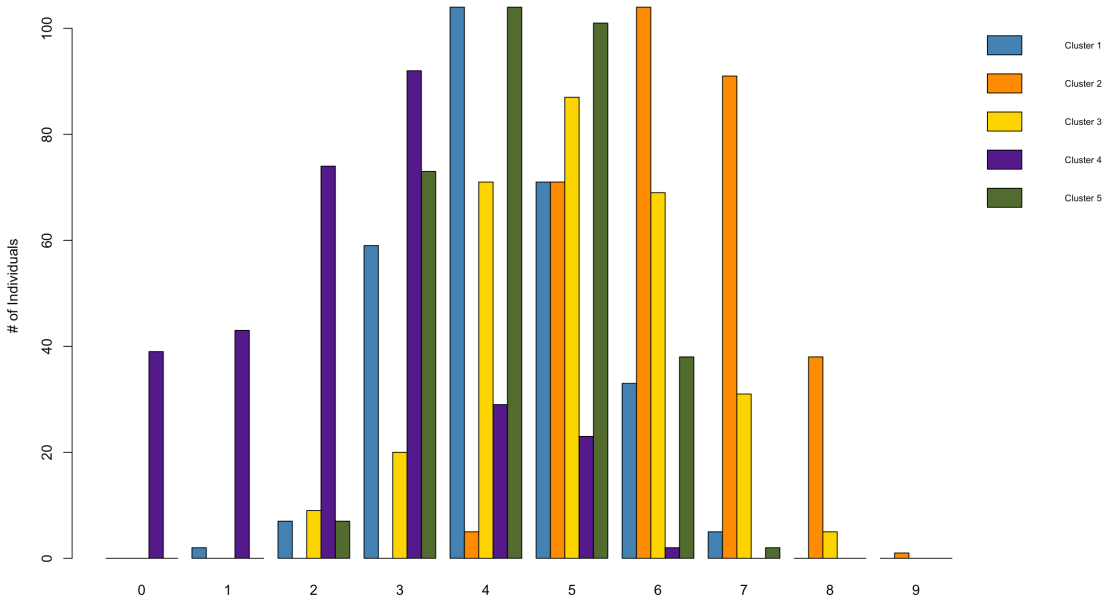


Figure C.59: Financial Behavior Scores of Clusters 1, 2, 3, 4, and 5 from the 2023 data set

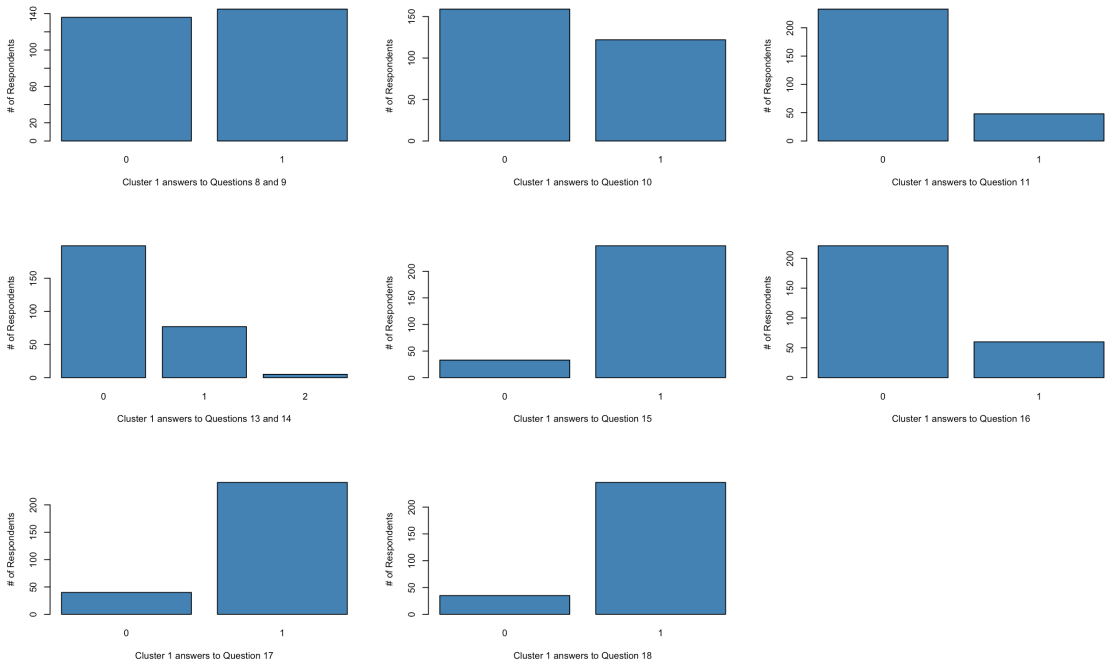


Figure C.60: Answers of the FBS variable from Cluster 1 of the 2023 data set

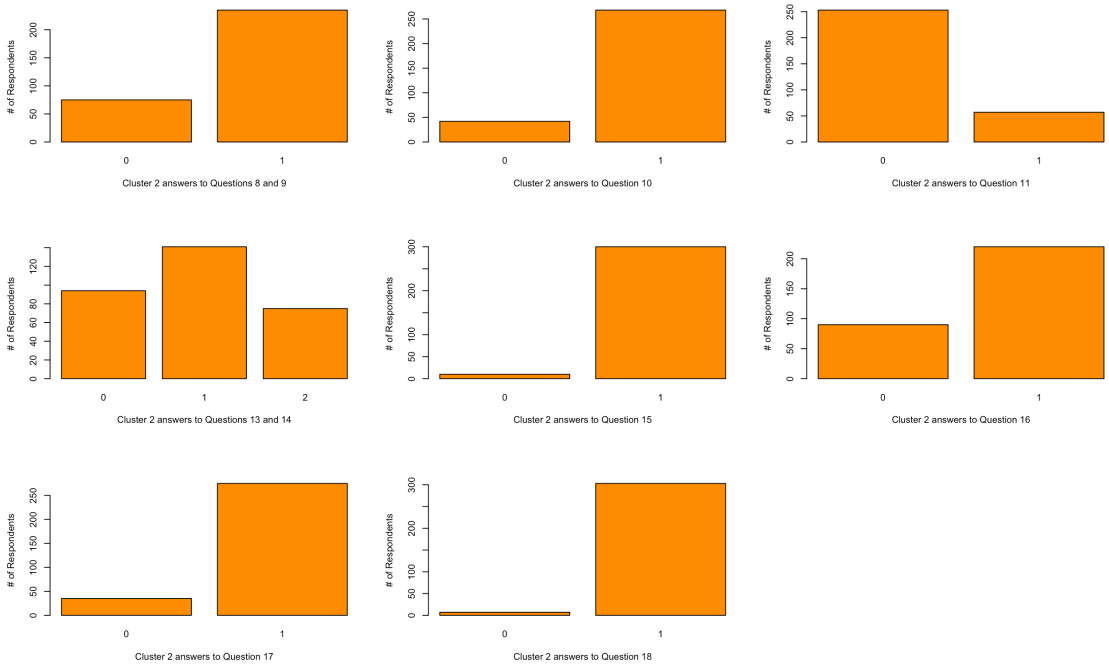


Figure C.61: Answers of the FBS variable from Cluster 2 of the 2023 data set

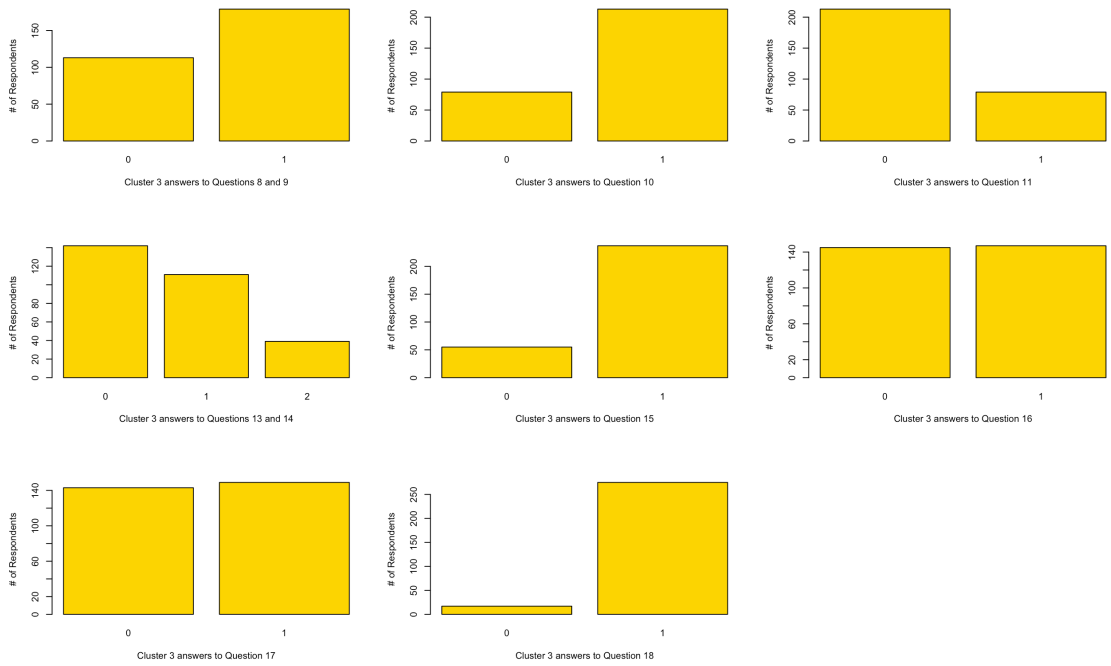


Figure C.62: Answers of the FBS variable from Cluster 3 of the 2023 data set

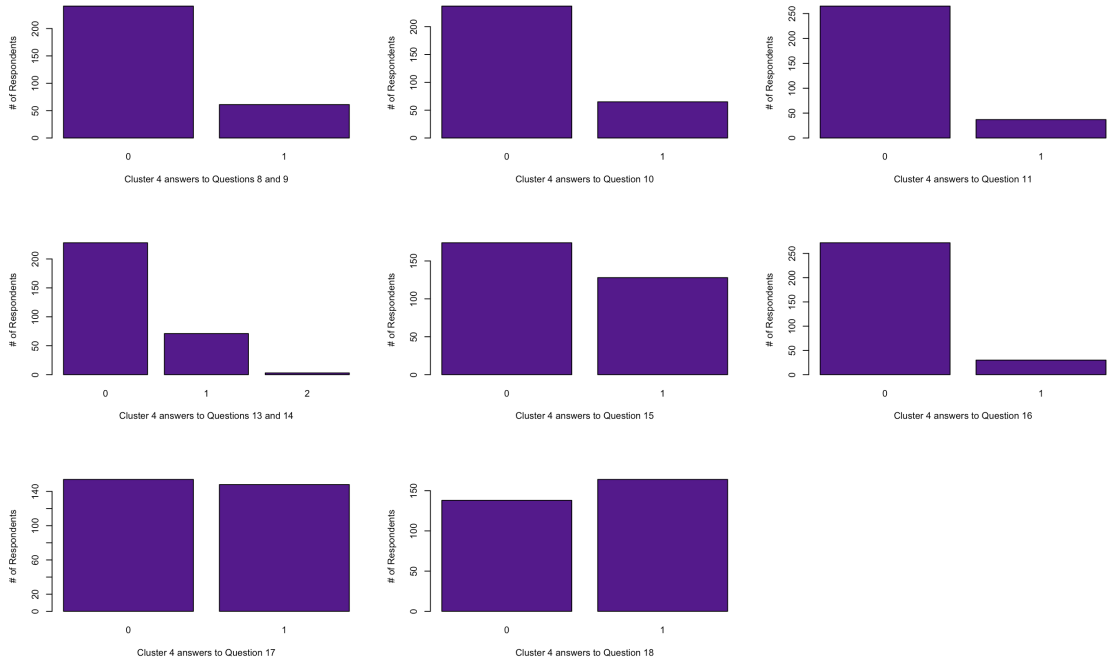


Figure C.63: Answers of the FBS variable from Cluster 4 of the 2023 data set

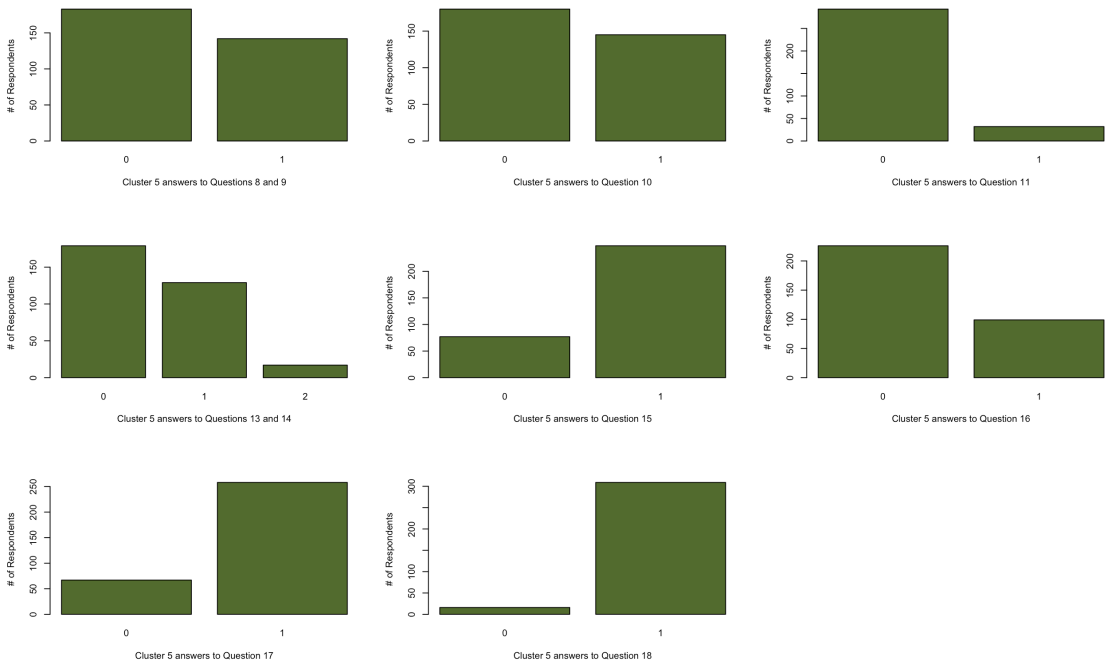


Figure C.64: Answers of the FBS variable from Cluster 5 of the 2023 data set

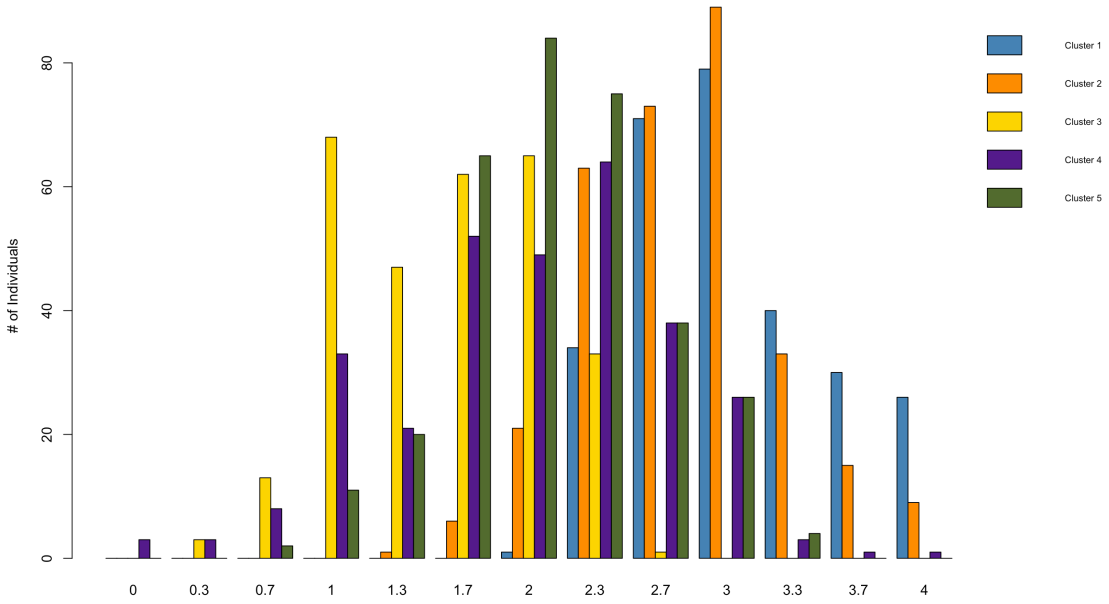


Figure C.65: Financial Attitude Scores of Clusters 1, 2, 3, 4, and 5 from the 2023 data set

