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Final Thesis

Retirement expectations of older workers in Europe.

What can microdata tell us?

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Abstract

In the last decades, several European countries have reformed deeply their pension system with the objective of enhancing their financial sustainability. As a consequence, the responsibility for pension adequacy was mainly shifted from the governments to the workers, who nowadays have to plan their retirement in advance and recur to investment products on the private market. Individuals' expectations about retirement can lead to efficient planning only if individuals are aware of the pension system characteristics and their expectations correspond with the economic choice eventually adopted. The research aims to present the information contained in the retirement expectations of older workers collected in the Survey of Health, Ageing and Retirement in Europe. The sample used in the analysis is representative of the population of workers aged 50-65 and living in 9 countries, allowing a European cross-country perspective. Indeed, the analysis shows to what extent individuals' expectations about retirement are affected by actual characteristics of the Social Security system and, in addition, to what extent retirement age and replacement rate expectations align with their subsequent realizations.

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I.   Introduction

Pensions and Social Security systems are one of the most relevant expenditure items of the government budget, especially in Europe. For instance, in 2006, public expenditure in pensions represented around 11% of the GDP of the European Union, while in 2015 it reached almost 13% (Eurostat, 2020). The 2018 Ageing report released by the European Commission gives estimations on the European Union most relevant demographic and macroeconomic factors for the period 2009-2060 (Eurostat, 2018). The projections show a substantial reduction in the share of the working-age population and an increase in the number of the elderly, leading to a doubling in the old-age dependency ratio. The dependency ratio is computed by dividing the total number of people aged 65 or above relative to the working-age population aged 15-64, over the period considered. Therefore, the steady ageing process and the decreasing fertility rate of recent years have led policymakers to prioritize pension policy strategies to avoid an explosive rise of government spending on Social Security programs. The main changes introduced by those reforms have impacted accessibility conditions for pension schemes, increased retirement ages, attenuated the system generosity and eventually, shifted a substantial part of the risk and responsibility for an adequate pension to individuals and private households. Nowadays, it is more and more crucial for workers to plan accurately their retirement by recurring to investment products and saving solutions offered by the private market. Therefore, planning is an essential action that workers need to undertake to maximize benefits received from the public programs and eventually integrate with other non-mandatory pension plans. In turn, the individual's plans for retirement are necessarily based on expectations about the timing of their retirement and the benefit perceived through the public pension program they are entitled to. To test the grounds upon which the individual's retirement planning is based, the following thesis aims to expose the information contained in the individuals' retirement expectations of older European workers. Data are extracted from the SHARE survey, a cross-country longitudinal dataset based on a representative sample of the European population aged over 50 years old. Data gathered range from demographical variables to information on health, socio-economic status, social and family network of older European

population. In particular, this thesis has focused on retirement expectations of older Europeans belonging to nine different countries, namely Austria, Sweden, Germany, Spain, Italy, France, Denmark, Switzerland and Belgium, and considering waves of the SHARE survey from the 1_{st} to the 6_{th}. Therefore, the period analyzed corresponds for wave 1 to 2004-2005, for wave 2 to 2006-2007, for wave 4 to 2011, for wave 5 to 2013 and for wave 6 to 2015.

The analysis carried out in the thesis is composed of two different parts, the first concerning the relationship between retirement expectations and pension reforms, and the second regarding the alignment between retirement expectations and realizations.

Specifically, the first section of the thesis relates to a sample of Europeans employee workers, aged between 50 and 65 years old and aims to explain whether and to what extent individuals' expectations about retirement age vary with changes in the statutory retirement ages in the old-age and early retirement public pension schemes. As said, the analysis is focused uniquely on expectations regarding first pillar pension schemes, since they are the most common Social Security programs among EU countries to grant an adequate standard of living to the elderly populations. Moreover, retirement arrangements related to second and third pension pillars are characterized by level and coverage that vary significantly by country. For this reason, we chose to limit the analysis to provision of first pillars public pension programs only, thus old-age and early retirement schemes rules. To conduct the analysis, information on Social Security system rules in place in European countries have been drawn from the MISSOC project, a multi-dimensional and cross-country database reporting national system rules on different Social Security matters, including all regulations related to retirement programs. Overall, the relevance of this analysis is to understand whether individuals develop retirement expectations taking into account the actual rules governing pension schemes. Europe proposes an interesting laboratory in this respect in view of the different pension systems at work in the European countries and the reforms they have undertaken at different timings, which generates cross-country and time-varying heterogeneity in pension system rules.

The second section of the thesis is instead focused on the assessment of the relationship between retirement expectations and retirement realizations. The sample used through the analysis is composed of all individual workers aged between 50 and 65 years old in wave 1 to wave 5, who, by the time of wave 6, become retired. The objective of the analysis is to evaluate the correlation existing between the individual's actual age of retirement and replacement rate on the corresponding expectations collected when they were still at work. The retirement replacement rate is defined as the percentage of the individual's annual employment income that is replaced by retirement income when the individual retires.