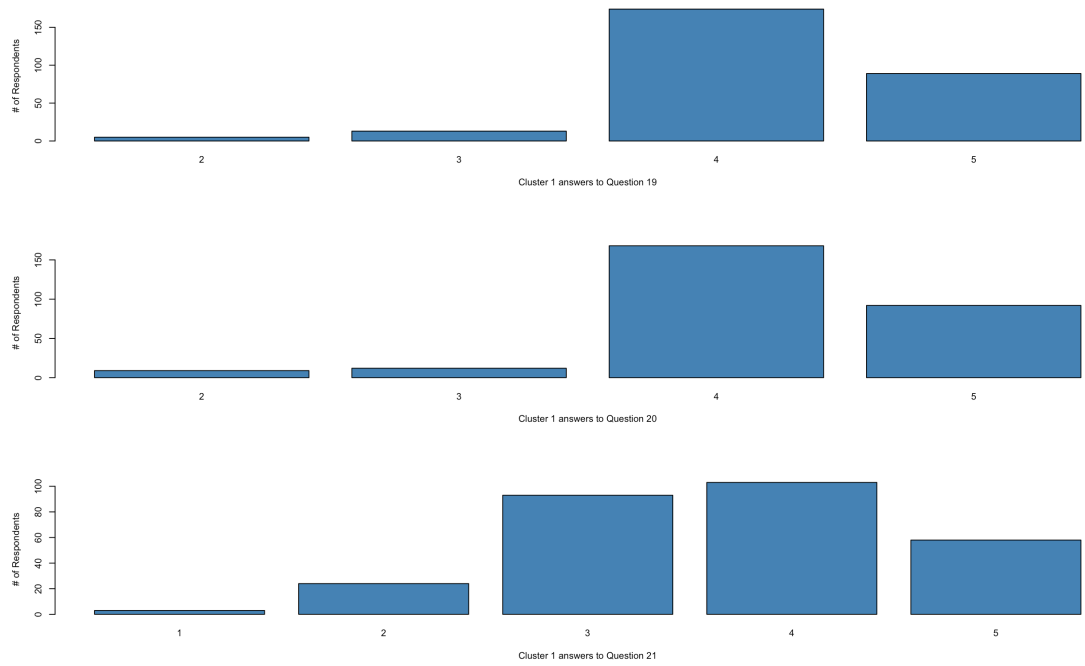


Figure C.66: Answers of the FAS variable from Cluster 1 of the 2023 data set

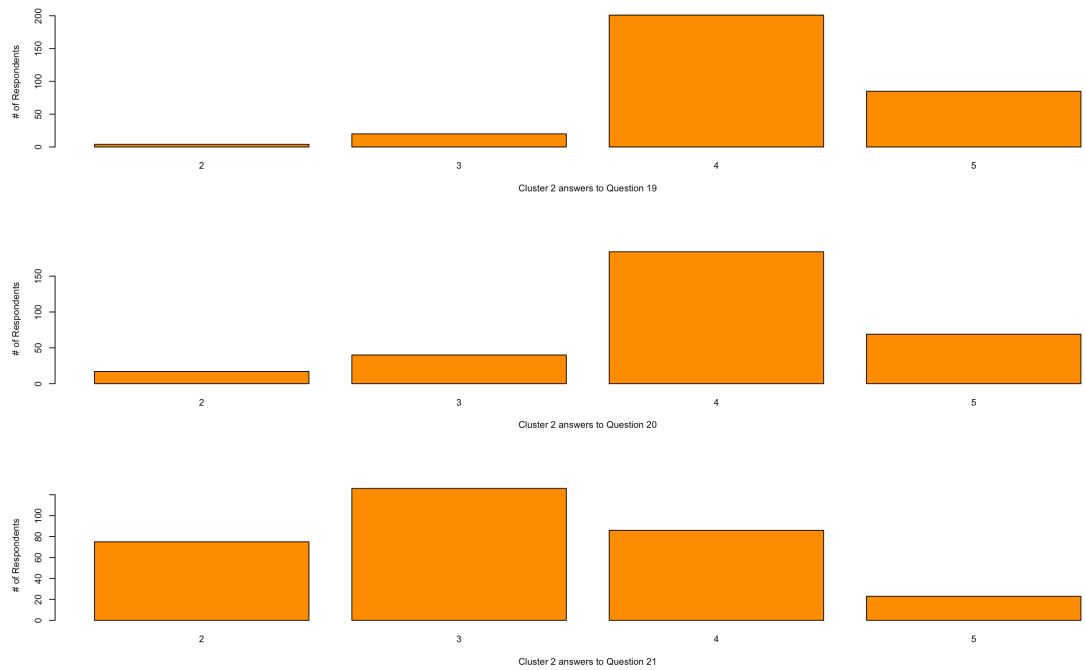


Figure C.67: Answers of the FAS variable from Cluster 2 of the 2023 data set

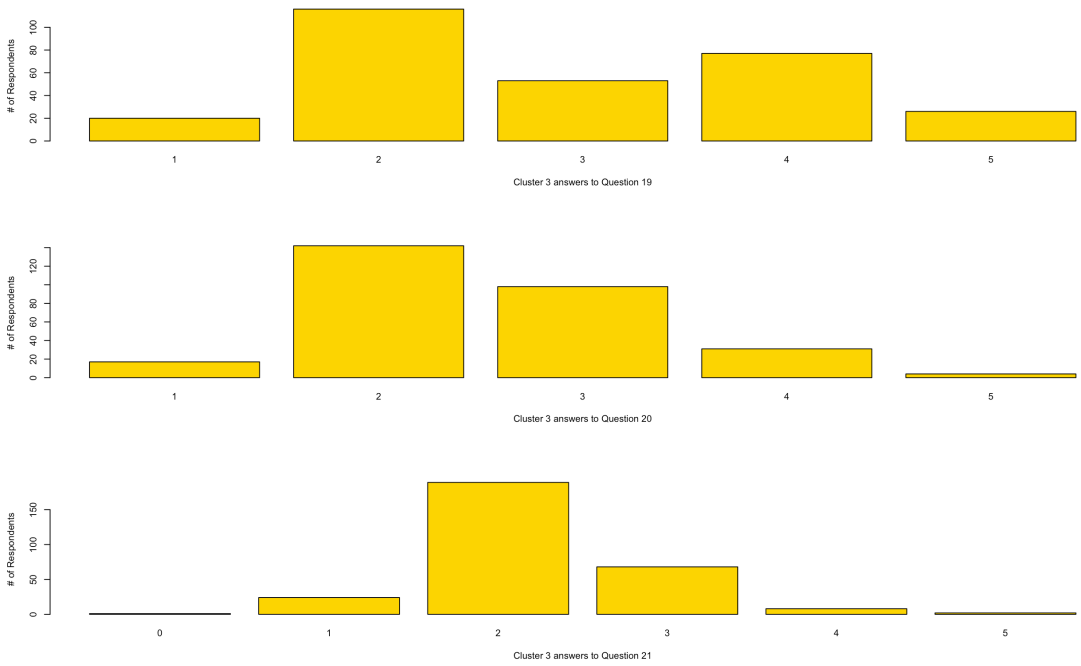


Figure C.68: Answers of the FAS variable from Cluster 3 of the 2023 data set

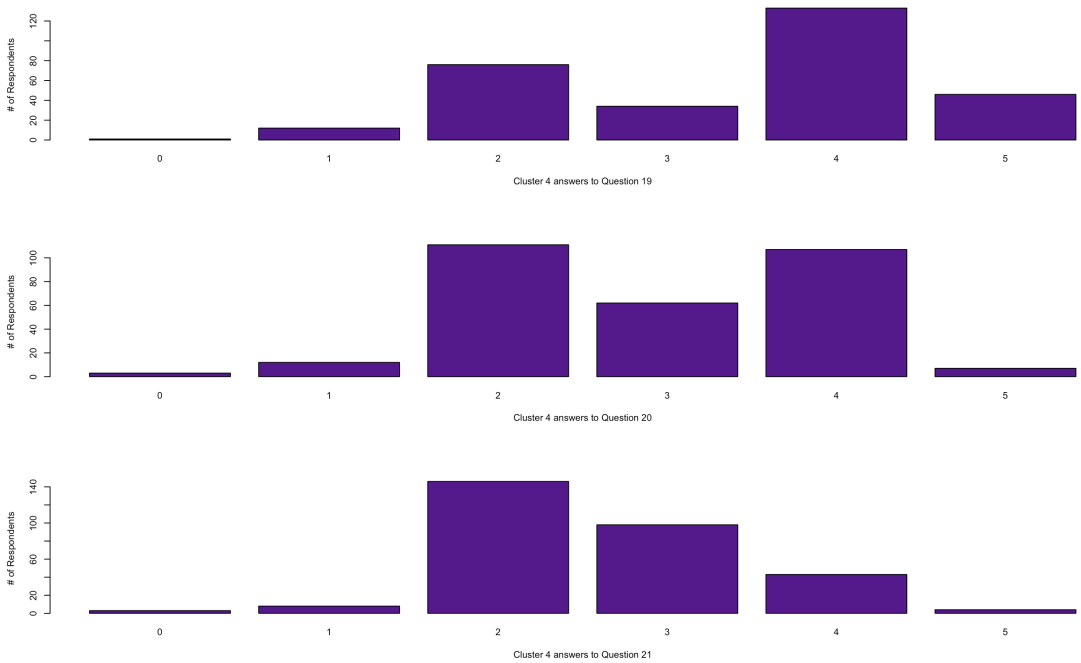


Figure C.69: Answers of the FAS variable from Cluster 4 of the 2023 data set

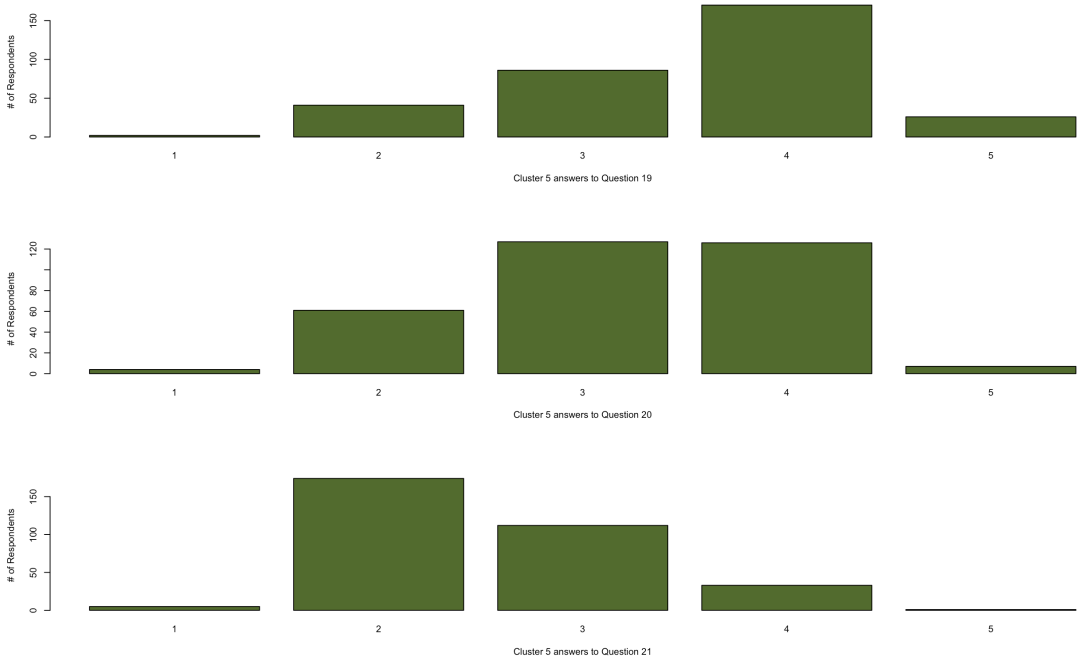


Figure C.70: Answers of the FAS variable from Cluster 5 of the 2023 data set

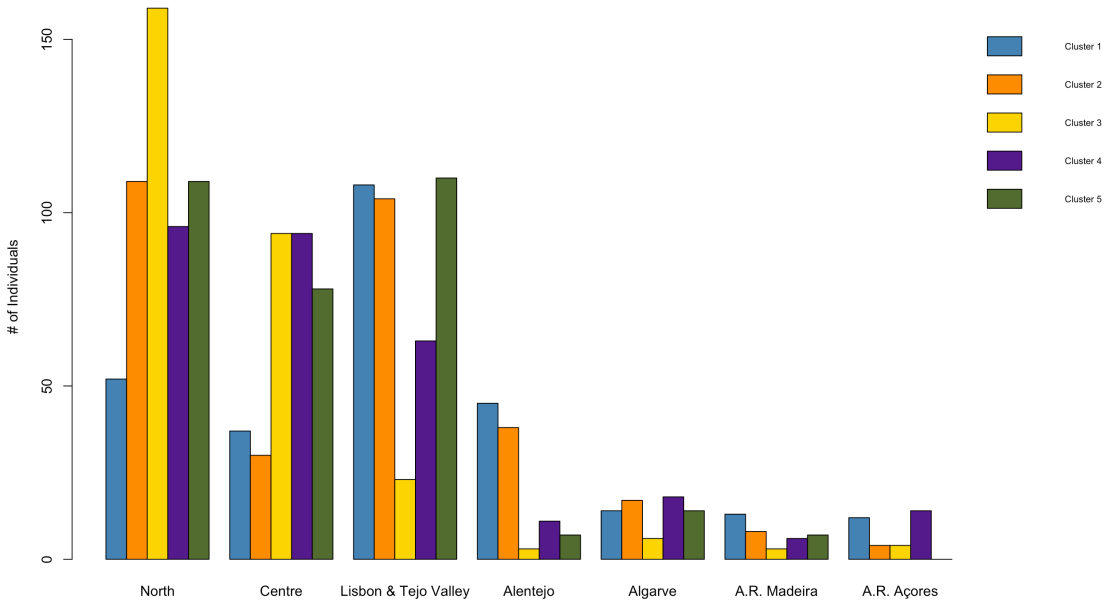


Figure C.71: Distribution of the REGION variable in Clusters 1, 2, 3, 4, and 5 from the 2023 data set

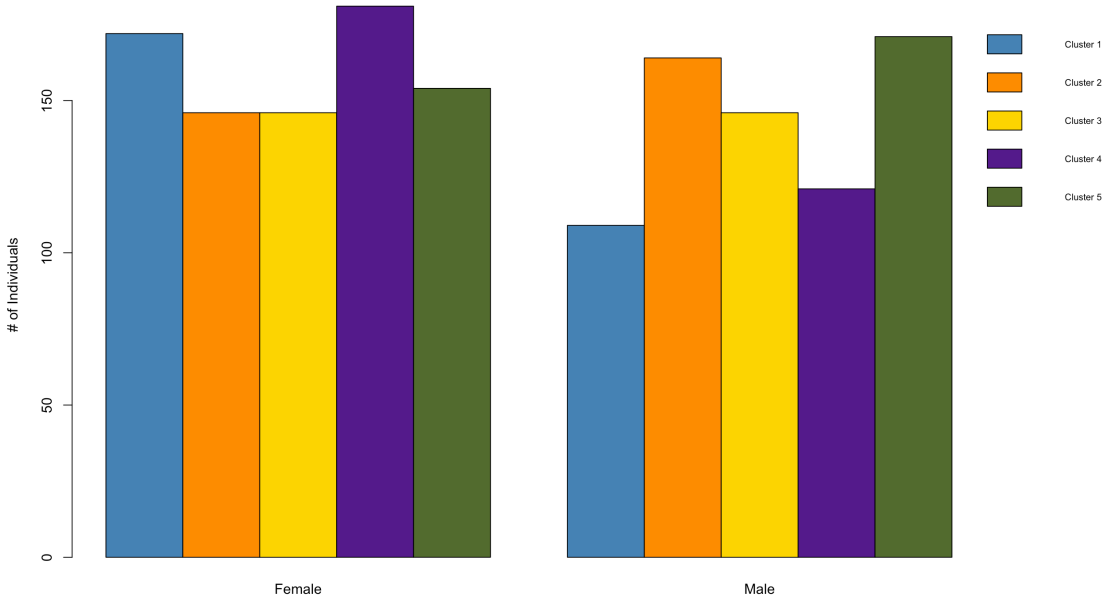


Figure C.72: Distribution of the GENDER variable in Clusters 1, 2, 3, 4, and 5 from the 2023 data set

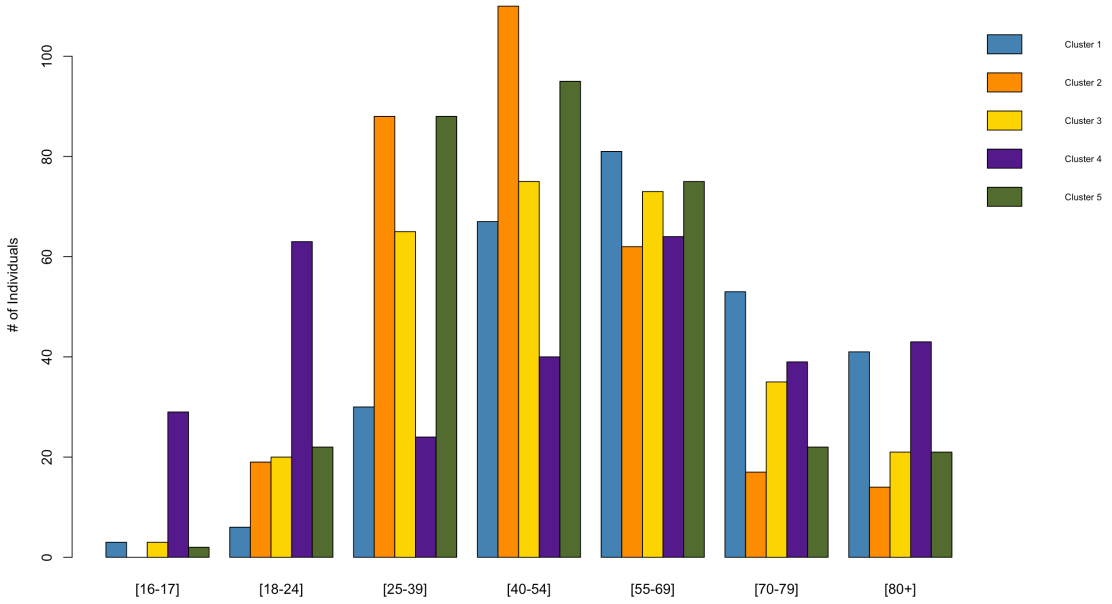


Figure C.73: Distribution of the AGE GROUP variable in Clusters 1, 2, 3, 4, and 5 from the 2023 data set

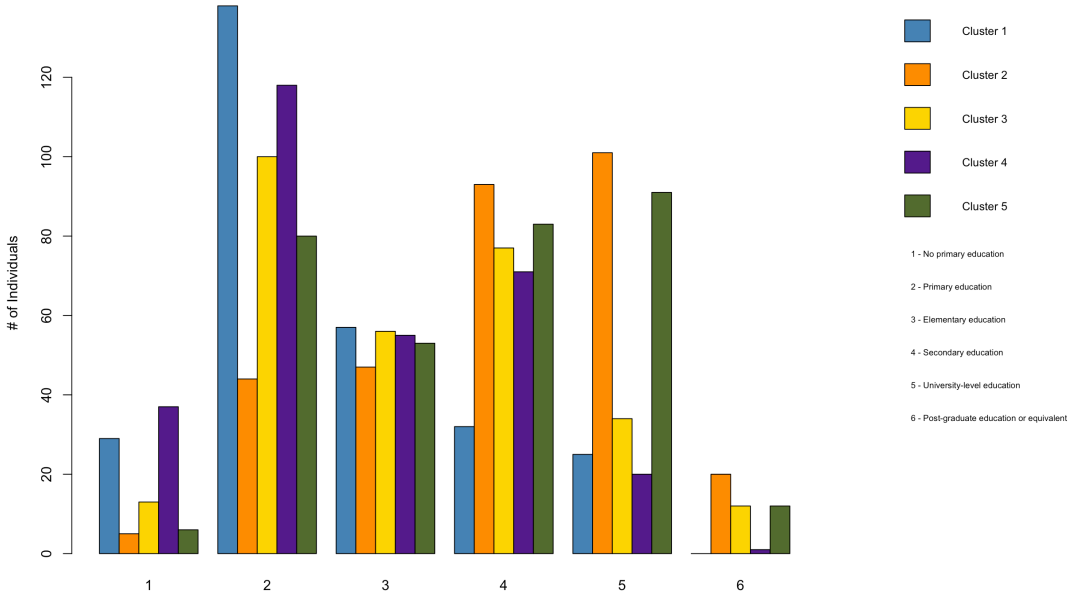


Figure C.74: Distribution of the EDUCATION variable in Clusters 1, 2, 3, 4, and 5 from the 2023 data set

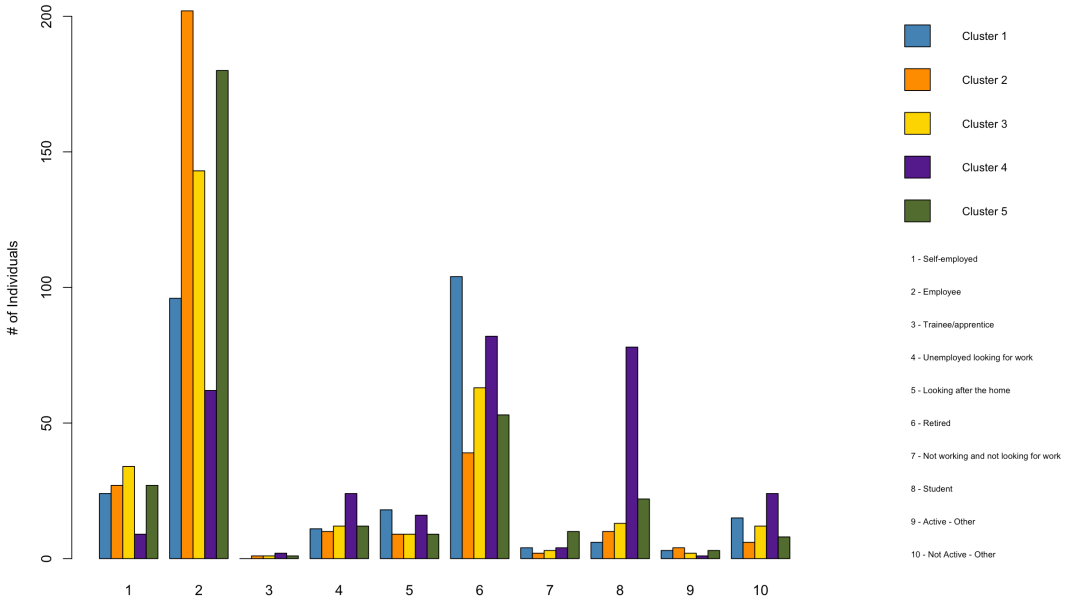


Figure C.75: Distribution of the OCCUPATION variable in Clusters 1, 2, 3, 4, and 5 from the 2023 data set

C.1 2 Cluster Analysis

C.1.1 2020 Data Set

In Table C.4 we have the clustering results from the hierarchical clustering applied to the 2020 data set for the two cluster partition. The clusters are not much different in size, with cluster 1 containing 781 observations, and cluster 2 with just 60 less. The cluster means show us that the negative values obtained in cluster 1 are indicative of a lower financial literacy level, while the opposite situation occurs in cluster 2.

The within-cluster sum of squares measure show us that cluster 2 is the most homogeneous out of the 2, since its lower value of 1631.2 indicates the data points are closer to each other, rather than the ones observed in cluster 2, who obtained a value of 2586, making those observation more sparse in terms on cohesiveness.

The last measure regarding the explained variance ratio indicate that these two clusters are able to explain almost one third of the total variance of the 2020 data set.

Reviewing the financial knowledge scores of both clusters present in Figure C.76, we can clearly see the vast difference in scores in the two clusters. While the majority of cluster 1 scores are concentrated on the lower end, with scores between zero and 3, the scores obtained by the individuals in cluster 2 are higher in comparison. In this last cluster, most individuals obtained a score of 5 and above, and no individual had a score below 2 point.

The next component relates to the financial behavior scores seen in Figure C.77. Here we see the same pattern as the previous variable, where the individuals from cluster 1 show lower scores than the individuals from cluster 2, with a max score of 7 points. Meanwhile in cluster 2, there are no individuals with scores below 3, and a great portion of the interviewees obtained a score of 6 out of 9.

The scores of the FAS variable of each cluster shown in Figure C.78 indicate a clear transition in the scores from when the number of individuals from cluster 2 surpasses the one from cluster 1, more specifically from the 2.3 mark and above, thus signifying the interviewees from cluster 2 have a higher financial attitude score than cluster 1. It is also to note that cluster 2 does not have any individuals with a score below 0.67.

The distributions of the global financial literacy index of each cluster seen in Figure C.79 put into evidence that cluster 1 is the cluster who represents the individuals with lower financial literacy scores, seeing that the lowest score obtained is zero, while in cluster 2 that score corresponds to 51.7 points. We see also that in cluster 1, the majority of the scores sit between 41.7 and 55 points, while in cluster 2 those scores sit in the interval [61.7-71.7] points. The max scores obtained by the respondents in cluster 1 and 2 were 65 and 95, respectively. Therefore, we can conclude in fact that cluster 2 is representative of the individuals of the Portuguese population with higher financial literacy scores.

The demographic profiles will be analyzed according to the same five demographic variables as the previous year.

Starting with the region variable in Figure C.80, we see a similar distribution between the two clusters, with the exception of the values from AR Azores which are higher than the ones from AR Madeira in cluster 1, and lower in cluster 2. The North region is by far the most represented, followed by Lisbon and Centre. On the contrary, Algarve and AR regions are the least represented regions in this survey.

Regarding the gender, Figure C.81 shows that cluster 1 has a higher number of female interviewees than male, while the opposite occurs in cluster 2. Despite that change, the num-

ber of female and male individuals in cluster 2 are very close to each other. In cluster 1, however, the difference between male and female individuals is higher, thus concluding that the individuals with lower financial literacy scores were majorly female.

Now looking at the distribution of the age group variable in Figure C.82, cluster 1 shows the age group [55-69] to be the most represented, followed by [40-54], and [25-39]. The least represent group in this cluster corresponds to the ones below 18 years old. In cluster 2, the most represented age group is the [40-54] group, followed by the [25-39]. On the contrary, the least represented groups are, once again, the [16-17], and [80+] groups. With this, we can then affirm that adults tend to have a better financial literacy level over younger and older individuals.

The plot of the education level of both clusters presented in Figure C.83 shows an overwhelmingly portion of the individuals with only a primary education level in cluster 1. When comparing the two clusters, we see that the individuals from cluster 1 tend to have a lower education level than the ones from cluster 2. It is also to note the considerable number of individuals with no formal education in cluster 1, specially when compared to the ones observed in cluster 2. Therefore, we can then determine that an individual with a higher level of education tends to have a higher financial literacy level, and vice-versa.

The last demographic variable corresponds to the occupation of the respondents from cluster 1 and 2, as evidenced in Figure C.84. The categories represented by the self-employed and employed individuals stand out due to the vast difference between the values of both clusters, with cluster 2 having the highest. However, the opposite tendency can be seen in the following categories, specially in the retired individuals category. We can then infer that employed individuals tend to have a better financial literacy score than non-employed ones.

	Cluster 1	**Cluster 2**
Size	781	721
Cluster Means		
FKS	-0.5960	0.6456
FBS	-0.6445	0.6981
FAS	-0.2413	0.2614
GFLI	-0.7699	0.8341
Within-Cluster Sum of Squares		
WCSS	2586.0	1631.2
Explained Variance Ratio		
29.8%		

Table C.4: Results of the Ward's 2 cluster partition applied to the 2020 data set

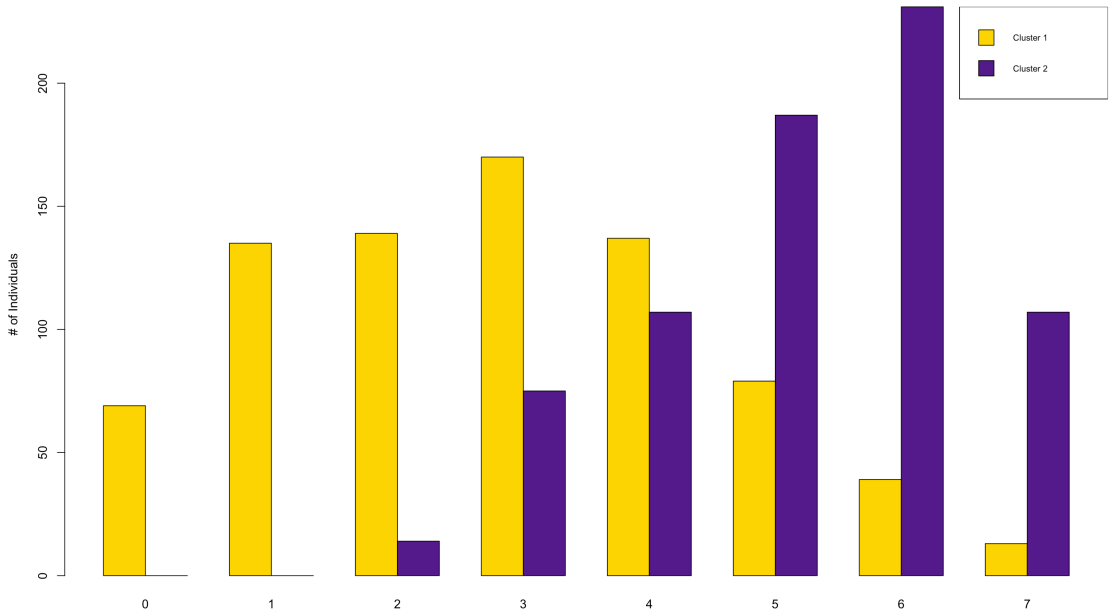


Figure C.76: Financial Knowledge Scores of Clusters 1 and 2 from the 2020 data set

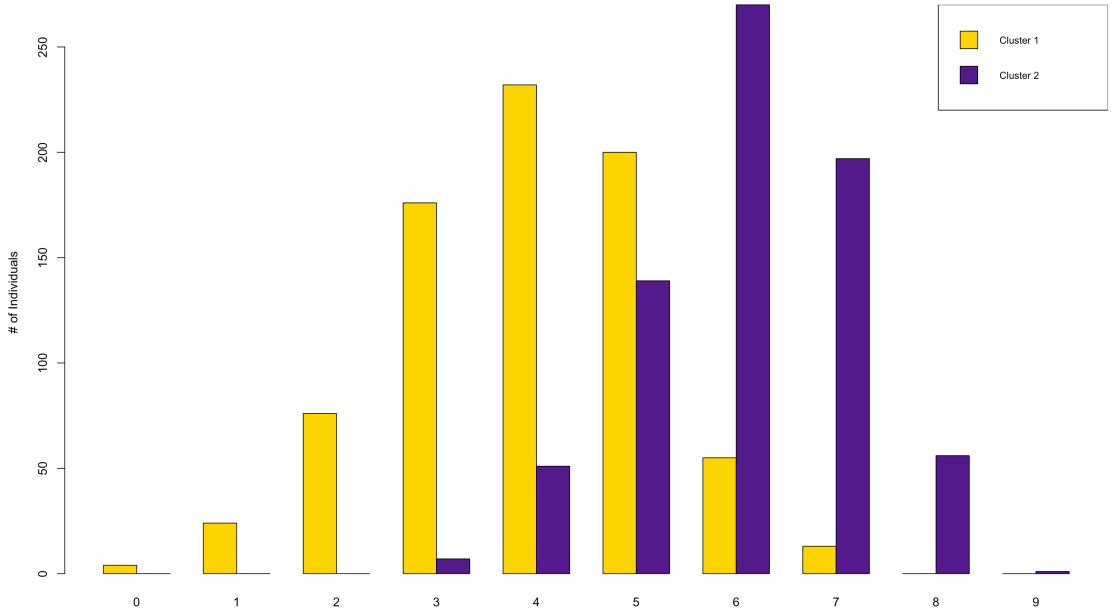


Figure C.77: Financial Behavior Scores of Clusters 1 and 2 from the 2020 data set

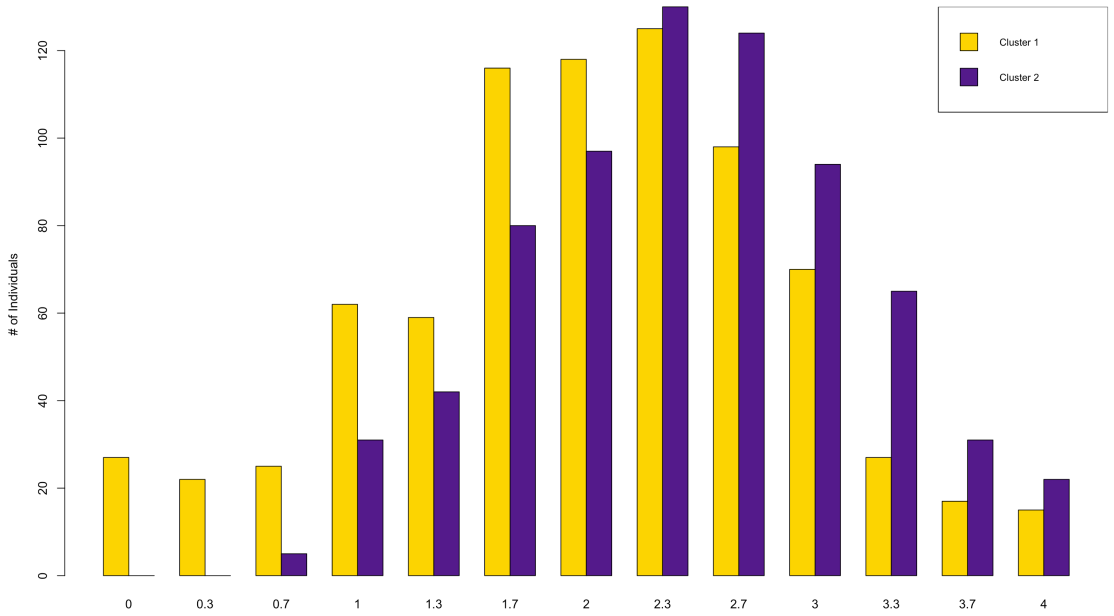


Figure C.78: Financial Attitude Scores of Clusters 1 and 2 from the 2020 data set

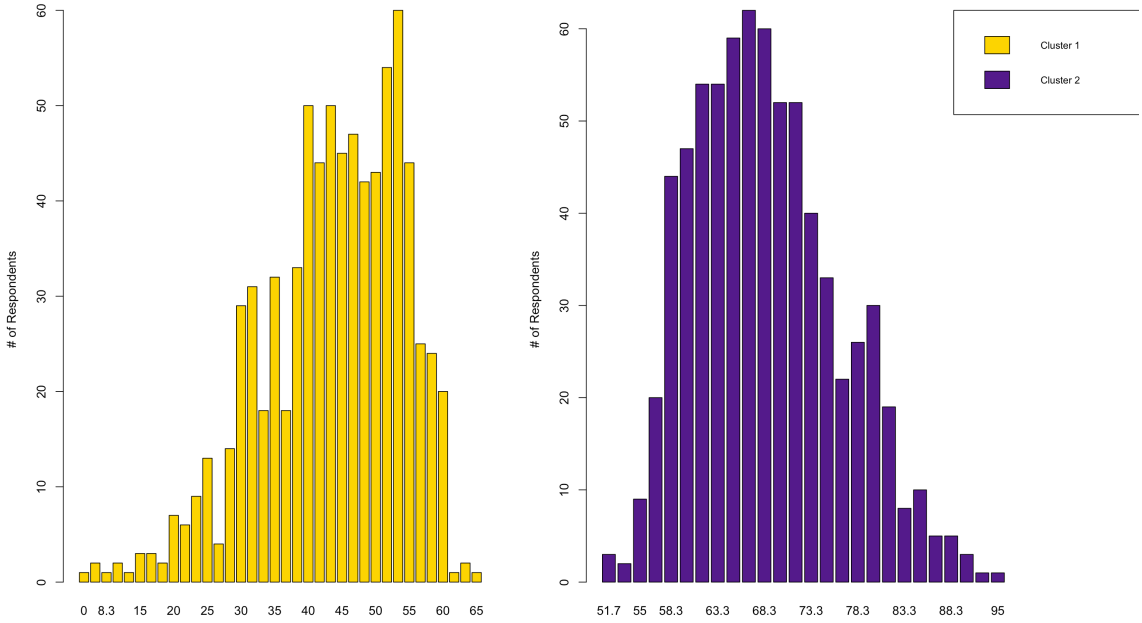


Figure C.79: Global Financial Literacy Index of Clusters 1 and 2 from the 2020 data set

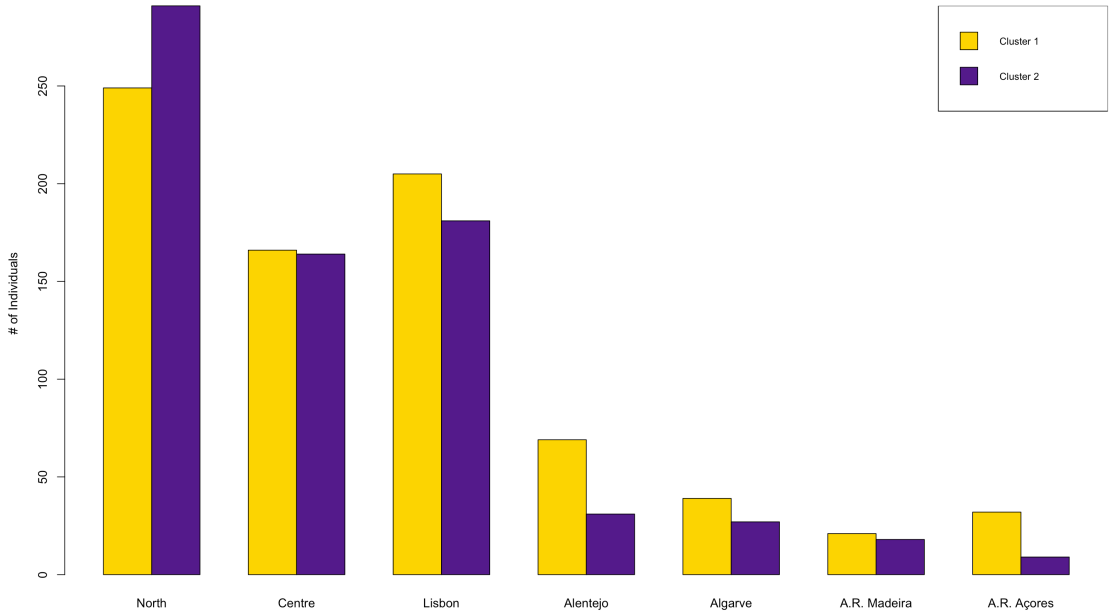


Figure C.80: Distribution of the REGION variable in Clusters 1 and 2 from the 2020 data set

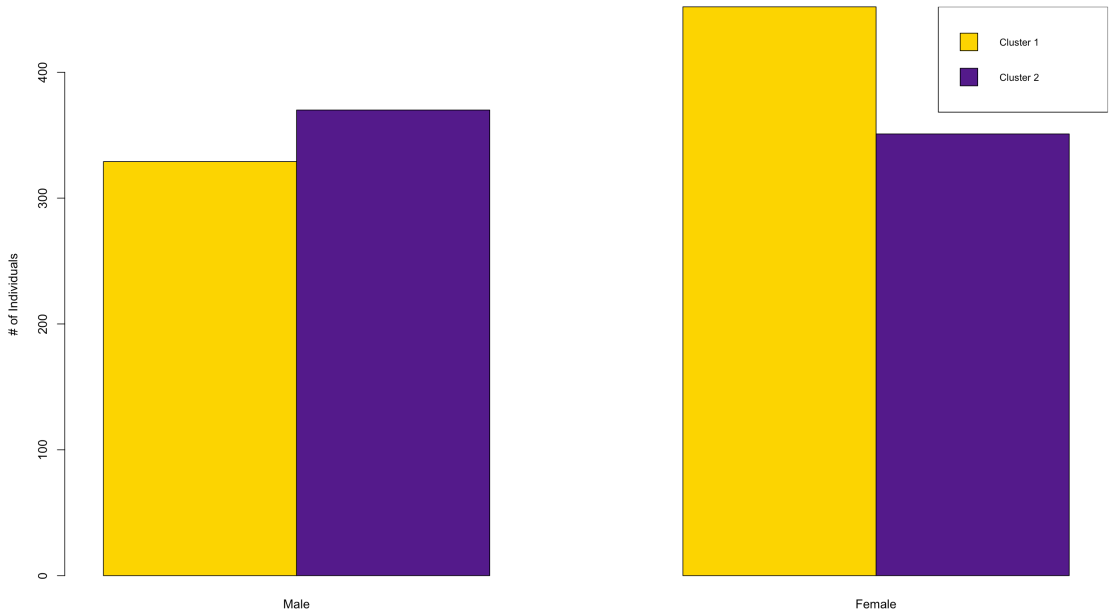


Figure C.81: Distribution of the GENDER variable in Clusters 1 and 2 from the 2020 data set

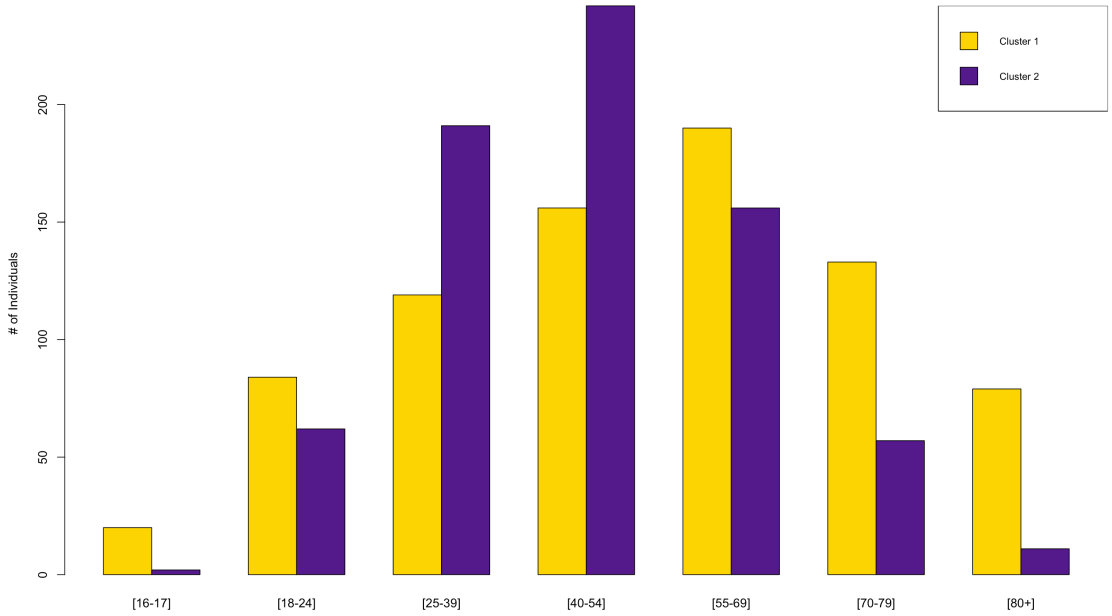


Figure C.82: Distribution of the AGE_GROUP variable in Clusters 1 and 2 from the 2020 data set

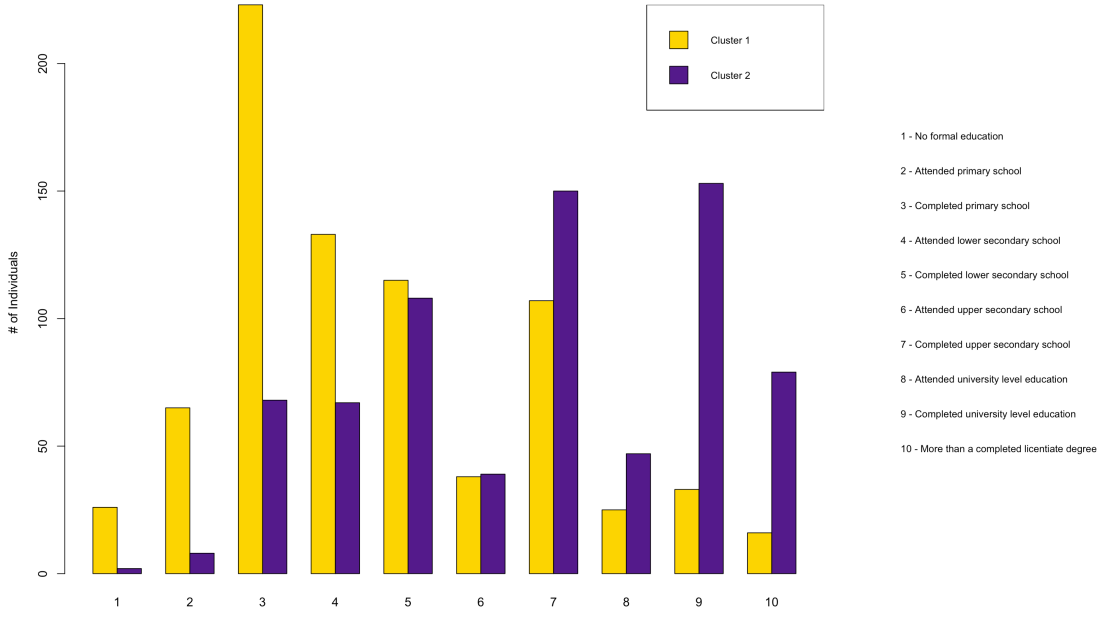


Figure C.83: Distribution of the EDUCATION variable in Clusters 1 and 2 from the 2020 data set

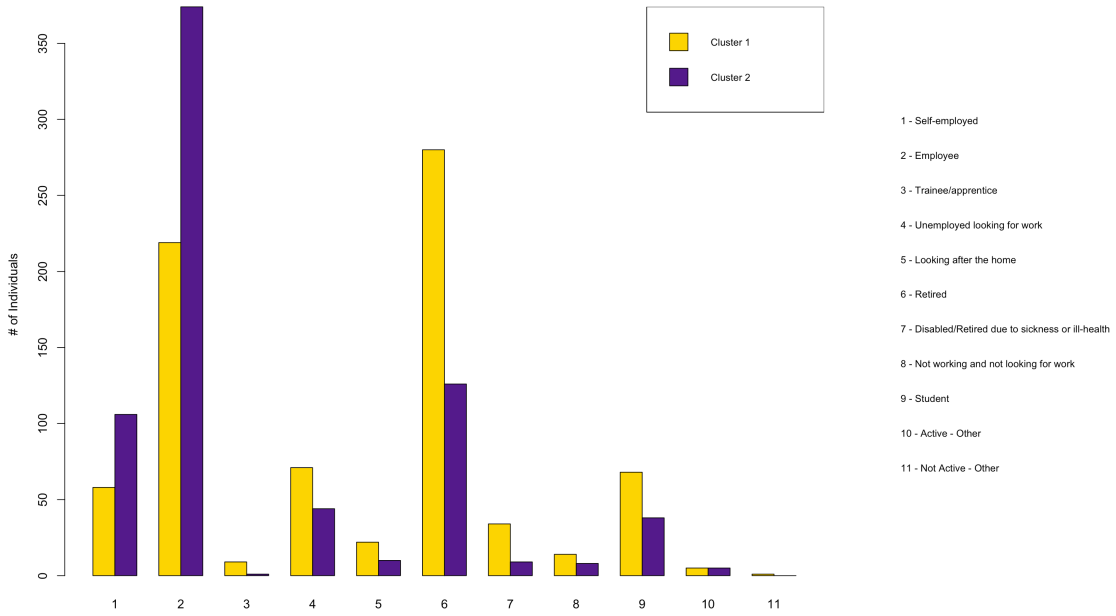


Figure C.84: Distribution of the OCCUPATION variable in Clusters 1 and 2 from the 2020 data set

C.1.2 2023 Data Set

The results of a two cluster division obtained from the application of the clustering method to the 2023 data set can be seen in Table C.5.

Looking at the sizes of the clusters, cluster 2 is where more than two thirds of the individuals of this survey were grouped. The cluster mean values show that cluster 1 has the lowest values out of the two, except in the FAS variable. This could be indicative of cluster 1 representing the individuals with lower financial literacy scores. The within-cluster sum of squares values are very close to each other, meaning the data points have a similar internal variance. The last measure corresponds to the explained variance ratio, where the result was very low, seeing that only roughly 3% of the total variance of the data set was explained by this cluster partition. Nonetheless, we still proceeded with the analysis of the results.

Concerning the first variable regarding the financial knowledge scores, seen in Figure C.85, the individuals from cluster 1 surpass the individuals from cluster 2 from 0 to 3 points, and vice-versa in higher scores, with the majority obtaining a score o 6 points.

Regarding the FBS variable, the plot presented in Figure C.86 once again shows that the individuals from cluster 1 have generally lower scores, when compared to the ones from cluster 2. In the former, the majority of the interviewees obtained a score of either 3 or 4 points, and there were no individuals with scores over 7. Meanwhile in cluster 2, there were no respondents with scores below 3, and the most obtained scores were of 5 or 6 points.

The results of the financial attitudes scores (see Figure C.87) show a different tendency compared to other variables, where from 1 to 2.3 points, the number of individuals of cluster 2 greatly surpasses the ones from cluster 1, and in the higher scores, from 3.3 and 4 points, this tendency shifts, thus indicating that in this financial component, the individuals from cluster 2 had relatively lower scores than cluster 1.

As expected, the distributions of the global financial literacy scores of clusters 1 and 2 present in Figure C.88 show that cluster 1 is representative of the individuals with lower financial literacy scores, since it is the only cluster with individuals who scored lower than 30, and the majority of the respondents obtained scores in the [45-50] range. In cluster 2, the plot shows that a significant amount of individuals obtained scores between 60 to 70 points, and the highest score obtained is 88.3 points.

We will now present the results from the demographic variables related to the region, gender, age group, schooling level, and occupation of both clusters.

First, we will analyze the region of the individuals of each cluster (see Figure C.89). The most represented areas of both clusters are North, Centre, and Lisbon & Tejo Valley, where the responders from cluster 1 are mainly from Lisbon & Tejo Valley area, while the ones from cluster 2 are mainly from the North region. We also see that the remaining four regions are the least represented, as they are the ones where the population density is low compared to the other three, however, there is a relevant amount of individuals from AR Azores in cluster 1.

The plot of the gender distribution in Figure C.90 shows that in cluster 1, the number of female individuals was higher than the male ones. the inverse tendency is seen in cluster 2, despite the number of individuals of each gender being almost even.

The age group variable plot in Figure C.91 indicates that in the age groups between 25 and 59 years old, the number of individuals from cluster 2 greatly surpasses the ones from cluster 1, while in the younger and older age groups, this tendency is reversed. Thus, we can infer that the youngest and oldest individuals are the ones with a lower financial literacy

level, while the young-adults and adults age groups are typically the one with higher financial literacy scores.