This part of the analysis is aimed at understanding whether retirement expectations are predictors of the realized outcomes and then whether the actual retirement behavior individuals undertake when retiring from the labor market aligns with their beliefs collected when working. Indeed, a necessary condition to develop an effective retirement planning is the consistency between expected and actual retirement behavior. If individuals have expectations about the timing of retirement and the replacement rate who mismatch with the actual outcomes, this might threaten the efficacy of their retirement planning and, for instance, of their saving decisions to finance their retirement years.

Overall, this thesis relates to the literature that analyzed the role of retirement expectations with regard to, on one side, the knowledge of Social Security provisions, and on the other to the actual retirement choice. The relationship between expectations and awareness of Social Security rules is analyzed in the works of Gustman & Steinmeier (2005) with regard to the US population, while, for Europe, Knell et al. (2015) studied the Austrian case and both Baldini et al. (2019) and Bottazzi et al. (2006) analyzed the development of individuals' expectations in the Italian context exploiting the reforms introduced in the last decade of the previous century. Unlike these papers, which focus on a single country and analyze the determinants of the mismatch between retirement expectations and pension rules, the first part of this thesis exploits the cross-country and time variation in our data to investigate how retirement age expectations of workers reacts to changes in the age eligibility rules set by the Social Security systems, once controlling for an extensive set of individual and household characteristics.

The second part of this thesis mainly refers to the literature investigating the relationship between retirement expectations and realizations or the determinants of the discrepancies between them. In this framework, expectations about the age of retirement are treated in the works of Bernheim (1989), Benitez-Silva & Dwyer (2005) and Ho and Raymo (2009) which investigated the expectations behavior across the US population, while the work of Disney & Tanner (1999) refers to a UK sample. Few academic works have tried to shed some light on the determinants and the accuracy of pension benefit expectations, like those of Bernheim (1987) and Mastrogiacomo (2003), respectively analyzing the US and the Italian contexts. The second part of this thesis follows the approach used by Disney and Tanner (1999) that uses reduced form regressions to assess how actual retirement outcomes of individuals are affected by changes in retirement expectations. Likewise Disney and Tanner (1999), this thesis considers the relationship between realizations and expectations for retirement age but it also extends the analysis to consider the replacement rate as additional retirement outcome. Since the replacement rate is a key-indicator for pension wealth and retirement planning efficacy, it is important to understand the link between realizations and expectations in a unified framework also in this respect. The nature of our dataset proposes as an important characteristic to address this research question since the variability in realization and outcomes reflects, on top of individual characteristics, cross-country and temporal heterogeneity that is important for the identification of the coefficients of interest.

This thesis is organized as follows. Chapter 2 is devoted to an overview of European pension reforms over the period 2004-2015 (paragraph 2.1), as well as the literature review about previous findings on the role of retirement planning (paragraph 2.2) and retirement expectations (paragraph 2.3). Following, chapter 3 presents the SHARE project and the dataset used (paragraph 3.1), the analysis and the main evidence obtained about the relationship between retirement expectations and statutory provisions (paragraph 3.2) and the relationship between expected and realized values of retirement age (paragraph 3.3) and retirement replacement rate (paragraph 3.4). The last section, chapter 4, discusses the main conclusions of the analysis carried out.

II.   Pension reforms, retirement planning and expectations

2.1.   Pension Reforms

Pension systems all over the world have undergone major changes in the last decades, especially in Europe, where Social Security systems have been traditionally very generous. In the last decades, reforming pension looms large over the policy agenda of many European countries due to the financial effects of increasing longevity and low fertility rates that characterize the developed world.

For what Europe is concerned, life expectancy grew rapidly in the last century (*see Figure 1*), with persistent significant differences among member states (Börsch-Supan, et al., 2005). For instance, a Danish newborn girl is expected to live almost four years less than her Swiss and Italian peers, and this difference persists almost as much between Denmark and Sweden. Likewise, a Swedish newborn boy has a life expectancy of almost three years longer than his Belgian counterpart (Börsch-Supan, et al., 2005).

Another European demographical issue to consider is the fertility rate. Indeed, the EU total fertility rate dropped from the mid-1960 until the end of the century, being roughly constant for the last two decades (*see Figure 2*). Given the fact a total fertility rate around 2.1 is considered the best replacement rate to keep developed countries' population stable, the 2015 value of 1.57 is far from the target (Eurostat, 2017). Despite the general trend, a substantial difference in fertility rates by country can be assessed, with the Mediterranean countries and Germany having very low fertility, while France, Belgium, the Netherlands and the Scandinavian countries having relatively high birth rates. For instance, Greece, Italy and Spain are considered to be low fertility countries, with a rate varying from 1.27 to 1.29 per woman, while Sweden, Denmark, the Netherlands and France have a high fertility rate, ranging from a minimum rate of 1.75 to 1.89 (Börsch-Supan, et al., 2005).