Regarding the schooling level, Figure C.92 shows the individuals from cluster 1 generally had lower education levels, with the majority of the respondents only having a primary education, while in cluster 2, a grand majority had a secondary education level or higher, despite the number of individuals with a primary education being close to cluster 1.

The distribution of the last demographic variable regarding the occupation of the interviewees in depicted in Figure C.93. In cluster 1, we see that a majority of the individuals correspond to non active members of society, namely, retired or student. Nonetheless, there is still a great portion of individuals that are employed in this cluster. In contrast, the number of employed individuals in cluster 2 is overwhelmingly higher than the remaining, followed by the number of retired and self-employed individuals.

	Cluster 1	**Cluster 2**
Size	583	927
Cluster Means		
FKS	-0.8881	0.5585
FBS	-0.6782	0.4265
FAS	0.2703	-0.1700
GFLI	-0.8103	0.5096
Within-Cluster Sum of Squares		
WCSS	2948.9	2925.4
Explained Variance Ratio		
2.74%		

Table C.5: Results of the Ward's 2 cluster partition applied to the 2023 data set

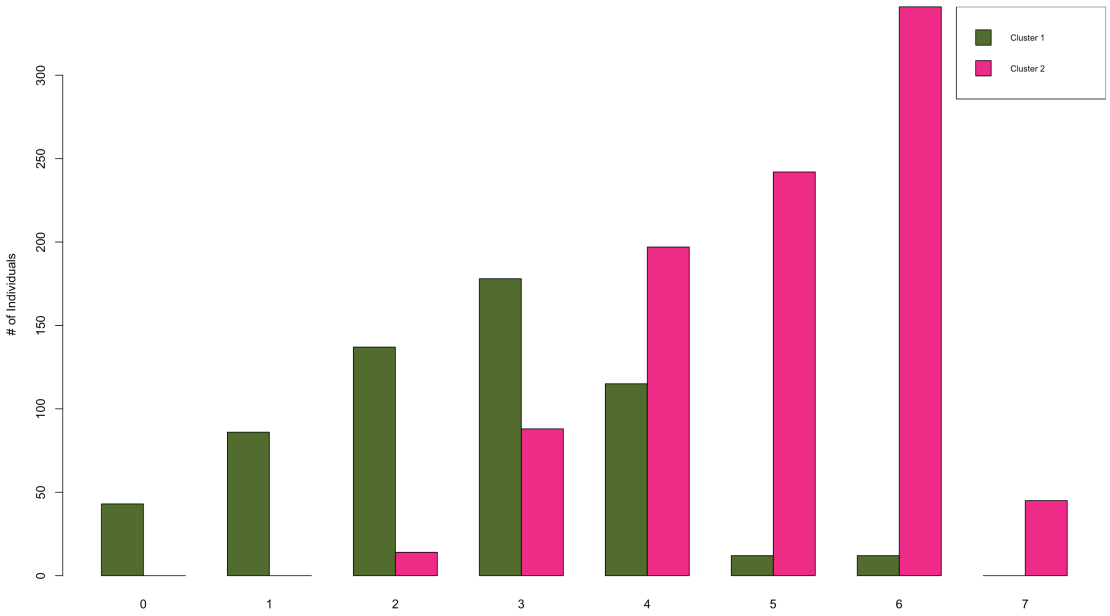


Figure C.85: Financial Knowledge Scores of Clusters 1 and 2 from the 2023 data set

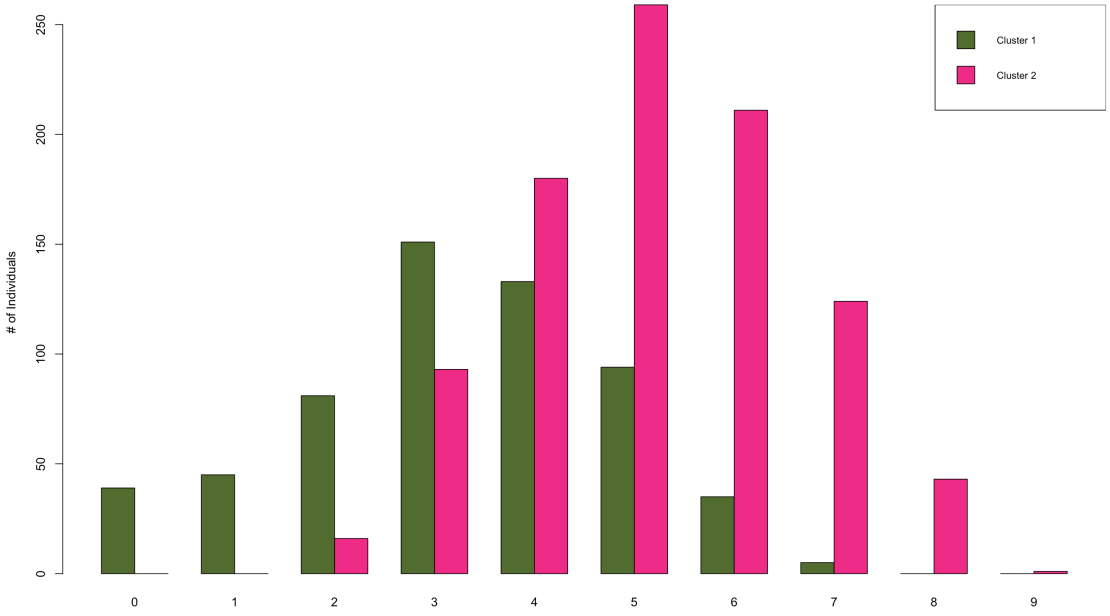


Figure C.86: Financial Behavior Scores of Clusters 1 and 2 from the 2023 data set

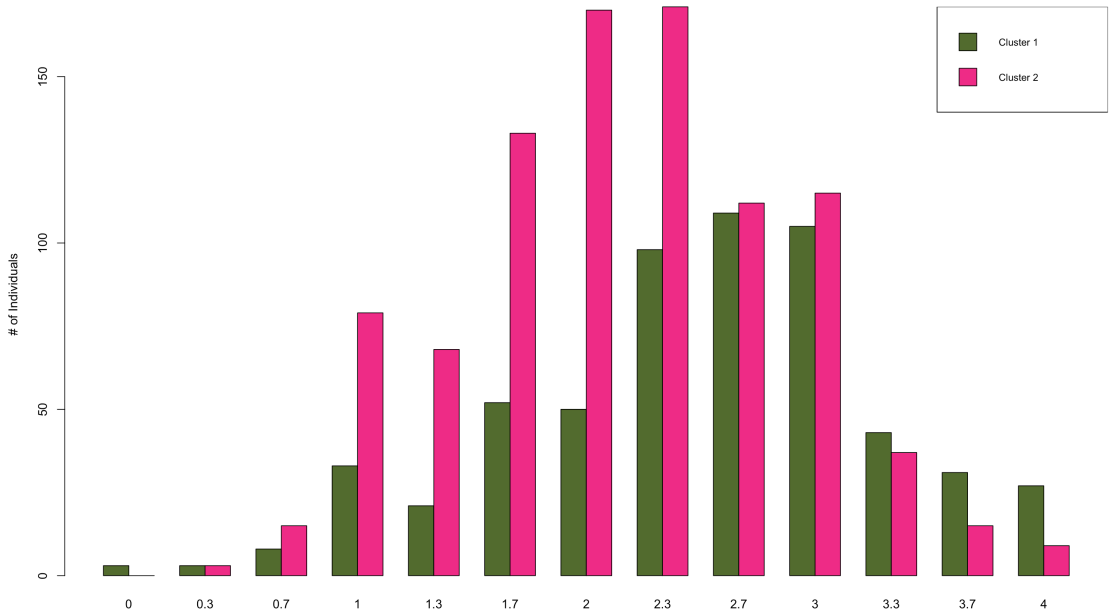


Figure C.87: Financial Attitude Scores of Clusters 1 and 2 from the 2023 data set

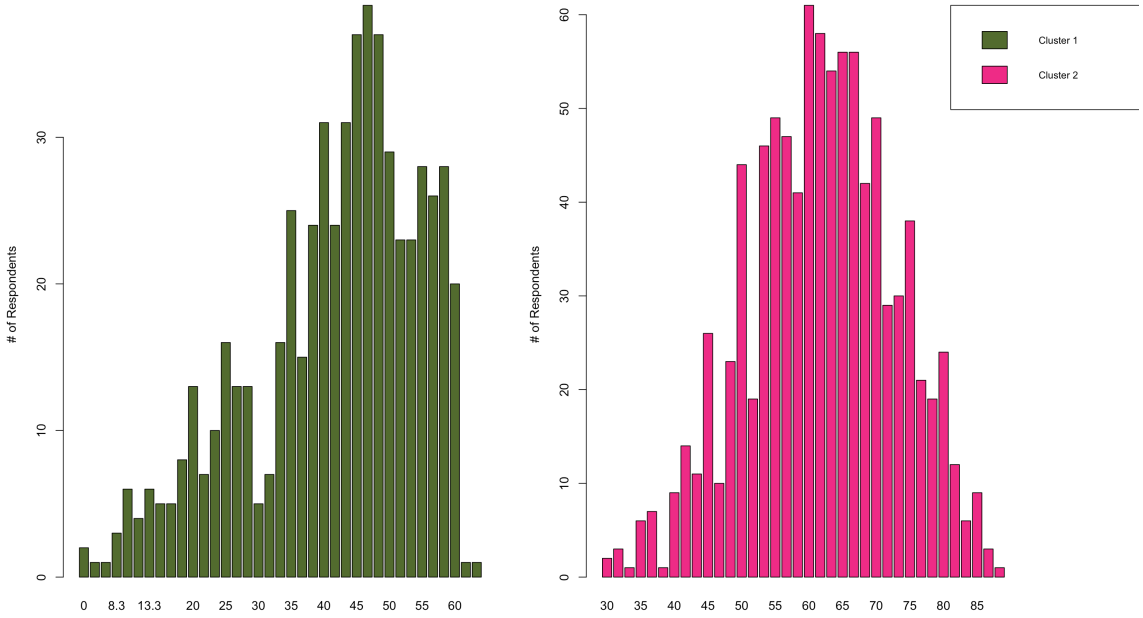


Figure C.88: Global Financial Literacy Index of Clusters 1 and 2 from the 2023 data set

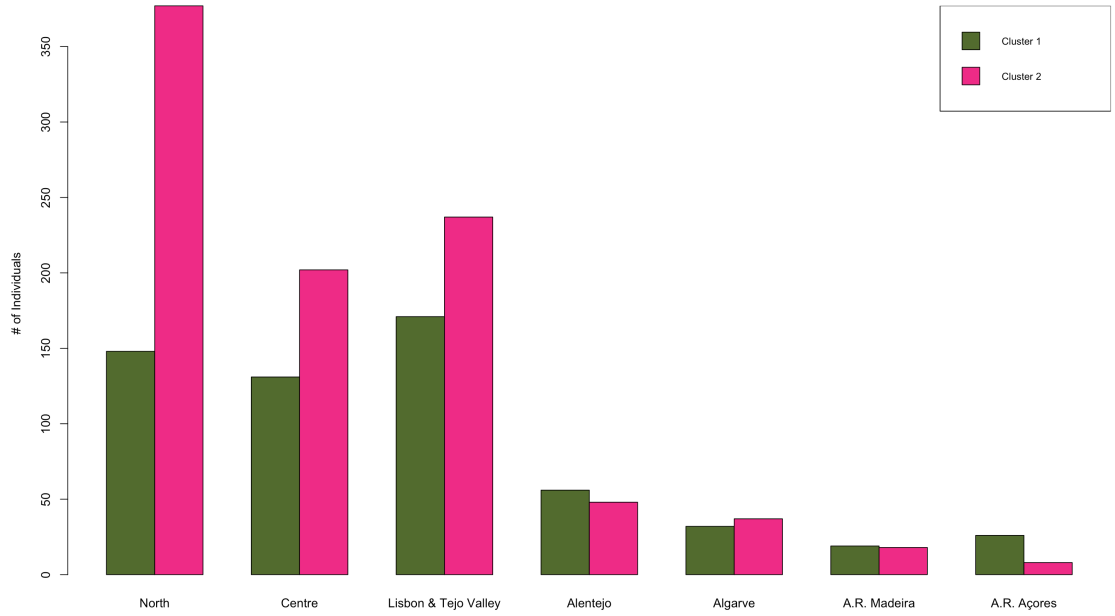


Figure C.89: Distribution of the REGION variable in Clusters 1 and 2 from the 2023 data set

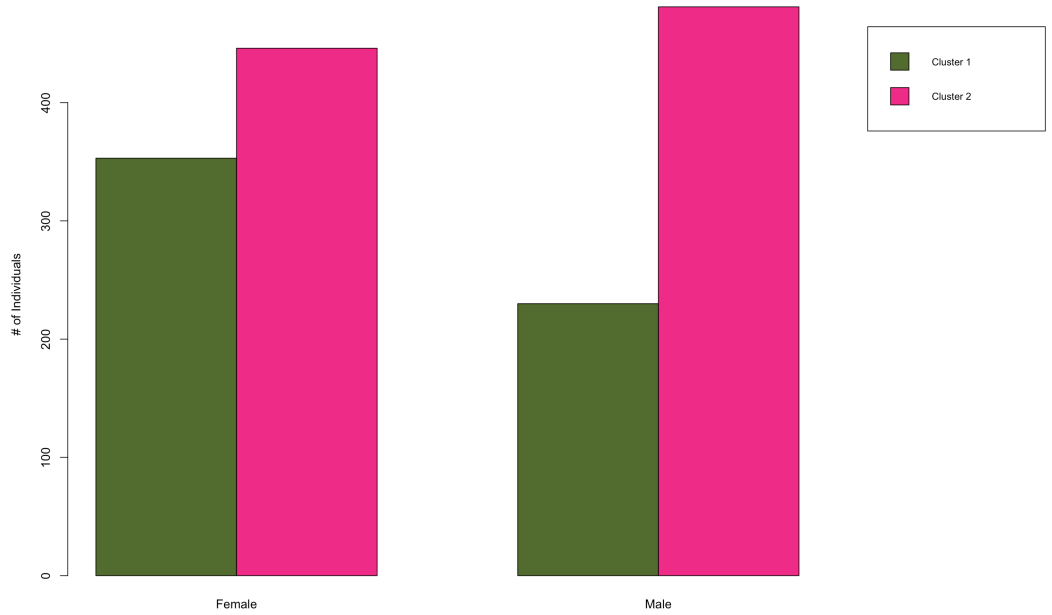


Figure C.90: Distribution of the GENDER variable in Clusters 1 and 2 from the 2023 data set

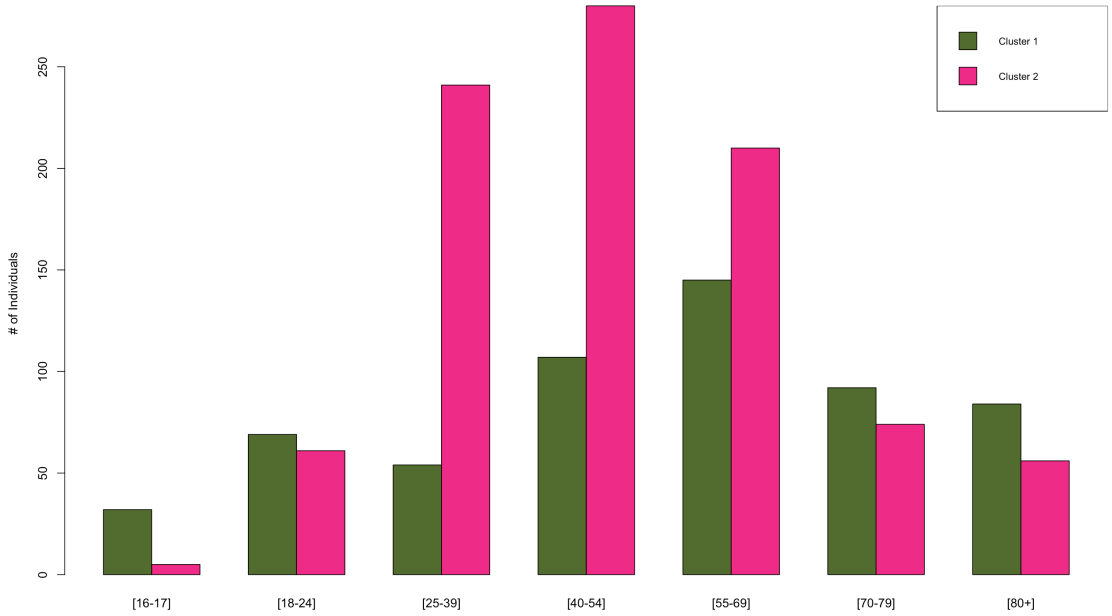


Figure C.91: Distribution of the AGE GROUP variable in Clusters 1 and 2 from the 2023 data set

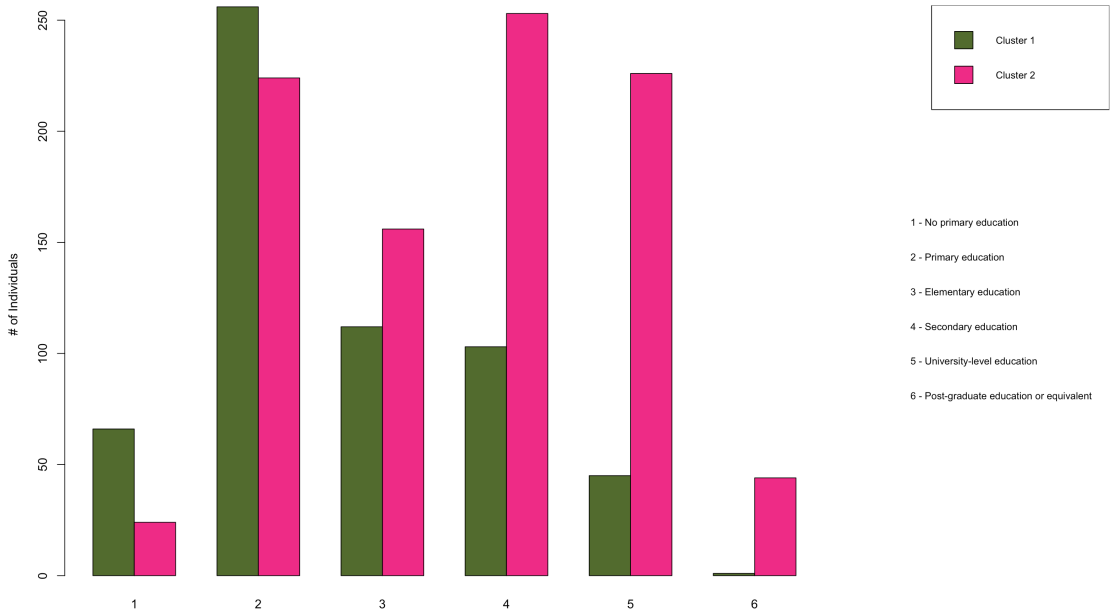


Figure C.92: Distribution of the EDUCATION variable in Clusters 1 and 2 from the 2023 data set

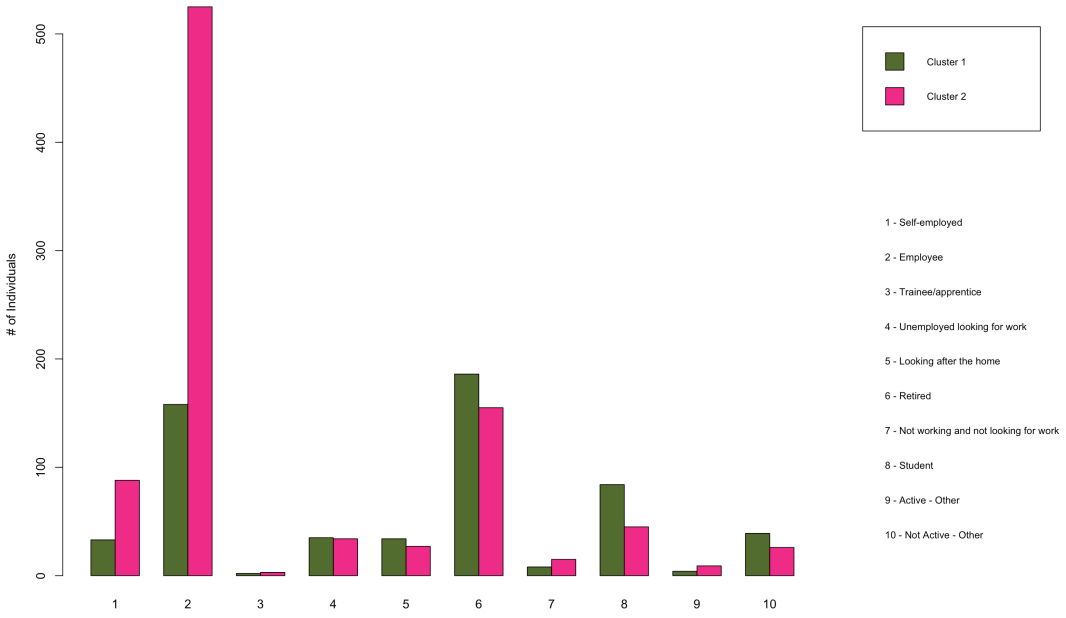


Figure C.93: Distribution of the OCCUPATION variable in Clusters 1 and 2 from the 2023 data set