Figure 1: Life Expectancy at birth - European countries
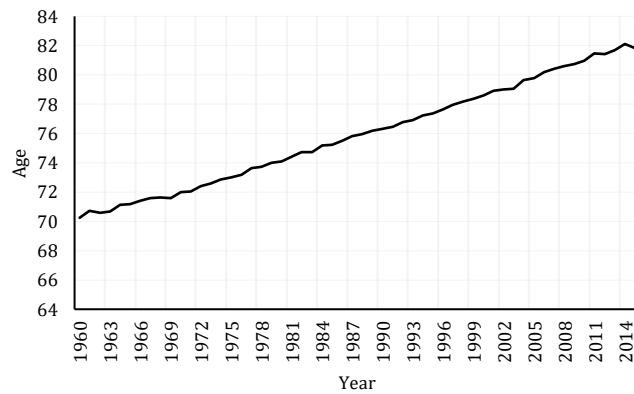
Source: (World Bank data, 2020)

Figure 2: Total fertility rate (births per woman) – European countries
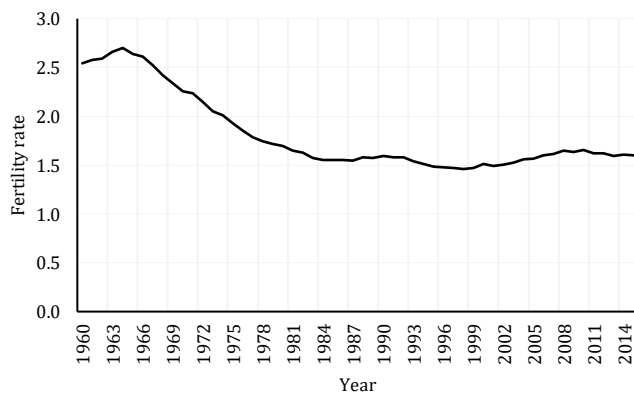
Source: (World Bank data, 2017)

The combination of both these demographical changes impacted strongly the age structure of the population, which is increasingly constituted by a relevant share of older persons and a declining share of persons in non-working-age, a situation potentially risky for the sustainability of pay-as-you-go pension systems[1]. In particular, because the shrinking future working-age population has to sustain the pension levels for an increasing number of elderly people, traditional pension systems have become especially burdensome to maintain in the long run. Besides, as a consequence of population ageing, public spending on pension programs have

[1] A system in which retirement benefits provided by the state to retired population are financed by contributions levied from current workers.

systematically expanded. For instance, public expenditure on old-age pensions and survivors' benefits in the OECD countries have grown, on average, from 6.7% of GDP in 2000 to 8.2% of GDP in 2013. Moreover, in 2013, countries with the highest spending were found in continental Europe, topped by Greece (with 17.4% of GDP) followed by Italy (at 16.3% of GDP), Austria, France and Portugal (at about 13% to 14% of GDP) (OECD, 2017). A further social change is given by the combined effect of population ageing and higher life expectancy: to balance out their different impacts on pensions, longer working life are required. Instead, the average length of a working career has been stable, therefore making retirement phase extremely extended and far more expensive to sustain from the point of view of the pension provider. For instance, the average rate of employment between the ages of 55 and 64 in the OECD countries in 2015 was 48%, varying from 25% or less in France and Belgium to 70% in Switzerland (OECD, 2005). The excessive spending, caused by all factors described above along with the deep economic crisis and its prolonged aftermath, has caused the prioritization of pension reform in the economic agenda of many countries. The reforms carried out in the last two decades combined, on one hand, the state's need to contain future costs and to improve the financial sustainability of the pension system, and on the other hand, the need to preserve pension adequacy and to protect the potentially exposed category of elderly people.

More specifically, starting from the early 2000s, many Europeans countries have implemented pension reforms with different extent and deepness. Some countries undertook a deep process of reforms that overhauled their system, while others maintained their structure only modifying some parameters or adding new rules. In some cases, pension reforms required a net passage from the old to the new rules. Although this is possible, in most of the cases new pension provisions were implemented differently across population cohorts, impacting younger and less experienced workers more than people closer to retirement. In addition, some pension rules can be specifically addressed to one market sector or to a specific category of workers, while other rules are more comprehensive and impact equally all workers.