Appendix D

Symbolic Data Sets

D.1 2015 Symbolic Data Set

Group	FKS	FBS	FAS	GFLI
AR Açores Female [16-17]	{3}	{4}	[2.67 : 2.67]	[48.33 : 48.33]
AR Açores Female [18-24]	{4}	{4}	[2.00 : 2.00]	[50.00 : 50.00]
AR Açores Female [25-39]	{6,2,5}	{6,5,7,4}	[3.00 : 3.33]	[51.67 : 76.67]
AR Açores Female [40-54]	{4,5,3}	{5,3}	[1.33 : 2.33]	[50.00 : 51.67]
AR Açores Female [55-69]	{4,1}	{6,5}	[3.33 : 3.67]	[48.33 : 66.67]
AR Açores Female [70-79]	{1}	{2}	[0.00 : 0.00]	[15.00 : 15.00]
AR Açores Female [80+]	{0}	{2}	[3.67 : 3.67]	[28.33 : 28.33]
AR Açores Male [18-24]	{3}	{3,2}	[1.33 : 2.33]	[31.67 : 41.67]
AR Açores Male [25-39]	{5,2,6}	{4,1,8}	[1.00 : 2.67]	[20.00 : 83.33]
AR Açores Male [40-54]	{2,4}	{6,3,5}	[1.67 : 3.33]	[43.33 : 56.67]
AR Açores Male [55-69]	{4,3}	{1,2}	[2.33 : 2.33]	[36.67 : 36.67]
AR Açores Male [70-79]	{6}	{7}	[3.00 : 3.00]	[80.00 : 80.00]
AR Madeira Female [18-24]	{6}	{4,2}	[2.00 : 2.33]	[50.00 : 61.67]
AR Madeira Female [25-39]	{2,5}	{2,7,5}	[2.67 : 3.67]	[33.33 : 78.33]
AR Madeira Female [40-54]	{6,1,2}	{4,2,3}	[2.00 : 3.00]	[25.00 : 63.33]
AR Madeira Female [55-69]	{1,6,3}	{3,7,5}	[3.00 : 3.33]	[35.00 : 81.67]
AR Madeira Female [70-79]	{3}	{3}	[2.33 : 2.33]	[41.67 : 41.67]
AR Madeira Female [80+]	{2}	{3}	[0.33 : 0.33]	[26.67 : 26.67]
AR Madeira Male [16-17]	{5}	{1}	[1.00 : 1.00]	[35.00 : 35.00]
AR Madeira Male [18-24]	{5}	{4}	[3.00 : 3.00]	[60.00 : 60.00]
AR Madeira Male [25-39]	{6,4,2}	{7,5,6,4}	[2.33 : 3.67]	[43.33 : 83.33]
AR Madeira Male [40-54]	{6,1,3}	{4,1,5,3}	[1.67 : 3.00]	[18.33 : 68.33]
AR Madeira Male [55-69]	{6,2}	{5,2}	[0.00 : 3.00]	[20.00 : 70.00]
AR Madeira Male [70-79]	{7}	{9}	[4.00 : 4.00]	[100.00 : 100.00]
Alentejo Female [16-17]	{1}	{2}	[1.33 : 1.33]	[21.67 : 21.67]
Alentejo Female [18-24]	{7,4,5}	{7,8,5}	[2.33 : 3.00]	[65.00 : 85.00]
Alentejo Female [25-39]	{6,7,5,4,1,3}	{4,6,7,3}	[1.33 : 3.67]	[48.33 : 80.00]
Alentejo Female [40-54]	{6,2,4,5,0,3}	{7,4,6,3,5}	[2.00 : 3.67]	[25.00 : 81.67]

Alentejo Female [55-69]	{6,4,3,0}	{5,6,7,2,8}	[1.67 : 3.67]	[20.00 : 76.67]
Alentejo Female [70-79]	{4,5,7,0,2}	{5,7,4,2,6}	[1.00 : 3.33]	[15.00 : 75.00]
Alentejo Female [80+]	{6,4,2}	{7,6}	[1.00 : 4.00]	[65.00 : 78.33]
Alentejo Male [16-17]	{5}	{3}	[2.33 : 2.33]	[51.67 : 51.67]
Alentejo Male [18-24]	{6,1}	{1,4,3}	[0.33 : 3.00]	[26.67 : 51.67]
Alentejo Male [25-39]	{6,3,5,4,0}	{4,7,6,5,3,8}	[0.67 : 3.00]	[45.00 : 75.00]
Alentejo Male [40-54]	{6,2,5,3,4}	{6,5,4,3}	[1.67 : 3.33]	[46.67 : 76.67]
Alentejo Male [55-69]	{5,4,6,3,7}	{7,5,3,4,6}	[1.00 : 4.00]	[50.00 : 90.00]
Alentejo Male [70-79]	{6,7,4,1}	{6,4,3}	[2.67 : 3.33]	[36.67 : 81.67]
Alentejo Male [80+]	{4,5,3}	{5,7}	[2.00 : 3.33]	[60.00 : 66.67]
Algarve Female [18-24]	{2,7}	{2,4}	[1.00 : 2.67]	[25.00 : 68.33]
Algarve Female [25-39]	{5,3,7}	{7,5,8}	[2.00 : 2.67]	[50.00 : 88.33]
Algarve Female [40-54]	{7,4,3,5}	{5,6}	[2.33 : 3.67]	[56.67 : 78.33]
Algarve Female [55-69]	{4,7,5}	{6,5,4}	[2.00 : 3.00]	[55.00 : 70.00]
Algarve Female [70-79]	{1,5,4}	{6,7,3}	[0.67 : 2.67]	[38.33 : 73.33]
Algarve Female [80+]	{0,4}	{3,6}	[1.67 : 2.67]	[28.33 : 58.33]
Algarve Male [16-17]	{7}	{5}	[1.33 : 1.33]	[66.67 : 66.67]
Algarve Male [18-24]	{6,7}	{7}	[1.00 : 2.00]	[75.00 : 75.00]
Algarve Male [25-39]	{4,6,5,7}	{5,7}	[1.00 : 2.33]	[53.33 : 76.67]
Algarve Male [40-54]	{5,3,6,7,4}	{6,2,7,5,3}	[0.67 : 2.67]	[33.33 : 78.33]
Algarve Male [55-69]	{5,3,7}	{4,3,6}	[1.67 : 3.00]	[45.00 : 73.33]
Algarve Male [70-79]	{4,7}	{4,7}	[2.00 : 2.33]	[50.00 : 81.67]
Algarve Male [80+]	{4}	{2}	[2.33 : 2.33]	[41.67 : 41.67]
Centre Female [16-17]	{4,3,5}	{5,4,1}	[1.33 : 2.67]	[41.67 : 55.00]
Centre Female [18-24]	{5,2,6,3,4}	{7,6,5,4,3,2}	[0.00 : 2.67]	[40.00 : 68.33]
Centre Female [25-39]	{6,4,5,3,7,2,1}	{6,4,7,5,2,8}	[0.00 : 3.67]	[30.00 : 75.00]
Centre Female [40-54]	{4,5,6,3,2,7,1}	{6,4,5,7,8,3}	[0.00 : 4.00]	[45.00 : 73.33]
Centre Female [55-69]	{6,4,5,2,7,3}	{5,7,3,4,6}	[1.00 : 3.67]	[40.00 : 80.00]
Centre Female [70-79]	{4,5,6,2,3,1}	{5,4,6,7,3,8}	[0.67 : 4.00]	[38.33 : 83.33]
Centre Female [80+]	{5,3,4,2,6,1,7}	{2,5,6,4,8,7}	[0.67 : 3.67]	[35.00 : 83.33]
Centre Male [16-17]	{5,4,3}	{2,3}	[1.00 : 3.00]	[31.67 : 50.00]
Centre Male [18-24]	{5,6,4,7}	{3,5,2,4}	[0.00 : 3.33]	[41.67 : 61.67]
Centre Male [25-39]	{6,5,4,7,3,1}	{6,7,4,5,8,9,3}	[0.67 : 3.67]	[51.67 : 78.33]
Centre Male [40-54]	{5,4,3,6,1}	{5,4,7,8,6,3,2}	[0.33 : 4.00]	[36.67 : 90.00]
Centre Male [55-69]	{4,6,2,5,7,3}	{6,5,4,7,8,2,1}	[1.00 : 4.00]	[36.67 : 80.00]
Centre Male [70-79]	{3,6,4,2,1,7}	{5,6,4}	[0.67 : 3.33]	[33.33 : 76.67]
Centre Male [80+]	{3,2,4,5}	{4,6,7,5,3}	[1.67 : 4.00]	[38.33 : 68.33]
Lisbon Female [16-17]	{4}	{1,2,4}	[1.00 : 2.33]	[36.67 : 45.00]
Lisbon Female [18-24]	{3,5,6,7,2,4}	{5,7,3,2,6,4,0}	[0.00 : 3.00]	[23.33 : 76.67]
Lisbon Female [25-39]	{3,4,7,6,5}	{1,6,8,7,5,4,3,9}	[0.00 : 4.00]	[28.33 : 88.33]
Lisbon Female [40-54]	{2,4,7,6,5,3}	{6,4,8,7,3,5,0}	[1.00 : 4.00]	[15.00 : 90.00]
Lisbon Female [55-69]	{4,7,3,5,6,2,0}	{7,8,6,4,5,3}	[0.00 : 3.67]	[30.00 : 88.33]
Lisbon Female [70-79]	{3,7,4,5,6,1,2}	{2,5,6,4,3,7}	[1.33 : 4.00]	[21.67 : 70.00]
Lisbon Female [80+]	{1,5,6,4,2,3}	{5,2,6,4,7,1}	[1.00 : 3.33]	[30.00 : 70.00]

Lisbon Male [16-17]	{2,5,3}	{1,2,0}	[1.00 : 2.00]	[20.00 : 43.33]
Lisbon Male [18-24]	{2,7,5,6,4,3}	{0,8,5,1,6,2,3,7,4}	[0.00 : 3.33]	[10.00 : 88.33]
Lisbon Male [25-39]	{5,6,4,7}	{7,9,6,5,4,8,2,1,3}	[0.00 : 3.67]	[35.00 : 90.00]
Lisbon Male [40-54]	{4,6,5,7,3,1}	{6,5,7,8,3,4,1}	[0.33 : 3.67]	[40.00 : 86.67]
Lisbon Male [55-69]	{4,6,7,5,3}	{5,6,7,2,4,1}	[0.33 : 4.00]	[25.00 : 85.00]
Lisbon Male [70-79]	{4,7,3,5,6}	{5,3,7,2,4,6}	[1.33 : 4.00]	[40.00 : 85.00]
Lisbon Male [80+]	{4,3,1,5}	{5,3,6}	[0.33 : 2.67]	[31.67 : 61.67]
North Female [16-17]	{5,4,6}	{5,2,6,1}	[0.33 : 4.00]	[31.67 : 71.67]
North Female [18-24]	{5,7,3,6,4}	{7,1,4,6,5,2,8}	[0.33 : 3.67]	[40.00 : 85.00]
North Female [25-39]	{7,5,3,6,4,2}	{6,4,2,3,7,5,8}	[0.33 : 4.00]	[33.33 : 81.67]
North Female [40-54]	{4,3,5,7,2,6,1}	{5,3,6,2,8,4,7}	[0.67 : 4.00]	[30.00 : 75.00]
North Female [55-69]	{5,6,4,2,3,1}	{6,5,4,7,2,3,8}	[1.00 : 4.00]	[36.67 : 85.00]
North Female [70-79]	{2,3,5,4,7}	{5,6,7}	[1.33 : 4.00]	[46.67 : 85.00]
North Female [80+]	{4,3,5,2}	{5,4,6,7,3}	[1.67 : 3.67]	[43.33 : 71.67]
North Male [16-17]	{5,6,7}	{3,5,6,4}	[0.33 : 3.00]	[48.33 : 70.00]
North Male [18-24]	{5,6,4,7}	{6,4,5,7,2,8}	[0.00 : 4.00]	[45.00 : 81.67]
North Male [25-39]	{6,5,3,4,7}	{7,4,5,2,6,3,8,0}	[0.33 : 4.00]	[28.33 : 90.00]
North Male [40-54]	{7,5,4,3,6,2}	{6,5,8,4,7,3,2}	[0.67 : 4.00]	[40.00 : 86.67]
North Male [55-69]	{7,4,3,2,5,6}	{6,5,8,7,4,2,3}	[0.00 : 4.00]	[41.67 : 81.67]
North Male [70-79]	{5,6,4,3,7}	{4,6,5,7,8}	[0.33 : 3.67]	[41.67 : 85.00]
North Male [80+]	{5,4,3}	{5,6}	[2.00 : 3.67]	[56.67 : 71.67]

D.2 2020 Symbolic Data Set

Group	FKS	FBS	FAS	GFLI
AR Açores Female [18-24]	{4}	{8,5}	[2.00 : 2.67]	[55.00 : 73.33]
AR Açores Female [25-39]	{2,3,7,6,5,1}	{4,3,7,5,8,6}	[1.33 : 3.00]	[31.67 : 81.67]
AR Açores Female [40-54]	{3,5,6,7}	{7,4,6}	[1.00 : 3.33]	[56.67 : 78.33]
AR Açores Female [55-69]	{3,2,6,0,4}	{2,5,6,4}	[1.00 : 3.33]	[25.00 : 71.67]
AR Açores Female [70-79]	{4}	{6,2}	[1.67 : 3.67]	[18.33 : 68.33]
AR Açores Female [80+]	{0}	{5}	[2.33 : 2.33]	[36.67 : 36.67]
AR Açores Male [18-24]	{2}	{3}	[2.00 : 2.00]	[35.00 : 35.00]
AR Açores Male [25-39]	{5,2,6}	{3,4,7,2}	[1.67 : 2.33]	[41.67 : 76.67]
AR Açores Male [40-54]	{6,4}	{4,5}	[0.67 : 2.00]	[48.33 : 60.00]
AR Açores Male [55-69]	{2,7,4}	{4,5}	[2.33 : 2.67]	[43.33 : 71.67]
AR Açores Male [70-79]	{7}	{7}	[1.67 : 1.67]	[78.33 : 78.33]
AR Açores Male [80+]	{6}	{6}	[0.33 : 0.33]	[61.67 : 61.67]
AR Madeira Female [18-24]	{2,1}	{4,3}	[2.33 : 3.33]	[31.67 : 46.67]
AR Madeira Female [25-39]	{1,4,3,6}	{5,8,4,3,2}	[1.33 : 2.67]	[36.67 : 73.33]
AR Madeira Female [40-54]	{4,2,5,1}	{7,4,3}	[1.67 : 3.67]	[28.33 : 76.67]
AR Madeira Female [55-69]	{2,1,5,4}	{5,3,6}	[0.00 : 2.33]	[20.00 : 46.67]
AR Madeira Female [70-79]	{1}	{3,4,2}	[0.67 : 1.67]	[23.33 : 30.00]
AR Madeira Male [18-24]	{6}	{6}	[3.00 : 3.00]	[75.00 : 75.00]
AR Madeira Male [25-39]	{4,2,3}	{3,5,2}	[1.67 : 3.67]	[38.33 : 46.67]
AR Madeira Male [40-54]	{7,2,3,1,5}	{4,2,6,5}	[1.67 : 3.67]	[30.00 : 68.33]
AR Madeira Male [55-69]	{5,1,3,2}	{5,3,4}	[0.67 : 4.00]	[23.33 : 61.67]
AR Madeira Male [70-79]	{5}	{6}	[2.33 : 2.33]	[66.67 : 66.67]
Alentejo Female [16-17]	{6,3}	{1,3}	[0.00 : 0.67]	[33.33 : 35.00]
Alentejo Female [18-24]	{6,5,3}	{1,8,3,2}	[0.00 : 2.00]	[35.00 : 71.67]
Alentejo Female [25-39]	{4,2,6,3,7}	{7,4,3,6,2}	[1.33 : 3.00]	[35.00 : 70.00]
Alentejo Female [40-54]	{5,6,3,0}	{7,5,6}	[1.33 : 3.33]	[40.00 : 73.33]
Alentejo Female [55-69]	{7,3,4,6,0}	{5,4,3}	[0.33 : 2.67]	[31.67 : 71.67]
Alentejo Female [70-79]	{3,2,6,1,0}	{5,3,4,6}	[0.33 : 3.67]	[16.67 : 76.67]
Alentejo Female [80+]	{3,0,1}	{3,2,4,1}	[1.67 : 4.00]	[15.00 : 43.33]
Alentejo Male [16-17]	{3}	{5,1}	[1.00 : 3.00]	[10.00 : 55.00]
Alentejo Male [25-39]	{6,5,7,3,4}	{8,4,6,7,3}	[1.00 : 2.67]	[45.00 : 83.33]
Alentejo Male [40-54]	{6,5,3,2,4,1}	{7,4,6,5,2}	[1.67 : 3.00]	[28.33 : 78.33]
Alentejo Male [55-69]	{5,7,2,3,1}	{6,5,3,2,4}	[0.00 : 3.33]	[25.00 : 80.00]
Alentejo Male [70-79]	{5,0,3,2,4}	{7,3,4,5}	[1.00 : 2.33]	[25.00 : 66.67]
Alentejo Male [80+]	{0,5,1}	{3,5}	[1.33 : 4.00]	[25.00 : 58.33]
Algarve Female [18-24]	{2}	{3,1}	[1.33 : 1.33]	[21.67 : 31.67]
Algarve Female [25-39]	{5,2,7,6,3,4}	{7,6,4,8,5}	[1.67 : 3.33]	[51.67 : 78.33]
Algarve Female [40-54]	{4,5,3,2,6}	{5,2,6,4,7,3}	[0.67 : 3.00]	[43.33 : 70.00]
Algarve Female [55-69]	{5,4,3,2,0,1}	{4,6,5,3,7}	[1.00 : 3.33]	[26.67 : 60.00]
Algarve Female [70-79]	{6}	{7,6}	[1.67 : 3.33]	[73.33 : 76.67]
Algarve Female [80+]	{3,0,1}	{3,4}	[0.33 : 1.67]	[21.67 : 38.33]

Algarve Male [16-17]	{3}	{5}	[2.33 : 2.33]	[51.67 : 51.67]
Algarve Male [18-24]	{2,1,4}	{5,4,7}	[1.33 : 2.33]	[33.33 : 66.67]
Algarve Male [25-39]	{7,6,5,0,4}	{7,5,8,6,3,4}	[1.00 : 3.00]	[21.67 : 83.33]
Algarve Male [40-54]	{6,4,2,5}	{2,4,7,6}	[0.33 : 2.67]	[30.00 : 68.33]
Algarve Male [55-69]	{5,6,3,1,4,7}	{4,5,2,3,1,8}	[0.33 : 3.33]	[25.00 : 83.33]
Algarve Male [70-79]	{0}	{6}	[1.00 : 1.00]	[35.00 : 35.00]
Centre Female [16-17]	{4,6,5}	{3,1,2}	[0.00 : 1.33]	[35.00 : 41.67]
Centre Female [18-24]	{1,4,5,3,2,6}	{2,8,7,5,1,4,6}	[0.33 : 3.67]	[16.67 : 73.33]
Centre Female [25-39]	{5,1,4,3,2,7,6}	{2,6,4,5,3,8,7}	[1.00 : 4.00]	[40.00 : 88.33]
Centre Female [40-54]	{5,6,4,0,7,3,2,1}	{4,5,6,7,3,8,2}	[0.67 : 4.00]	[25.00 : 86.67]
Centre Female [55-69]	{1,7,3,5,6,2,4}	{5,4,6,3,7,8,2}	[0.00 : 3.67]	[31.67 : 83.33]
Centre Female [70-79]	{1,3,2,4,6,5,0}	{3,4,5,6,2}	[1.00 : 3.33]	[25.00 : 76.67]
Centre Female [80+]	{4,1,0,2,3}	{5,4,0,3,2}	[0.00 : 3.33]	[0.00 : 53.33]
Centre Male [16-17]	{3,1}	{4,3}	[1.00 : 3.00]	[30.00 : 50.00]
Centre Male [18-24]	{4,3,5,6,1,7}	{6,5,3,7,0,2,4}	[0.00 : 3.00]	[30.00 : 70.00]
Centre Male [25-39]	{6,2,5,4,3,7,1}	{7,4,6,3,8,5}	[0.00 : 3.67]	[36.67 : 80.00]
Centre Male [40-54]	{5,6,3,7,2,1,4}	{5,6,4,7,3,8,2}	[0.33 : 3.67]	[28.33 : 81.67]
Centre Male [55-69]	{7,6,3,4,5,2}	{6,5,4,3,7,1}	[0.67 : 2.67]	[31.67 : 71.67]
Centre Male [70-79]	{2,5,6,4,1,3,7}	{5,3,6,4,7}	[1.00 : 3.67]	[25.00 : 78.33]
Centre Male [80+]	{1,2,5,7,3,6}	{3,4,6,1}	[0.33 : 2.67]	[28.33 : 71.67]
Lisbon Female [16-17]	{1,3}	{0,1}	[0.00 : 1.00]	[10.00 : 20.00]
Lisbon Female [18-24]	{5,4,3,6,7,0,2}	{1,3,6,7,5,4}	[0.00 : 3.00]	[28.33 : 71.67]
Lisbon Female [25-39]	{4,3,6,5,2,7,0,1}	{3,4,8,6,7,5,2}	[0.33 : 4.00]	[30.00 : 85.00]
Lisbon Female [40-54]	{6,4,5,3,7,2,1}	{7,5,2,6,4,3,8}	[0.33 : 4.00]	[30.00 : 93.33]
Lisbon Female [55-69]	{1,0,6,5,4,3,2,7}	{5,4,7,6,3,2,1}	[0.00 : 4.00]	[28.33 : 85.00]
Lisbon Female [70-79]	{3,5,2,6,1,0,4}	{3,5,6,4,1,7,0}	[0.33 : 4.00]	[20.00 : 78.33]
Lisbon Female [80+]	{0,1,3,5,4,2}	{2,4,1,3,5,6}	[0.00 : 3.00]	[5.00 : 60.00]
Lisbon Male [16-17]	{4}	{4}	[2.33 : 2.33]	[51.67 : 51.67]
Lisbon Male [18-24]	{5,6,4,3,2,0,7,1}	{2,5,3,6,7,8,4,1}	[0.00 : 2.67]	[30.00 : 73.33]
Lisbon Male [25-39]	{5,3,6,4,7,2,1}	{6,7,8,5,3,4,2,9}	[0.00 : 3.67]	[25.00 : 95.00]
Lisbon Male [40-54]	{2,6,5,7,1,0,3,4}	{2,7,4,8,6,5,3,1}	[0.00 : 4.00]	[30.00 : 81.67]
Lisbon Male [55-69]	{7,2,3,5,6,4,0}	{6,4,3,5,7,8}	[0.67 : 4.00]	[33.33 : 86.67]
Lisbon Male [70-79]	{4,3,0,1,5,7,2,6}	{6,5,2,4,3}	[0.33 : 4.00]	[15.00 : 80.00]
Lisbon Male [80+]	{1,7,3,0,4}	{4,5,6,2,3}	[0.67 : 3.00]	[13.33 : 73.33]
North Female [16-17]	{7}	{3}	[2.67 : 2.67]	[63.33 : 63.33]
North Female [18-24]	{5,2,4,3,6,7,0,1}	{5,7,6,4,1,8}	[0.67 : 4.00]	[8.33 : 81.67]
North Female [25-39]	{4,5,7,3,6,2,1,0}	{5,7,8,6,4,3,2}	[0.67 : 3.67]	[21.67 : 90.00]
North Female [40-54]	{3,4,1,5,2,7,6,0}	{4,6,7,5,3,8}	[0.00 : 4.00]	[25.00 : 88.33]
North Female [55-69]	{5,2,1,3,4,7,6,0}	{5,4,2,6,7,3,8}	[0.67 : 4.00]	[28.33 : 86.67]
North Female [70-79]	{0,3,4,1,5,2}	{5,6,4,3,2,7}	[0.33 : 4.00]	[20.00 : 65.00]
North Female [80+]	{6,1,0,4,5,2}	{4,5,3,2,7}	[1.00 : 4.00]	[20.00 : 70.00]
North Male [16-17]	{5,2,6,1}	{2,6,4,3}	[1.00 : 3.33]	[28.33 : 71.67]
North Male [18-24]	{5,1,4,7,6,3,2}	{6,4,3,1,2,7,5}	[0.67 : 3.33]	[15.00 : 80.00]
North Male [25-39]	{4,5,6,2,7,3,1}	{5,3,6,7,8,2,4}	[0.00 : 3.67]	[23.33 : 85.00]

North Male [40-54]	{5,4,2,7,6,3,0,1}	{4,7,5,6,8,3}	[0.67 : 3.67]	[25.00 : 88.33]
North Male [55-69]	{6,2,7,0,1,4,5,3}	{6,4,5,7,3,2}	[0.67 : 4.00]	[23.33 : 85.00]
North Male [70-79]	{3,6,5,2,1,4,0}	{7,6,5,4,3}	[0.00 : 4.00]	[28.33 : 81.67]
North Male [80+]	{3,1,2,6,7,5,4}	{3,5,2,4,6}	[0.33 : 2.67]	[21.67 : 76.67]

D.3 2023 Symbolic Data Set

Group	FKS	FBS	FAS	GFLI
AR Açores Female [18-24]	{2,1}	{4,3}	[2.33 : 3.33]	[31.67 : 46.67]
AR Açores Female [25-39]	{1,4,3,6}	{5,8,4,3,2}	[1.33 : 2.67]	[36.67 : 73.33]
AR Açores Female [40-54]	{4,2,5,1}	{7,4,3}	[1.67 : 3.67]	[28.33 : 76.67]
AR Açores Female [55-69]	{2,1,5,4}	{5,3,6}	[0.00 : 2.33]	[20.00 : 46.67]
AR Açores Female [70-79]	{1}	{3,4,2}	[0.67 : 1.67]	[23.33 : 30.00]
AR Açores Male [18-24]	{6}	{6}	[3.00 : 3.00]	[75.00 : 75.00]
AR Açores Male [25-39]	{4,2,3}	{3,5,2}	[1.67 : 3.67]	[38.33 : 46.67]
AR Açores Male [40-54]	{7,2,3,1,5}	{4,2,6,5}	[1.67 : 3.67]	[30.00 : 68.33]
AR Açores Male [55-69]	{5,1,3,2}	{5,3,4}	[0.67 : 4.00]	[23.33 : 61.67]
AR Açores Male [70-79]	{5}	{6}	[2.33 : 2.33]	[66.67 : 66.67]
AR Madeira Female [18-24]	{4}	{8,5}	[2.00 : 2.67]	[55.00 : 73.33]
AR Madeira Female [25-39]	{2,3,7,6,5,1}	{4,3,7,5,8,6}	[1.33 : 3.00]	[31.67 : 81.67]
AR Madeira Female [40-54]	{3,5,6,7}	{7,4,6}	[1.00 : 3.33]	[56.67 : 78.33]
AR Madeira Female [55-69]	{3,2,6,0,4}	{2,5,6,4}	[1.00 : 3.33]	[25.00 : 71.67]
AR Madeira Female [70-79]	{4}	{6,2}	[1.67 : 3.67]	[18.33 : 68.33]
AR Madeira Female [80+]	{0}	{5}	[2.33 : 2.33]	[36.67 : 36.67]
AR Madeira Male [18-24]	{2}	{3}	[2.00 : 2.00]	[35.00 : 35.00]
AR Madeira Male [25-39]	{5,2,6}	{3,4,7,2}	[1.67 : 2.33]	[41.67 : 76.67]
AR Madeira Male [40-54]	{6,4}	{4,5}	[0.67 : 2.00]	[48.33 : 60.00]
AR Madeira Male [55-69]	{2,7,4}	{4,5}	[2.33 : 2.67]	[43.33 : 71.67]
AR Madeira Male [70-79]	{7}	{7}	[1.67 : 1.67]	[78.33 : 78.33]
AR Madeira Male [80+]	{6}	{6}	[0.33 : 0.33]	[61.67 : 61.67]
Alentejo Female [16-17]	{6,3}	{1,3}	[0.00 : 0.67]	[33.33 : 35.00]
Alentejo Female [18-24]	{6,5,3}	{1,8,3,2}	[0.00 : 2.00]	[35.00 : 71.67]
Alentejo Female [25-39]	{4,2,6,3,7}	{7,4,3,6,2}	[1.33 : 3.00]	[35.00 : 70.00]
Alentejo Female [40-54]	{5,6,3,0}	{7,5,6}	[1.33 : 3.33]	[40.00 : 73.33]
Alentejo Female [55-69]	{7,3,4,6,0}	{5,4,3}	[0.33 : 2.67]	[31.67 : 71.67]
Alentejo Female [70-79]	{3,2,6,1,0}	{5,3,4,6}	[0.33 : 3.67]	[16.67 : 76.67]
Alentejo Female [80+]	{3,0,1}	{3,2,4,1}	[1.67 : 4.00]	[15.00 : 43.33]
Alentejo Male [16-17]	{3}	{5,1}	[1.00 : 3.00]	[10.00 : 55.00]
Alentejo Male [25-39]	{6,5,7,3,4}	{8,4,6,7,3}	[1.00 : 2.67]	[45.00 : 83.33]
Alentejo Male [40-54]	{6,5,3,2,4,1}	{7,4,6,5,2}	[1.67 : 3.00]	[28.33 : 78.33]
Alentejo Male [55-69]	{5,7,2,3,1}	{6,5,3,2,4}	[0.00 : 3.33]	[25.00 : 80.00]
Alentejo Male [70-79]	{5,0,3,2,4}	{7,3,4,5}	[1.00 : 2.33]	[25.00 : 66.67]
Alentejo Male [80+]	{0,5,1}	{3,5}	[1.33 : 4.00]	[25.00 : 58.33]
Algarve Female [18-24]	{2}	{3,1}	[1.33 : 1.33]	[21.67 : 31.67]
Algarve Female [25-39]	{5,2,7,6,3,4}	{7,6,4,8,5}	[1.67 : 3.33]	[51.67 : 78.33]
Algarve Female [40-54]	{4,5,3,2,6}	{5,2,6,4,7,3}	[0.67 : 3.00]	[43.33 : 70.00]
Algarve Female [55-69]	{5,4,3,2,0,1}	{4,6,5,3,7}	[1.00 : 3.33]	[26.67 : 60.00]
Algarve Female [70-79]	{6}	{7,6}	[1.67 : 3.33]	[73.33 : 76.67]
Algarve Female [80+]	{3,0,1}	{3,4}	[0.33 : 1.67]	[21.67 : 38.33]

Algarve Male [16-17]	{3}	{5}	[2.33 : 2.33]	[51.67 : 51.67]
Algarve Male [18-24]	{2,1,4}	{5,4,7}	[1.33 : 2.33]	[33.33 : 66.67]
Algarve Male [25-39]	{7,6,5,0,4}	{7,5,8,6,3,4}	[1.00 : 3.00]	[21.67 : 83.33]
Algarve Male [40-54]	{6,4,2,5}	{2,4,7,6}	[0.33 : 2.67]	[30.00 : 68.33]
Algarve Male [55-69]	{5,6,3,1,4,7}	{4,5,2,3,1,8}	[0.33 : 3.33]	[25.00 : 83.33]
Algarve Male [70-79]	{0}	{6}	[1.00 : 1.00]	[35.00 : 35.00]
Centre Female [16-17]	{4,6,5}	{3,1,2}	[0.00 : 1.33]	[35.00 : 41.67]
Centre Female [18-24]	{1,4,5,3,2,6}	{2,8,7,5,1,4,6}	[0.33 : 3.67]	[16.67 : 73.33]
Centre Female [25-39]	{5,1,4,3,2,7,6}	{2,6,4,5,3,8,7}	[1.00 : 4.00]	[40.00 : 88.33]
Centre Female [40-54]	{5,6,4,0,7,3,2,1}	{4,5,6,7,3,8,2}	[0.67 : 4.00]	[25.00 : 86.67]
Centre Female [55-69]	{1,7,3,5,6,2,4}	{5,4,6,3,7,8,2}	[0.00 : 3.67]	[31.67 : 83.33]
Centre Female [70-79]	{1,3,2,4,6,5,0}	{3,4,5,6,2}	[1.00 : 3.33]	[25.00 : 76.67]
Centre Female [80+]	{4,1,0,2,3}	{5,4,0,3,2}	[0.00 : 3.33]	[0.00 : 53.33]
Centre Male [16-17]	{3,1}	{4,3}	[1.00 : 3.00]	[30.00 : 50.00]
Centre Male [18-24]	{4,3,5,6,1,7}	{6,5,3,7,0,2,4}	[0.00 : 3.00]	[30.00 : 70.00]
Centre Male [25-39]	{6,2,5,4,3,7,1}	{7,4,6,3,8,5}	[0.00 : 3.67]	[36.67 : 80.00]
Centre Male [40-54]	{5,6,3,7,2,1,4}	{5,6,4,7,3,8,2}	[0.33 : 3.67]	[28.33 : 81.67]
Centre Male [55-69]	{7,6,3,4,5,2}	{6,5,4,3,7,1}	[0.67 : 2.67]	[31.67 : 71.67]
Centre Male [70-79]	{2,5,6,4,1,3,7}	{5,3,6,4,7}	[1.00 : 3.67]	[25.00 : 78.33]
Centre Male [80+]	{1,2,5,7,3,6}	{3,4,6,1}	[0.33 : 2.67]	[28.33 : 71.67]
Lisbon Female [16-17]	{1,3}	{0,1}	[0.00 : 1.00]	[10.00 : 20.00]
Lisbon Female [18-24]	{5,4,3,6,7,0,2}	{1,3,6,7,5,4}	[0.00 : 3.00]	[28.33 : 71.67]
Lisbon Female [25-39]	{4,3,6,5,2,7,0,1}	{3,4,8,6,7,5,2}	[0.33 : 4.00]	[30.00 : 85.00]
Lisbon Female [40-54]	{6,4,5,3,7,2,1}	{7,5,2,6,4,3,8}	[0.33 : 4.00]	[30.00 : 93.33]
Lisbon Female [55-69]	{1,0,6,5,4,3,2,7}	{5,4,7,6,3,2,1}	[0.00 : 4.00]	[28.33 : 85.00]
Lisbon Female [70-79]	{3,5,2,6,1,0,4}	{3,5,6,4,1,7,0}	[0.33 : 4.00]	[20.00 : 78.33]
Lisbon Female [80+]	{0,1,3,5,4,2}	{2,4,1,3,5,6}	[0.00 : 3.00]	[5.00 : 60.00]
Lisbon Male [16-17]	{4}	{4}	[2.33 : 2.33]	[51.67 : 51.67]
Lisbon Male [18-24]	{5,6,4,3,2,0,7,1}	{2,5,3,6,7,8,4,1}	[0.00 : 2.67]	[30.00 : 73.33]
Lisbon Male [25-39]	{5,3,6,4,7,2,1}	{6,7,8,5,3,4,2,9}	[0.00 : 3.67]	[25.00 : 95.00]
Lisbon Male [40-54]	{2,6,5,7,1,0,3,4}	{2,7,4,8,6,5,3,1}	[0.00 : 4.00]	[30.00 : 81.67]
Lisbon Male [55-69]	{7,2,3,5,6,4,0}	{6,4,3,5,7,8}	[0.67 : 4.00]	[33.33 : 86.67]
Lisbon Male [70-79]	{4,3,0,1,5,7,2,6}	{6,5,2,4,3}	[0.33 : 4.00]	[15.00 : 80.00]
Lisbon Male [80+]	{1,7,3,0,4}	{4,5,6,2,3}	[0.67 : 3.00]	[13.33 : 73.33]
North Female [16-17]	{7}	{3}	[2.67 : 2.67]	[63.33 : 63.33]
North Female [18-24]	{5,2,4,3,6,7,0,1}	{5,7,6,4,1,8}	[0.67 : 4.00]	[8.33 : 81.67]
North Female [25-39]	{4,5,7,3,6,2,1,0}	{5,7,8,6,4,3,2}	[0.67 : 3.67]	[21.67 : 90.00]
North Female [40-54]	{3,4,1,5,2,7,6,0}	{4,6,7,5,3,8}	[0.00 : 4.00]	[25.00 : 88.33]
North Female [55-69]	{5,2,1,3,4,7,6,0}	{5,4,2,6,7,3,8}	[0.67 : 4.00]	[28.33 : 86.67]
North Female [70-79]	{0,3,4,1,5,2}	{5,6,4,3,2,7}	[0.33 : 4.00]	[20.00 : 65.00]
North Female [80+]	{6,1,0,4,5,2}	{4,5,3,2,7}	[1.00 : 4.00]	[20.00 : 70.00]
North Male [16-17]	{5,2,6,1}	{2,6,4,3}	[1.00 : 3.33]	[28.33 : 71.67]
North Male [18-24]	{5,1,4,7,6,3,2}	{6,4,3,1,2,7,5}	[0.67 : 3.33]	[15.00 : 80.00]
North Male [25-39]	{4,5,6,2,7,3,1}	{5,3,6,7,8,2,4}	[0.00 : 3.67]	[23.33 : 85.00]

North Male [40-54]	{5,4,2,7,6,3,0,1}	{4,7,5,6,8,3}	[0.67 : 3.67]	[25.00 : 88.33]
North Male [55-69]	{6,2,7,0,1,4,5,3}	{6,4,5,7,3,2}	[0.67 : 4.00]	[23.33 : 85.00]
North Male [70-79]	{3,6,5,2,1,4,0}	{7,6,5,4,3}	[0.00 : 4.00]	[28.33 : 81.67]
North Male [80+]	{3,1,2,6,7,5,4}	{3,5,2,4,6}	[0.33 : 2.67]	[21.67 : 76.67]

Appendix E

Symbolic Clustering Results

Cluster 1	Cluster 2	Cluster 3
Size		
11	60	13
Group Composition		
AR Açores Female [16-17]	AR Açores Female [25-39]	AR Açores Female [40-54]
AR Açores Female [18-24]	AR Açores Female [55-69]	AR Açores Male [18-24]
AR Madeira Female [40-54]	AR Açores Male [40-54]	AR Açores Male [25-39]
AR Madeira Male [18-24]	AR Madeira Female [25-39]	AR Açores Male [55-69]
AR Madeira Male [40-54]	AR Madeira Female [55-69]	AR Madeira Female [18-24]
Alentejo Male [16-17]	AR Madeira Male [25-39]	AR Madeira Female [70-79]
Alentejo Male [18-24]	Alentejo Female [18-24]	AR Madeira Male [55-69]
Alentejo Male [70-79]	Alentejo Female [25-39]	Algarve Female [18-24]
Algarve Male [55-69]	Alentejo Female [40-54]	Algarve Male [80+]
Centre Male [18-24]	Alentejo Female [55-69]	Centre Female [16-17]
North Male [16-17]	Alentejo Female [70-79]	Centre Male [16-17]
	Alentejo Female [80+]	Lisbon Female [16-17]
	Alentejo Male [25-39]	Lisbon Male [80+]
	Alentejo Male [40-54]	
	Alentejo Male [55-69]	
	Alentejo Male [80+]	
	Algarve Female [25-39]	
	Algarve Female [40-54]	
	Algarve Female [55-69]	
	Algarve Female [70-79]	
	Algarve Female [80+]	
	Algarve Male [16-17]	
	Algarve Male [25-39]	
	Algarve Male [40-54]	
	Algarve Male [70-79]	
	Centre Female [18-24]	
	Centre Female [25-39]	

	Centre Female [40-54]	
	Centre Female [55-69]	
	Centre Female [70-79]	
	Centre Female [80+]	
	Centre Male [25-39]	
	Centre Male [40-54]	
	Centre Male [55-69]	
	Centre Male [70-79]	
	Centre Male [80+]	
	Lisbon Female [18-24]	
	Lisbon Female [25-39]	
	Lisbon Female [40-54]	
	Lisbon Female [55-69]	
	Lisbon Female [70-79]	
	Lisbon Female [80+]	
	Lisbon Male [18-24]	
	Lisbon Male [25-39]	
	Lisbon Male [40-54]	
	Lisbon Male [55-69]	
	Lisbon Male [70-79]	
	North Female [16-17]	
	North Female [18-24]	
	North Female [25-39]	
	North Female [40-54]	
	North Female [55-69]	
	North Female [70-79]	
	North Female [80+]	
	North Male [18-24]	
	North Male [25-39]	
	North Male [40-54]	
	North Male [55-69]	
	North Male [70-79]	
	North Male [80+]	

Table E.1: Results of the 6 cluster partition applied to the 2015 symbolic data set

Cluster 4	Cluster 5	Cluster 6
Size		
3	3	3
Group Composition		
AR Açores Female [70-79]	AR Açores Male [70-79]	AR Madeira Female [80+]
AR Açores Female [80+]	AR Madeira Male [70-79]	AR Madeira Male [16-17]
Alentejo Female [16-17]	Algarve Male [18-24]	Lisbon Male [16-17]

Table E.2: Results of the 6 cluster partition applied to the 2015 symbolic data set (Continuation)

Cluster 1	Cluster 2	Cluster 3
Size		
70	6	7
Group Composition		
AR Açores Female [18-24]	AR Açores Female [70-79]	AR Açores Male [18-24]
AR Açores Female [25-39]	AR Açores Male [80+]	AR Madeira Female [18-24]
AR Açores Female [40-54]	AR Madeira Male [18-24]	AR Madeira Female [70-79]
AR Açores Female [55-69]	AR Madeira Male [70-79]	Alentejo Female [80+]
AR Açores Female [80+]	Algarve Female [70-79]	Algarve Female [18-24]
AR Açores Male [25-39]	Algarve Male [70-79]	Algarve Female [80+]
AR Açores Male [40-54]		Centre Male [16-17]
AR Açores Male [55-69]		
AR Madeira Female [25-39]		
AR Madeira Female [40-54]		
AR Madeira Female [55-69]		
AR Madeira Male [25-39]		
AR Madeira Male [40-54]		
AR Madeira Male [55-69]		
Alentejo Female [25-39]		
Alentejo Female [40-54]		
Alentejo Female [55-69]		
Alentejo Female [70-79]		
Alentejo Male [16-17]		
Alentejo Male [25-39]		
Alentejo Male [40-54]		
Alentejo Male [55-69]		
Alentejo Male [70-79]		
Alentejo Male [80+]		
Algarve Female [25-39]		
Algarve Female [40-54]		
Algarve Female [55-69]		
Algarve Male [16-17]		
Algarve Male [18-24]		

Algarve Male [25-39]		
Algarve Male [40-54]		
Algarve Male [55-69]		
Centre Female [18-24]		
Centre Female [25-39]		
Centre Female [40-54]		
Centre Female [55-69]		
Centre Female [70-79]		
Centre Female [80+]		
Centre Male [18-24]		
Centre Male [25-39]		
Centre Male [40-54]		
Centre Male [55-69]		
Centre Male [70-79]		
Centre Male [80+]		
Lisbon Female [18-24]		
Lisbon Female [25-39]		
Lisbon Female [40-54]		
Lisbon Female [55-69]		
Lisbon Female [70-79]		
Lisbon Female [80+]		
Lisbon Male [16-17]		
Lisbon Male [18-24]		
Lisbon Male [25-39]		
Lisbon Male [40-54]		
Lisbon Male [55-69]		
Lisbon Male [70-79]		
Lisbon Male [80+]		
North Female [18-24]		
North Female [25-39]		
North Female [40-54]		
North Female [55-69]		
North Female [70-79]		
North Female [80+]		
North Male [16-17]		
North Male [18-24]		
North Male [25-39]		
North Male [40-54]		
North Male [55-69]		
North Male [70-79]		
North Male [80+]		

Table E.3: Results of the 5 cluster partition applied to the 2020 symbolic data set

Cluster 4	Cluster 5
Size	
2	4
Group Composition	
AR Açores Male [70-79]	Alentejo Female [16-17]
North Female [16-17]	Alentejo Female [18-24]
	Centre Female [16-17]
	Lisbon Female [16-17]

Table E.4: Results of the 5 cluster partition applied to the 2020 symbolic data set (Continuation)

Cluster 1	Cluster 2
Size	
71	6
Group Composition	
AR Açores Female [16-17]	AR Açores Female [18-24]
AR Açores Female [25-39]	AR Açores Male [18-24]
AR Açores Female [40-54]	Alentejo Female [16-17]
AR Açores Female [55-69]	Alentejo Male [16-17]
AR Açores Male [25-39]	Algarve Female [18-24]
AR Açores Male [40-54]	Algarve Male [18-24]
AR Açores Male [55-69]	
AR Madeira Female [18-24]	
AR Madeira Female [25-39]	
AR Madeira Female [40-54]	
AR Madeira Female [55-69]	
AR Madeira Female [70-79]	
AR Madeira Female [80+]	
AR Madeira Male [18-24]	
AR Madeira Male [25-39]	
AR Madeira Male [40-54]	
AR Madeira Male [55-69]	
AR Madeira Male [70-79]	
Alentejo Female [18-24]	
Alentejo Female [25-39]	
Alentejo Female [40-54]	
Alentejo Female [55-69]	
Alentejo Female [70-79]	
Alentejo Female [80+]	
Alentejo Male [25-39]	
Alentejo Male [40-54]	
Alentejo Male [55-69]	
Alentejo Male [70-79]	

Alentejo Male [80+]	
Algarve Female [25-39]	
Algarve Female [40-54]	
Algarve Female [55-69]	
Algarve Female [70-79]	
Algarve Female [80+]	
Algarve Male [25-39]	
Algarve Male [40-54]	
Algarve Male [55-69]	
Algarve Male [70-79]	
Algarve Male [80+]	
Centre Female [25-39]	
Centre Female [40-54]	
Centre Female [55-69]	
Centre Female [70-79]	
Centre Male [18-24]	
Centre Male [25-39]	
Centre Male [40-54]	
Centre Male [55-69]	
Centre Male [70-79]	
Lisbon Female [18-24]	
Lisbon Female [25-39]	
Lisbon Female [40-54]	
Lisbon Female [55-69]	
Lisbon Female [70-79]	
Lisbon Female [80+]	
Lisbon Male [18-24]	
Lisbon Male [25-39]	
Lisbon Male [40-54]	
Lisbon Male [55-69]	
Lisbon Male [70-79]	
Lisbon Male [80+]	
North Female [18-24]	
North Female [25-39]	
North Female [40-54]	
North Female [55-69]	
North Female [80+]	
North Male [18-24]	
North Male [25-39]	
North Male [40-54]	
North Male [55-69]	
North Male [70-79]	
North Male [80+]	