One of the most common features of recent European reforms is the increase in retirement pensionable age, especially with regard to old-age pension, as done by

Germany, France and Italy. For instance, in November 2006 the German Federal Cabinet decided on the adjustment of the standard retirement age to demographic development, approving a gradual increase of the standard retirement age between 65 and 67 years old to be achieved in the period 2012-2029 (MISSOC, 2019); in a similar way, in France, according to the 2011 pension reform, minimum pensionable ages were set, from the age of 62 in 2013, to rise, irrespective of any individual contribution conditions, to 67 years by 2022 (OECD, 2013); likewise, in Italy, by the reform of 2012, the age at which both gender started drawing an old-age pension was set to reach age 67 by 2021, a significant hike especially for the female population who, until 2010, retired at 60, while men retired at 65. (OECD, 2013) (MISSOC, 2019). By making people work longer, states collect more taxes and contributions from the active population while saving the pension expenditures from the extra years of work demanded by the reform. Occasionally, the rise of pensionable age concerned only women, as the measures implemented were finalized to reconcile age retirement conditions for both genders. For Eu countries, this practice is also consistent with the 1978 EC directive n° 79/7 (Council of the European Union, 1978), which requires the progressive implementation of equal treatment between men and women in social security matters. While some countries as Belgium and others are remedying their gender pension gap on age during the period 2004-2015, Austria has planned to join the group only in 2033, due to the provisions of a reform adopted prior to 2004. Based on current legislation, along with other OECD members, the only European country among those analyzed to maintain a lower pensionable age for women is Switzerland (OECD, 2019).

Other than increasing retirement old-age threshold, a more indirect way to rise pensionable age is by linkage of the retirement age to life expectancy, so that no further pension reforms will be necessary to adjust the system with respect to the consequence of a growing life expectancy. This type of measure has been introduced in Italy, Denmark, Germany and also in Finland, the Netherlands and Portugal, but its material effect on retirement outcomes depends on the formula prescribed by each country (OECD, 2019) (Martin & Whitehouse, 2008). Lastly, retirement age can also be modified by altering the condition on the period of contribution needed to

be entitled to an old-age pension, as happened in Spain, France and Sweden, where reforms have increased the number of years of contributions required to receive a full pension, thus restricting the condition to access retirement (Martin & Whitehouse, 2008) (OECD, 2015).

It should be noticed that old-age pension regime is not the only one modified during the last two decades, many countries have indeed also tightened or discouraged the access to early retirement schemes and closed down special regimes of retirement (as regimes for certain sectors or professions). In Denmark, the access to the early retirement scheme has been scaled back since January 2006, while in other countries including Austria, Germany and Italy, penalties for exiting the workforce before the standard early retirement age have been introduced. Differently, Spain has increased the bonus paid to people retiring after the normal pensionable age. (Martin & Whitehouse, 2008). Incentives to encourage people to work longer can be implemented in many different ways: they can be received via tax discount payment, as it happens in Sweden, or can be simply the results of a new law directly affecting labor market for older people (as the measures to ensure older workers retain their employment status and/or they are not discriminated against on the job market) (OECD, 2013). Regardless it is penalties or incentives that are introduced, in both cases, the main purpose of these kinds of provisions is to induce people to stay longer in the workforce and retire later.

Another major change of paradigm introduced by recent pension reforms has been the passage from a Defined Benefit system (DB) to a Defined Contribution (DC) or to a Notional Defined Contribution pension system (NDC). Defined benefit plans are sponsored by the public sector in most of the OECD countries, but they can also be provided by the corporate employer due to a mandatory or quasi mandatory formula, as happens in Switzerland (OECD, 2013). Defined benefit systems guarantee a set retirement income, generally as a function of individual salary and contribution period. Differently from DB, in DC system the pension earned depends on the amount of contributions and interests earned on them during the working life of the individual. DC plans are a step towards personalized pension since they account for the relationship between individual lifetime contributions and final benefit perceived. Where the system mimics the principles governing DC but it still

relies on a pay-as-you-go basis, the system is called NDC: for instance, Italy has applied a NDC system in full to labor-market entrants from 1996 onwards, while Sweden adopted a partial NDC system thanks to the 1999 pension reform (OECD, 2005) (OECD, 2013). DC schemes can be private or public, and they can have either a compulsory or voluntary nature. Overall, the shift from a DB to a DC scheme means that more of the risk on pension is shifted from the employer/public administration to the workers, who differently from before, bears more risks than in traditional DB system.

Overall, pension reforms of the last decades have instituted numerous typologies of retirement-income systems, which are often summarized according to the World Bank's classification (World Bank, 1994). This frequently used typology differentiates pensions according to three pillars. The first pillar corresponds to pension schemes designed to provide minimum standard of living to elderly people. These pensions are mandatory and generally paid by the public administration with the objective to grant pension adequacy. The second pillar is represented by savings solutions created to achieve some targeted standard of living in retirement with respect to the one held during the working life. These pension schemes can be classified by provider (public or private) and they can be either mandatory, quasi-mandatory or voluntary. The last pillar includes instead all forms of voluntary provisions, be it individual or employer provided.

The development of such pillars is specific to each country, which constitute their national pension system on the basis on different type of retirement schemes. Risks related to economic trends and financial markets vary by each pension pillars and also by retirement programs. However, pension schemes related to first pillar tend to be less risky than second and third pillar pension programs, because they are provided mainly by public authorities and interests earned on contributions is often set on previously decided variable, for instance to GDP growth rate (Antichi, 2015) (OECD, 2005). On the opposite, third pillar programs, based on worker savings, bears inevitably a higher degree of risk: individuals need to manage their financial assets being exposed to the risks involved in choosing the appropriate solution onto the financial market, thus facing investment and inflation risk. In addition, as a result of the shift toward DC pension scheme and the empowerment of second and third

pillars pension programs, public authorities are gradually transferring risks to individual workers and private subjects. Risk related to investment, inflation and individuals' longevity, traditionally handled by public administration, nowadays has shifted on the shoulder of individuals, household or private entities.

The increasing shift to DC[2] pension schemes is causing not only a general reconfiguration of traditional risk owners, but it is also affecting the final payout of pension. In other words, resulting benefits are often lower, due to the new calculation method and the linkage to life expectancy measures (because the accumulation of contributions and investment returns is usually converted into a pension-income stream using a formula based on life expectancy). DC and hybrid schemes (programs containing both DB and DC elements) make it also necessary to start saving earlier than in traditional system because of the functioning of the compound interest. Despite the existence of different applications of the DC principles, the passage from DB to DC schemes is common in many countries: in 2013, 10 OECD countries had a compulsory DC scheme (OECD, 2013). Moreover, in some Social Security systems, shifting to DC benefit schemes allows members to make their own investment decisions. The wider choice given to workers will let them take into consideration their own individual risk profiles and investment preferences, thus personalizing even further their pension account. The range of choices, however, varies significantly by country. Some countries allow a complete range of investments to be selected (for example, the US), whilst in other countries there is more control, as happens in Sweden, where it is possible to choose the asset manager and the preferred portfolio, or as happens in Hungary, where it is possible to choose just the asset manager (OECD, 2005).

Changes in benefit pension are not always as evident as a shift in retirement age. Other than reforming the benefit calculation formula, a particularly frequent measure adopted with the intent to improve long term financial sustainability of the pension system is the variation of the indexation mechanism. Since pension payments are uprated by a combination of index based on wage growth or inflation, it is easy to change the final amount of pension benefit just modifying the adjustment

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2 Including in this category also hybrid pension systems and NDC systems

of the index. New rules on indexation moved in different direction, according to the needs of the countries and the economic situation faced: for example, in a post pension reform situation, Germany increased the index adjustments, while Austria and other EU countries have frozen adjustment for all but the lowest earners to contain budget pressure (OECD, 2015) (Martin & Whitehouse, 2008).

In conclusion, in the period between 2000 and 2015 many Europeans countries have started to review and adjust their pension system in order to make them financially sustainable, given the ongoing process of population ageing. In some cases, reforms have been concluded, while in other cases, provisions will be applied only to future cohorts. With the intent of limiting public future expenditure on pension benefit, countries have generally strengthened the condition for retirement eligibility, raised the standard age of retirement and lowered the benefit perceived by different means. Even though reforms have configured diverse retirement income system with diverse programs, it is possible to categorize pension schemes into three different tiers: a first group of "publicly managed system with mandatory participation and the limited goal of reducing poverty among the old", which is named as first pillar pension; "a privately managed mandatory saving system", constituting the second pillar, and eventually the part of "voluntary savings" as the third pillar (World Bank, 1994). All EU pension reforms that took place during the period 2000-2015, tried, directly or indirectly, to shift the focus from the public to the individual sphere, allocating much more importance on second and third pillars than ever before. Reforms across Europe enhanced the role of private pension in providing pension income in the future, sometimes introducing mandatory private pension as a substitute for part of public retirement income provisions, like in Sweden, or explicitly declaring public pension cuts must be offset by private initiative to balance the effect on future retirement income, like in Germany (Martin & Whitehouse, 2008). Especially in countries where pension reforms were deep and where new provisions granted small public pensions, individuals will need to make an extra, voluntary, private saving plan in order to ensure that their living standard does not decline sharply as they enter retirement. In order to smooth this transition and oversee the private market, several countries, as Switzerland in 2012 and Sweden in 2009, along with reforms, introduced new pension funds regulations

with the scope of encouraging prudent investment management and diversified portfolio(OECD, 2013). All in all, individual responsibility on pension matters will be central for future retirees, especially not to compromise their future pension adequacy.

2.2.   Retirement Planning

To face the challenges imposed by an ageing population and limitations given by the last financial crisis, many industrialized countries, in Europe and elsewhere, have started reforming their pension system during the first years of 2000s. The main changes introduced by those reforms have impacted accessibility conditions for pension schemes, increased retirement ages, attenuated the system generosity and eventually, shifted a substantial part of the risk and responsibility for an adequate pension to individuals and private household. As already mentioned, workers are more and more encouraged to resort to pension fund solutions, to invest in voluntary tax-advantaged schemes or to choose from different investment possibilities in order to manage their savings. As a consequence, researchers on the subject have long been interested in studying whether individuals are truly capable of making pension-related decisions that are in line with their best interests. To this purpose, research have focused their attention on retirement planning behavior, defined as the individual's attitude to think about timing and consumption of financial resources for the period of the pension and to act accordingly by getting information or undertaking precautionary actions. On one side, the discussion over the relevance of retirement planning is linked to academic research related to wealth accumulation issues and saving behavior studies, and, on the other side, to academic papers related to the individual's education and literacy level.