Table E.5: Results of the 4 cluster partition applied to the 2023 symbolic data set

Cluster 3	Cluster 4
Size	
7	11
Group Composition	
AR Açores Female [70-79]	Alentejo Male [18-24]
AR Açores Female [80+]	Centre Female [16-17]
AR Açores Male [70-79]	Centre Female [18-24]
AR Açores Male [80+]	Centre Female [80+]
AR Madeira Male [16-17]	Centre Male [16-17]
Algarve Female [16-17]	Centre Male [80+]
Algarve Male [16-17]	Lisbon Female [16-17]
	Lisbon Male [16-17]
	North Female [16-17]
	North Female [70-79]
	North Male [16-17]

Table E.6: Results of the 4 cluster partition applied to the 2023 symbolic data set (Continuation)

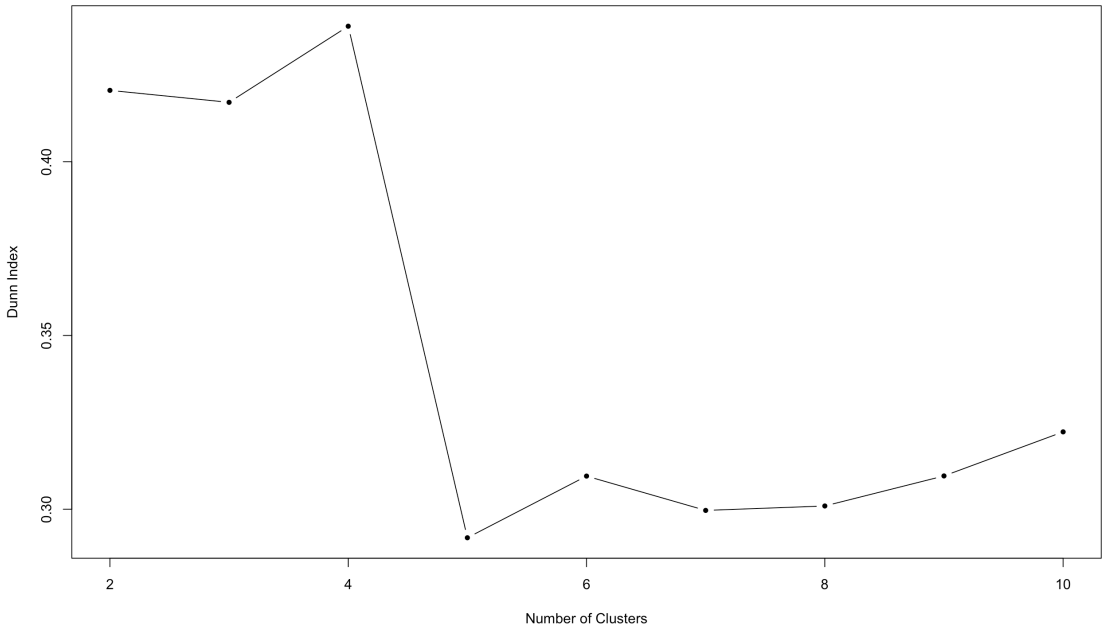


Figure E.1: Results of the Dunn Index for the 2015 symbolic data set

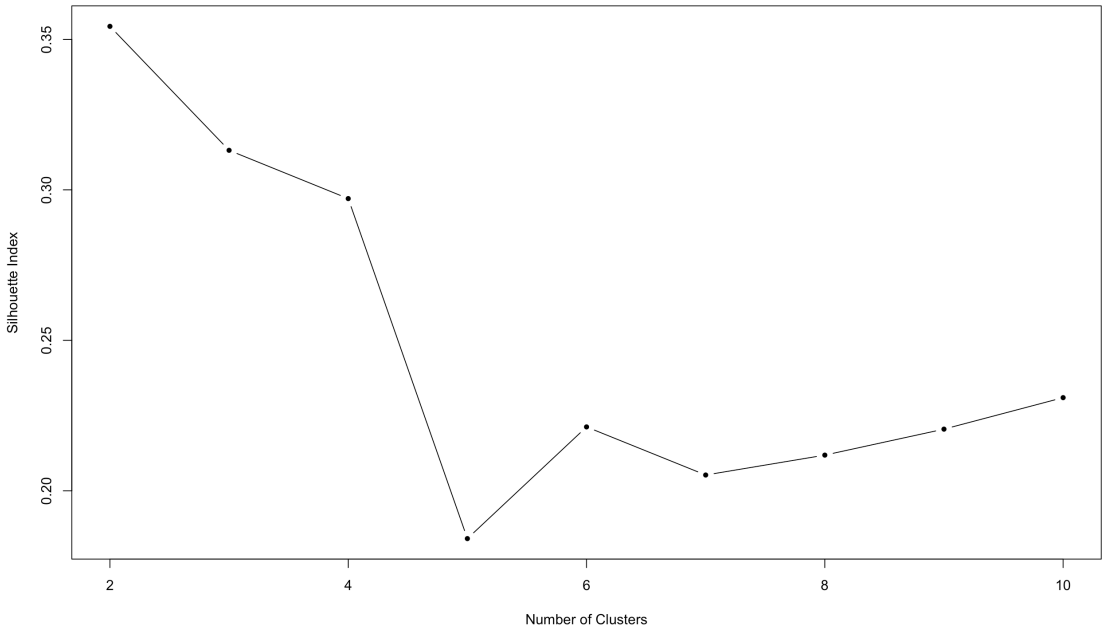


Figure E.2: Results of the Silhouette Index for the 2015 symbolic data set

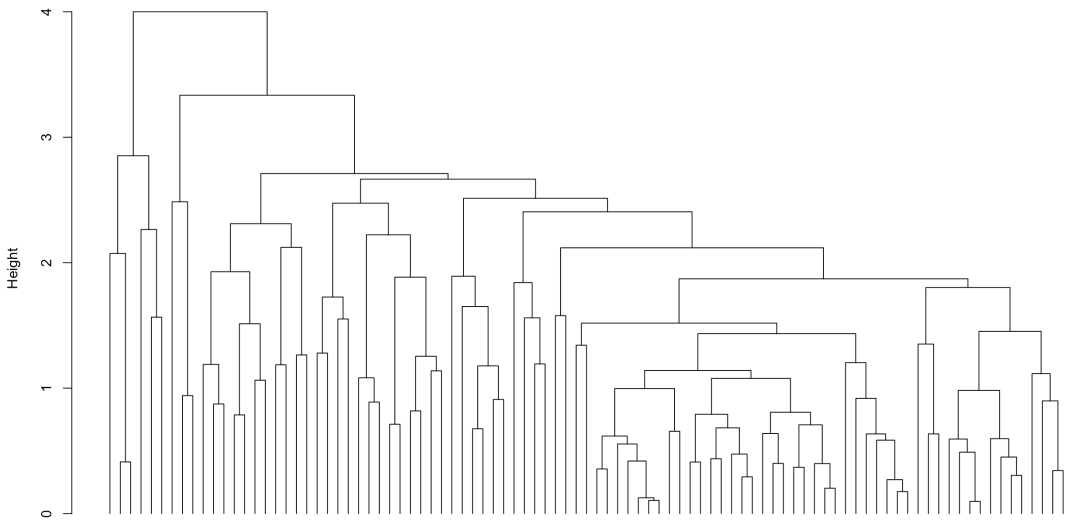


Figure E.3: Complete Linkage Method Dendrogram for the 2015 symbolic data set

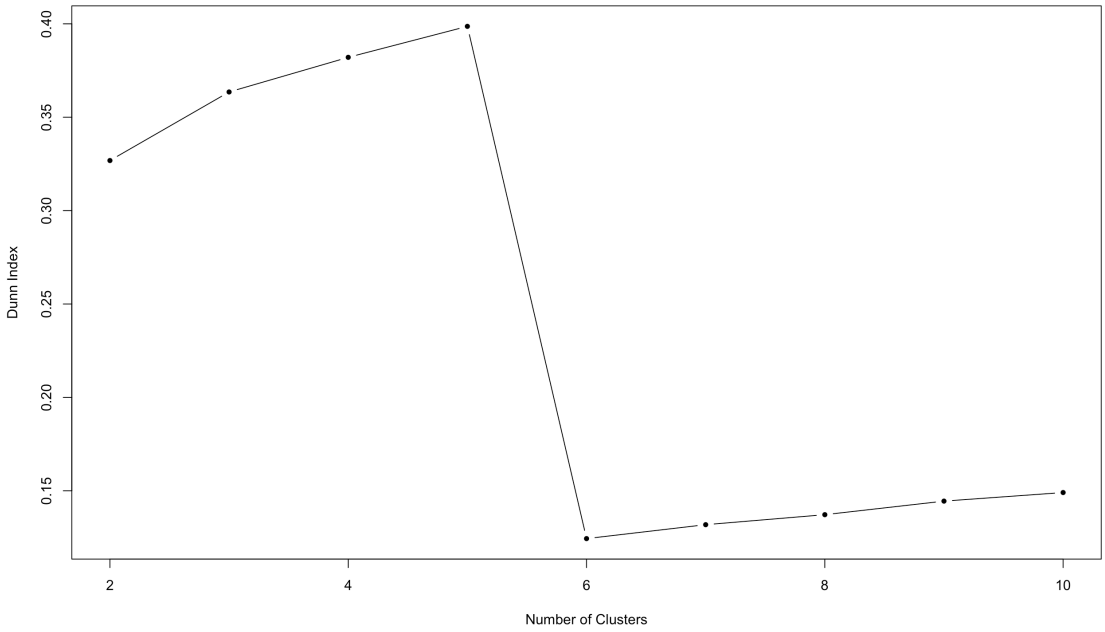


Figure E.4: Results of the Dunn Index for the 2020 symbolic data set

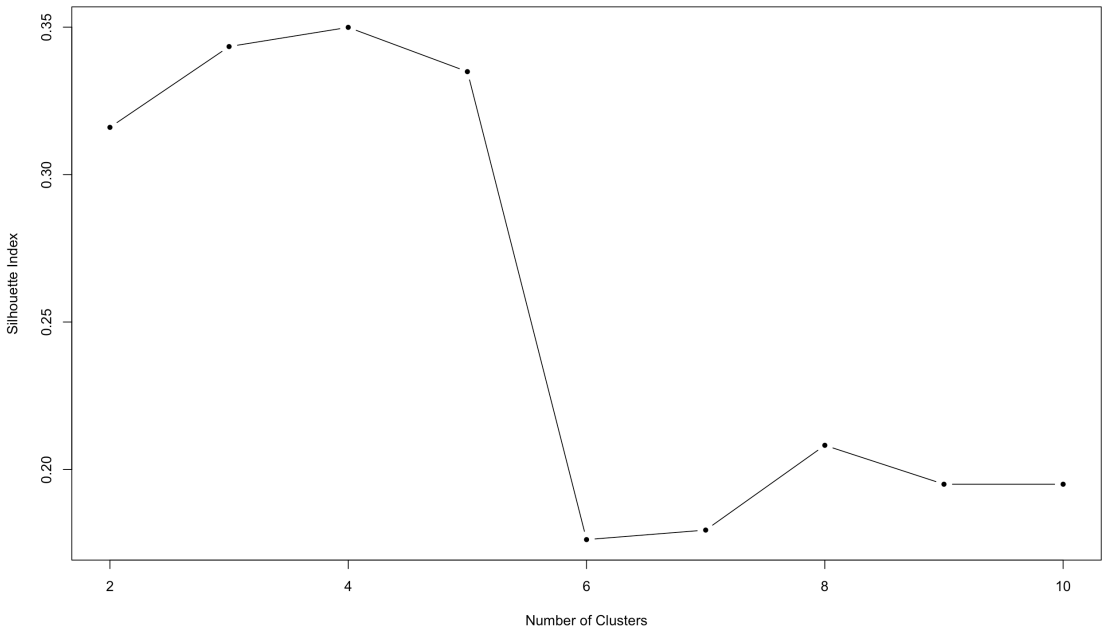


Figure E.5: Results of the Silhouette Index for the 2020 symbolic data set

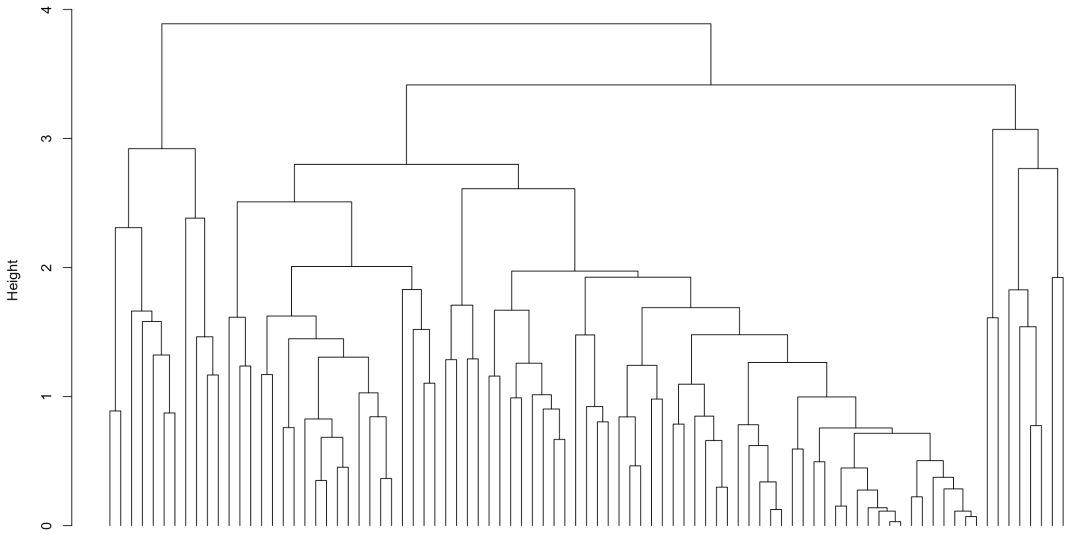


Figure E.6: Complete Linkage Method Dendrogram for the 2020 symbolic data set

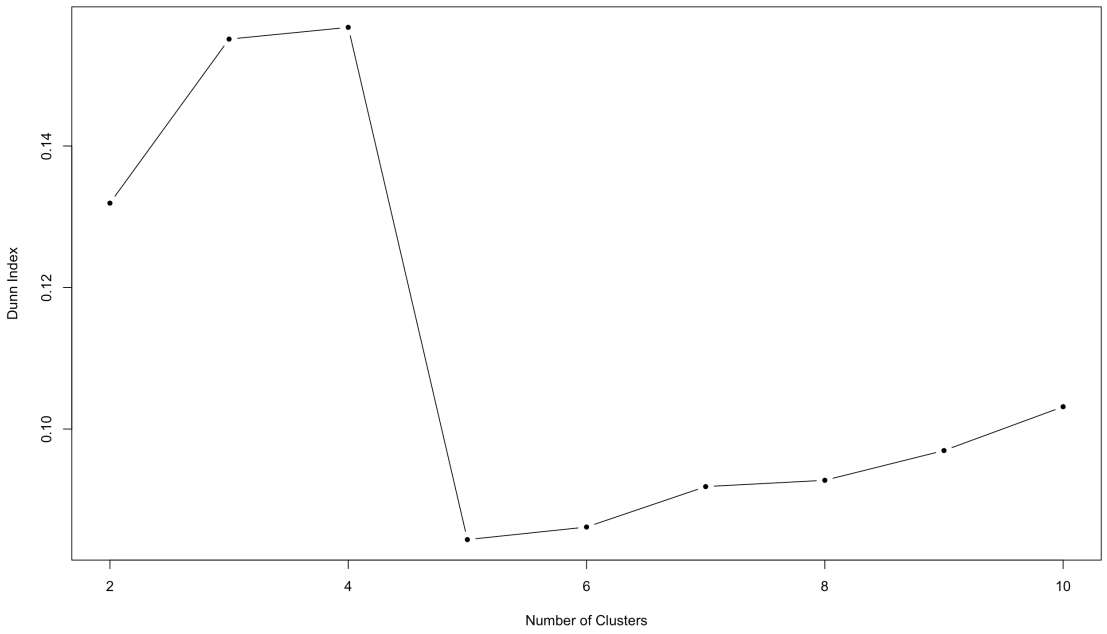


Figure E.7: Results of the Dunn Index for the 2023 symbolic data set

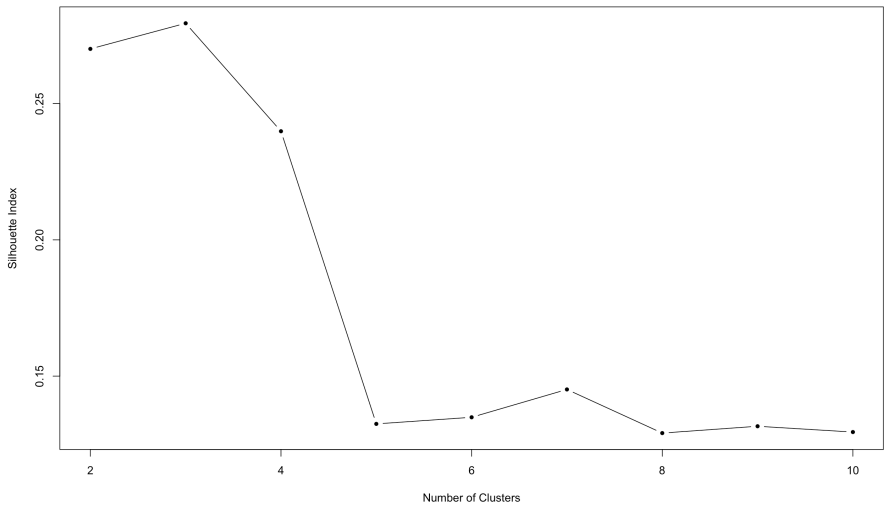


Figure E.8: Results of the Silhouette Index for the 2023 symbolic data set

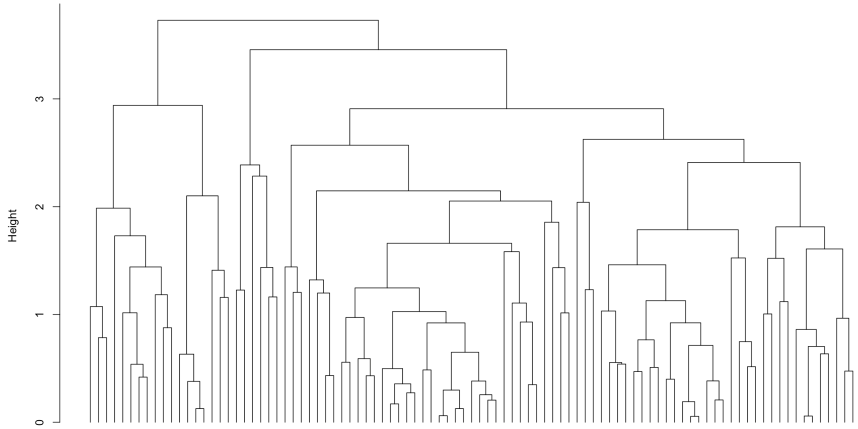


Figure E.9: Complete Linkage Method Dendrogram for the 2023 symbolic data set

Appendix F

MEC Framework Results

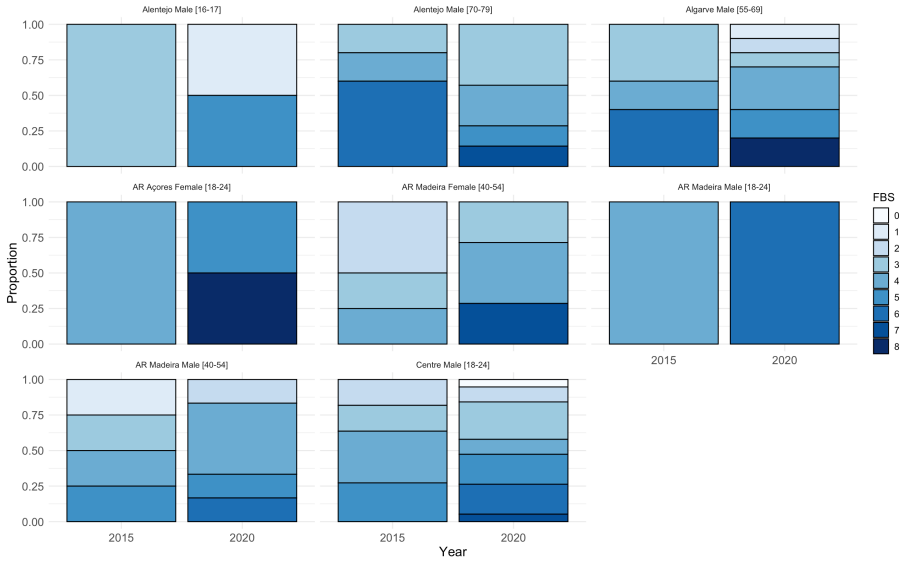


Figure F.1: Financial Behavior Score variation between $C_1(2015)$ and $C_1(2020)$

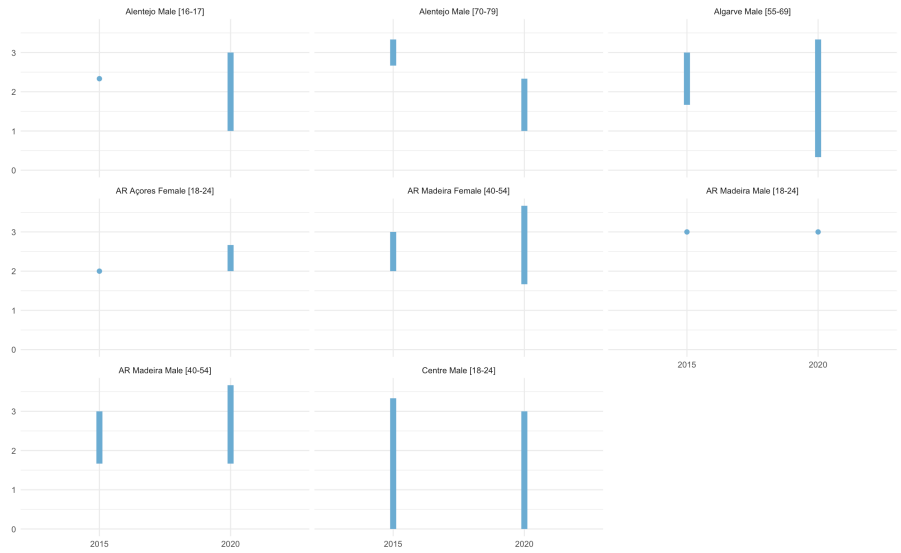


Figure F.2: Financial Attitude Score variation between $C_1(2015)$ and $C_1(2020)$