Traditional life-cycle models suggest that individuals plan their consumption and savings behavior over their entire life, specifically by saving during working-age and dissaving during older ages to maintain an overall constant level of consumption. Such models are based on the assumption that individuals are able to make saving

decisions basing their choice on informed guesses about their lifetime earnings and level of consumption. Despite their general validity, these theories have been criticized mainly because they disregarded the fact that planning for retirement is a complex task that many people perform only imperfectly. To plan adequately for retirement income, people need extensive information, as they must forecast their future retirement level of consumption and survival probability, they must be aware of rules governing Social Security and private pensions, and they may account for both future economic outlook and personal or family situations. In addition, since retirement is not a repeated event, it does not provide people the possibility to learn from their mistakes and there is no corrective mechanism that prevents workers from plan incorrectly for retirement. Consistently with the standard life-cycle principle, several factors explain why pre-retirement financial savings may be low: unexpected situations, as experiencing bad events or worsening of health conditions, may cause saving asset depletion. Other research support instead the view that low pre-retirement accumulations are caused mostly by the lack of planning actives. Indeed, if done properly, planning behavior is shown to play an important role in explaining the level of wealth holding pre-retirement (Lusardi, 2010).

Other empirical evidence confirms the assertion that retirement planning affects wealth accumulation: Lusardi and Mitchell conclude difference in savings are explained by planning behavior even when considering a sample composed of different cohorts (Lusardi & Mitchell, 2007), while Van Rooij et al. (2011) highlights the role of retirement planning as a channel by which financial literacy contributes to wealth cumulation. Specifically, the latter authors support the view according which financial literacy lowers the costs of collecting and processing information, hence it facilitates the development of retirement plans and consequently, the cumulation of a proper amount of savings. Supporting this view, they analyzed a Dutch dataset and found a net worth difference of 80,000€ between individuals being in the 75th versus the 25th percentiles of the literacy distribution (Van Rooij et al., 2011).

Planning activities demanded to the single are becoming particularly relevant considering the last decade changes to pension frameworks. As already mentioned, a second group of academic papers focused on the determinants of a correct planning attitude, emphasizing the role of financial literacy and the individual's education. Financial literacy is defined as the knowledge of basic financial concepts and the ability to combine relevant information to make sensible economic choices. Financial literacy enables individuals to be more aware of the possible retirement options and to take a more active role in arranging future retirement situations. Financially educated individuals can better evaluate the characteristics of different saving plans, perceive more truthfully the risks and responsibility to be beard and make savvier decisions on investment and asset allocation. In addition, financial education is needed not only to ensure retirement adequacy, but also, to narrow the gap between the desired retirement living standard and the one the individuals can actually afford. Particularly in lights of the new reforms, it will be central to individuals to be aware of the means to be employed to save enough to live retirement the manner they hoped for, once they stop working.

It may seem that the level of financial education required would vary according to the characteristics of the public system. For instance, a deeper level of understanding would seem necessary for pension systems where individual choice is involved at all levels and where public pensions provide only a limited income safety, whilst less intensive awareness may be deemed appropriate where individuals still rely on public pensions and do not have individual responsibility for investment choices. However, in lights of new pension reforms which reshaped welfare public system in almost all the developed countries, financial preparation should be considered increasingly crucial regardless of the country or system taken into consideration. Good level of financial literacy and education are needed to understand private pension plans and complex saving products, along with laws applying to highly legislated pension environments. For this reason, many research have assessed whether individuals are sufficiently knowledgeable to make rational decisions and to plan appropriately for retirement. To this extent, several studies have been carried out both on an international and national level. On a cross country level, Halser & Lusardi (2017) emphasize the potential influence that financial literacy has on the individual's financial behavior and decision-making. Indeed, the

authors find that individuals with a better understanding of financial concepts and long-term implications of financial decision-making are more thoughtful in saving money for their golden years. The strong correlation between financial literacy score and saving propensity is well displayed, on a country basis, on *Figure 3*.

Figure 3: Financial literacy and percentage saving at financial institutions by gender
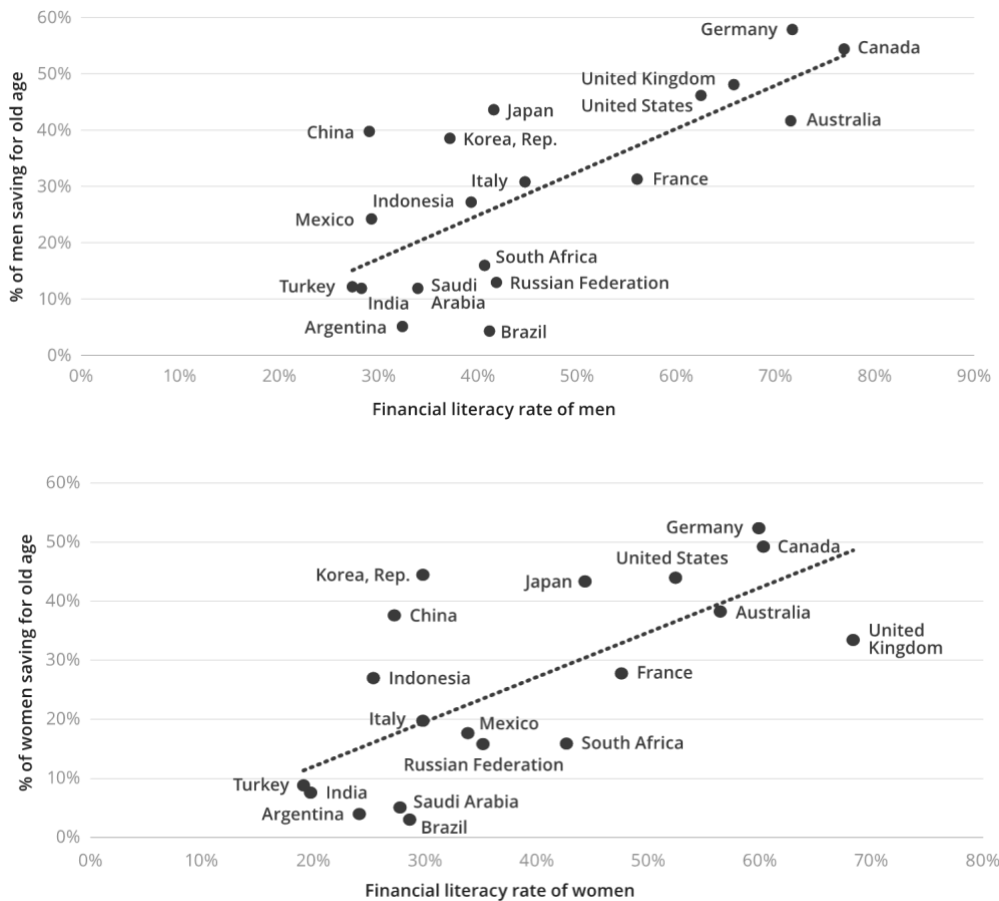
Source: (Hasler & Lusardi, 2017)

Several other papers on the subject confirms the strong relationship between financial literacy and planning behavior, meaning that people who get high scores on the financial literacy questions are much more likely to plan for retirement both in the US (Lusardi & Mitchell, 2007) (Lusardi & Mitchell, 2011a) (Lusardi & Mitchell, 2011b) and elsewhere (Lusardi & Mitchell, 2014) (Van Rooij et al., 2011) (Bucher-Koenen & Lusardi, 2011) (Arrondel et al., 2013) (Almenberg & Säve-Söderbergh, 2011). In countries where private market solutions are gradually been imposed due to the reconfiguration of public pension system, financial literacy contributes to the

likelihood of saving for retirement by participating in private pension plans (Fornero & Monticone, 2011). In all these cases, indexes to measure the level of financial literacy are based on the assessment of the person's knowledge on three main concepts related to pension decisions: i) numeracy and the ability to do calculations on interest rate, which is particularly important to individual subject to defined contribution systems, who need to be aware of the functioning of compound interest in order to compute their final benefit; ii) inflation, as a fundamental concept to make investment decisions and iii) risk diversification, as fundamental principle of the functioning of financial market, where planners seek to get proper instruments to manage their savings. Individuals not possessing these knowledge (or at least not a sufficient level) do not have the proper means to understand and prepare their future retirement and, as a consequence, may be cut off from having an adequate pension, or worse, may risk ending up living below the poverty threshold when older.

As for what financial literacy distribution concerns, *Figure 4* illustrates the percentage of financially literate individuals, grouped by gender, in five G20 countries. Although literacy levels tend to be higher in richer economies, as Germany, UK and US, nevertheless, strong variability is proven both by and within countries (Hasler & Lusardi, 2017).