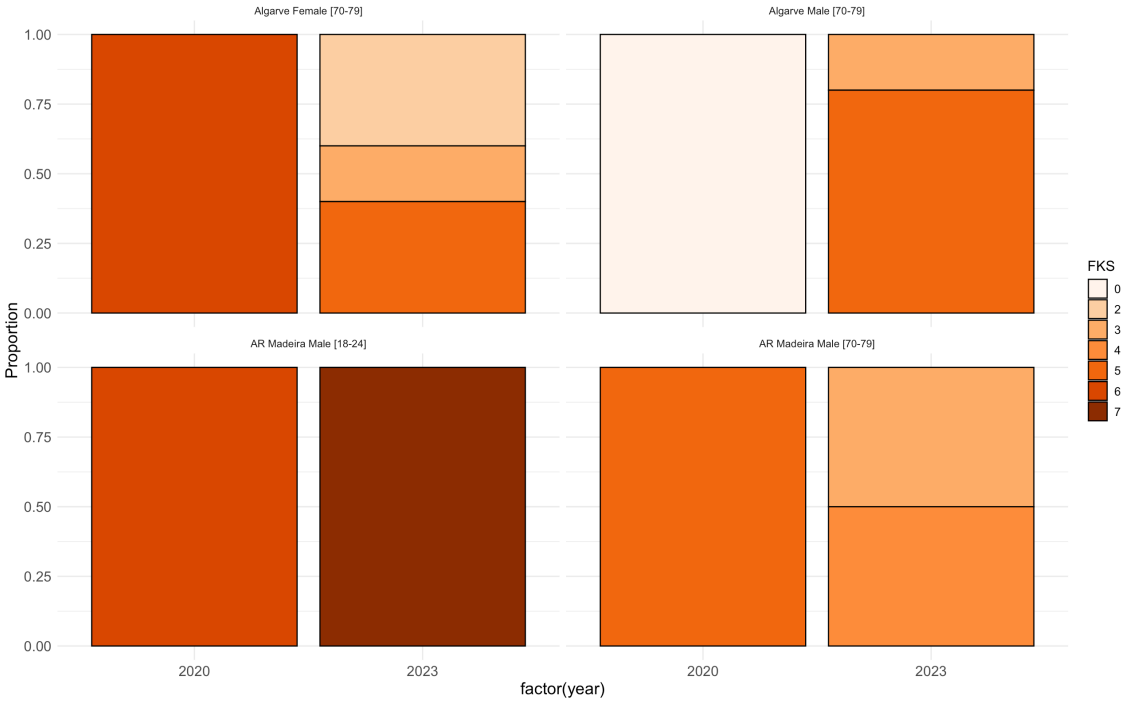


Figure F.3: Financial Knowledge Score variation between $C_2(2020)$ and $C_1(2023)$

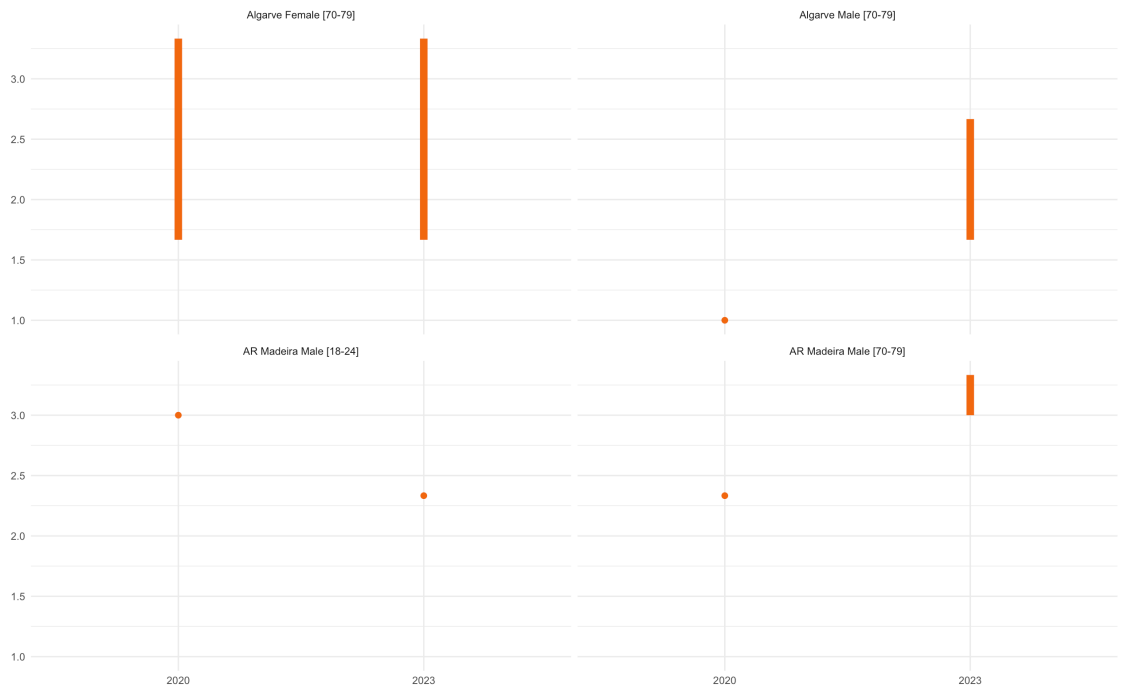


Figure F.4: Financial Attitude Score variation between $C_2(2020)$ and $C_1(2023)$

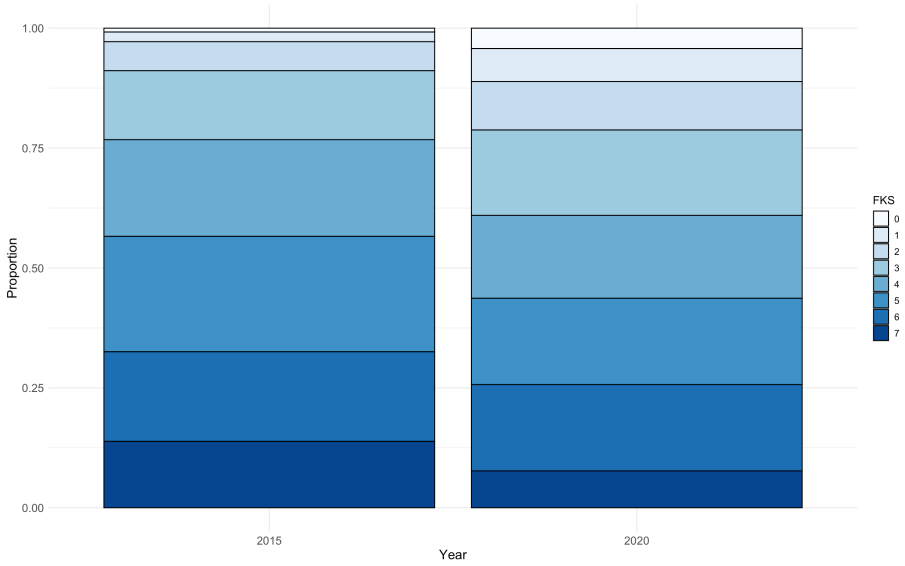


Figure F.5: Financial Knowledge Score variation between $C_2(2015)$ and $C_1(2020)$

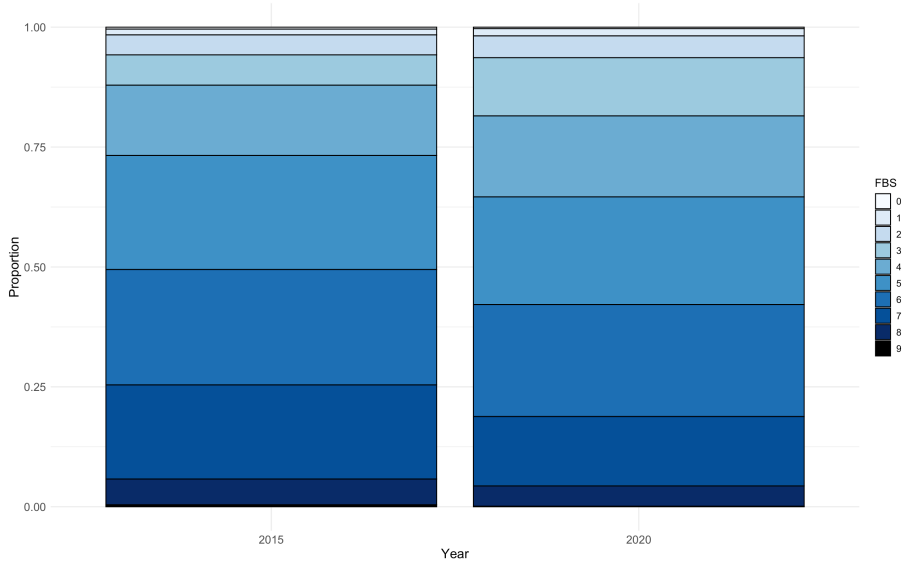


Figure F.6: Financial Behavior Score variation between $C_2(2015)$ and $C_1(2020)$

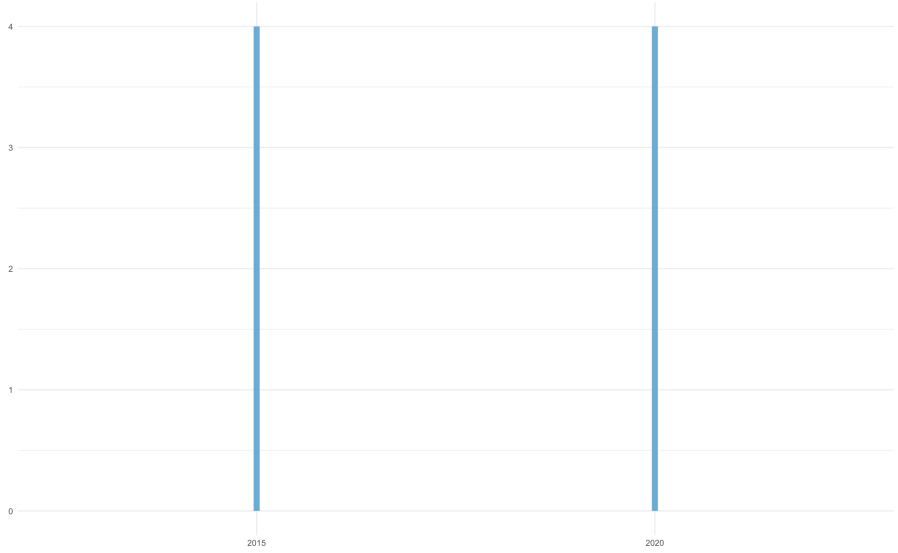


Figure F.7: Financial Attitude Score variation between $C_2(2015)$ and $C_1(2020)$

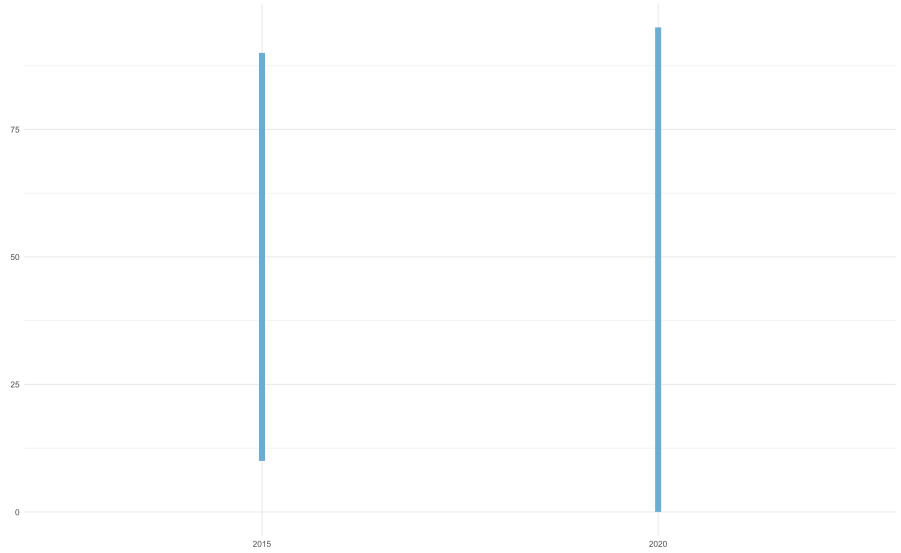


Figure F.8: Global Financial Literacy Index variation between $C_2(2015)$ and $C_1(2020)$

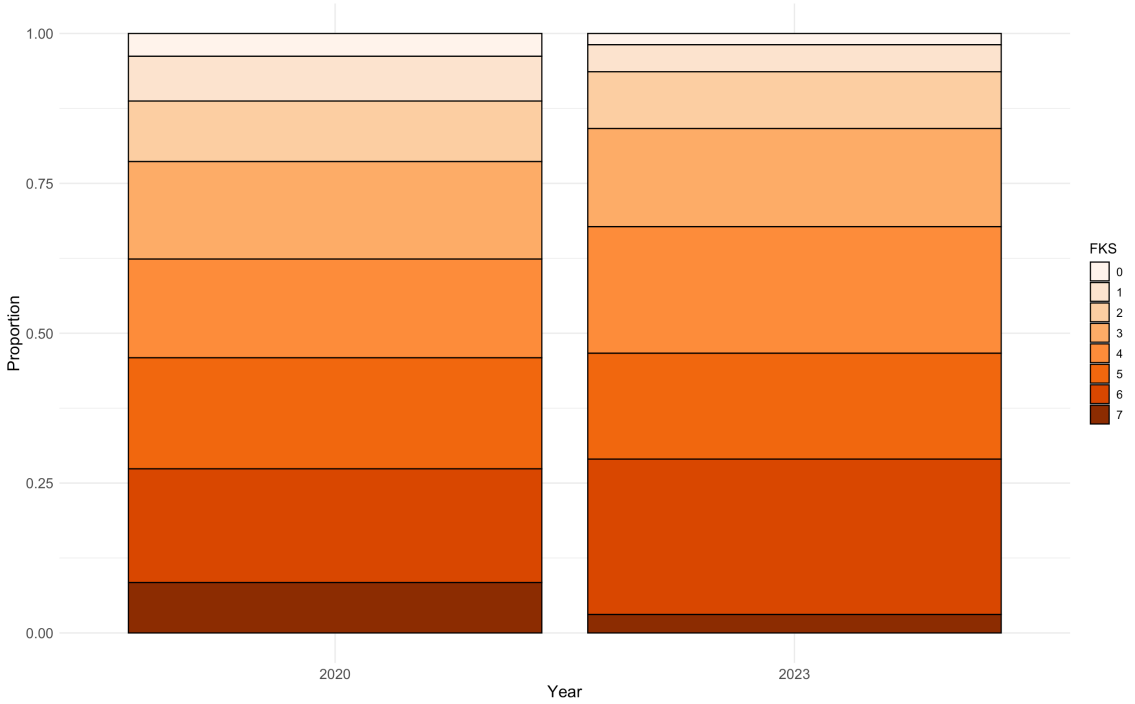


Figure F.9: Financial Knowledge Score variation between $C_1(2020)$ and $C_1(2023)$

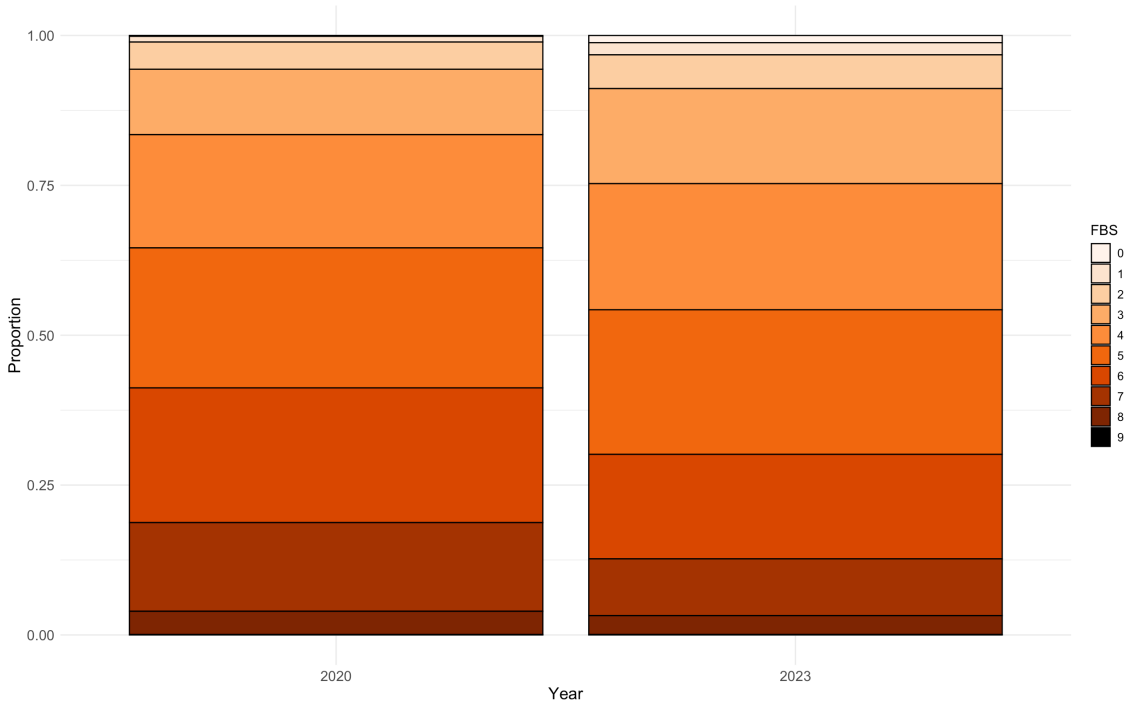


Figure F.10: Financial Behavior Score variation between $C_1(2020)$ and $C_1(2023)$

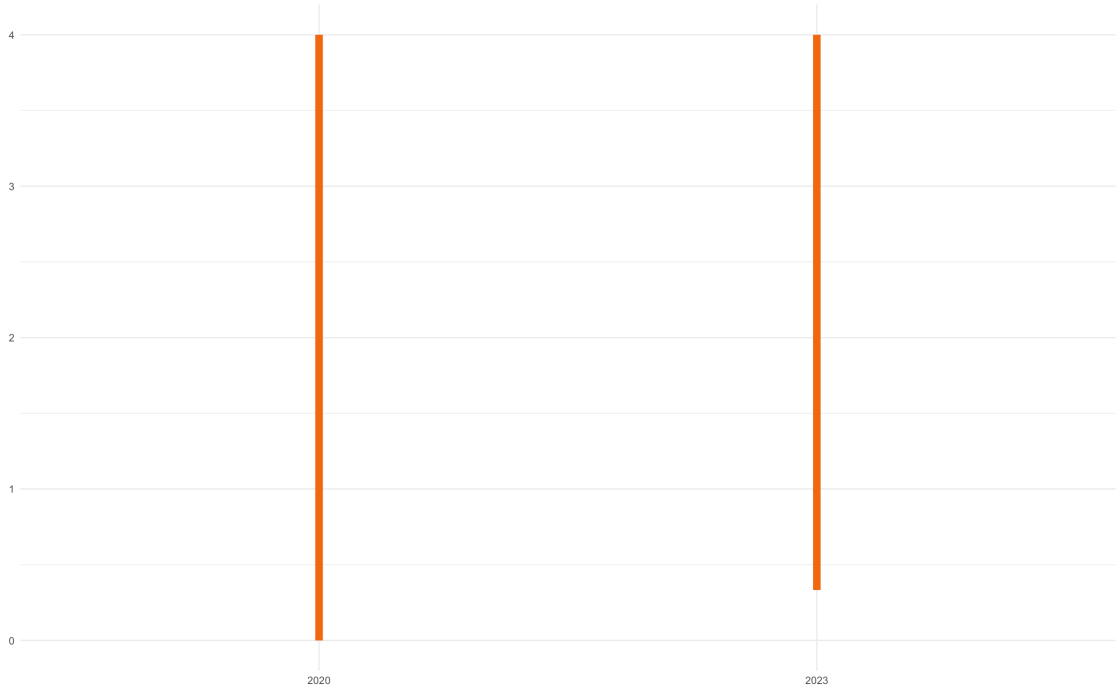


Figure F.11: Financial Attitude Score variation between $C_1(2020)$ and $C_1(2023)$

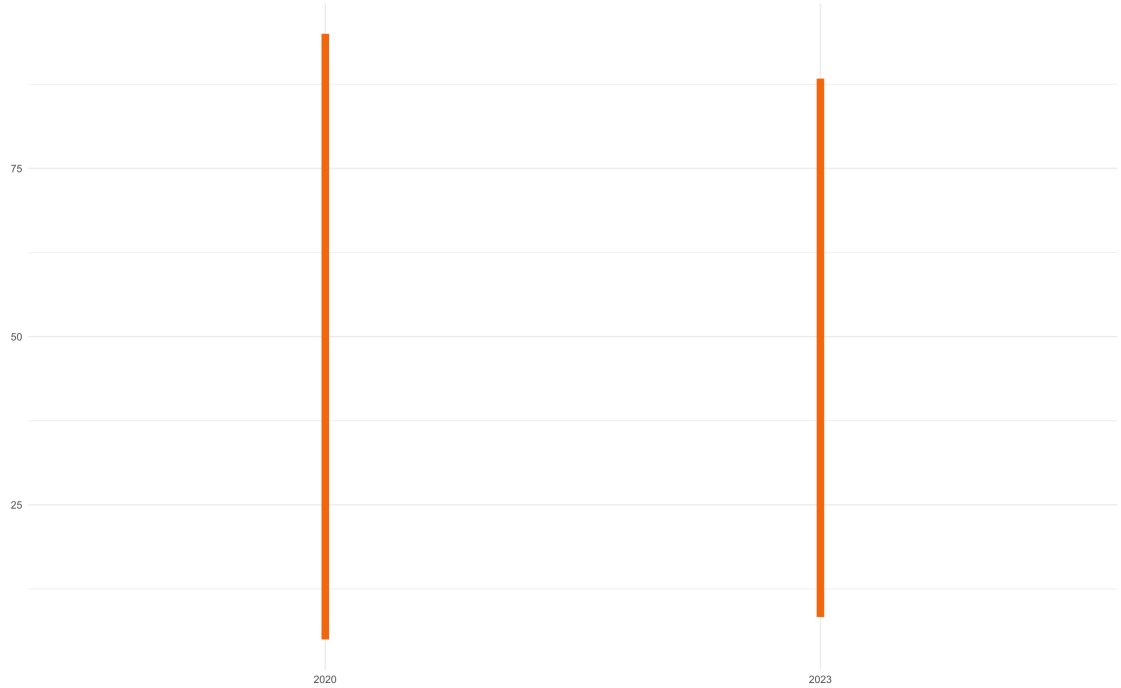


Figure F.12: Global Financial Literacy Index variation between $C_1(2020)$ and $C_1(2023)$