Figure 4: Percentage of financial literate individuals in 5 countries

■ At least 3 out of 4 answers correct - men[1]   ■ At least 3 out of 4 answers correct - women[1]   ■ Financial literacy gap (men - women)
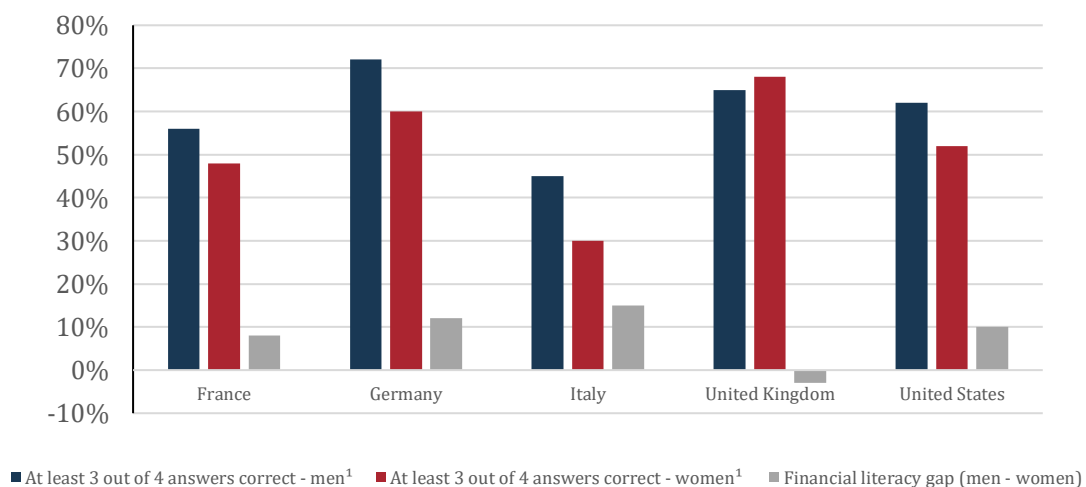
[1] Questions related to knowledge on numeracy, compound interest, inflation and risk diversification

Source: (Hasler & Lusardi, 2017)

In particular, looking to the US demographic, low literacy appears to be widespread among specific groups of the American society, thus those with low education, low income, Black and Hispanic household (Lusardi & Mitchell, 2007), young people and women (Lusardi & Mitchell, 2011a). Financial literacy rates vary widely also across Europe. According to Klapper et al. (2015), on average, 52% of European adults are financially literate, with northern Eu countries performing better than Mediterranean and East European countries, as can be noted in *Figure 5.*

Figure 5: Financial literacy level in Europe
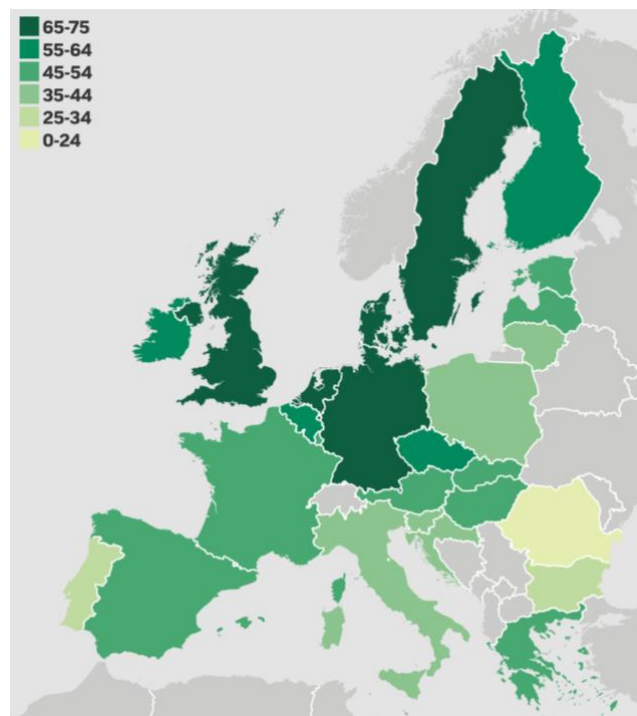
Source: (Klapper, Lusardi, & Van Oudheusden, 2015)
Note: Darker shades of green corresponds to greater financial literacy.

Furthermore, each country exhibits its own demographical variability in financial literacy level. For instance, in Italy, literacy differences can also be assessed on a country regional basis, as emphasized by Fornero and Monticone (2011) and illustrated through *Figure 6.* According to them, along with South dwellers, also women are accounted for low level of financial literacy. In the Netherlands, women and people with low education attainment are shown to be the least financially literate (Van Rooij et al., 2011); in Germany, women, less educated, students, unemployed, homemakers and East Germany dwellers lack basic economic

knowledge (Bucher-Koenen & Lusardi, 2011) while in France, age and also political opinion are among the factors explaining literacy differences in the population (Arrondel et al., 2013). Given the fact literacy is a relevant driver to planning behavior, those categories are particularly at risk of not being able to plan for their retirement and therefore, not save enough for it.

Figure 6: Financial literacy at the regional level in Italy

Note: Darker shades of grey corresponds to greater financial literacy.
Source: (Fornero & Monticone, 2011).

On top of the fact that many individuals struggle with low financial literacy level, they often lack basic knowledge of pension and retirement saving plans. Indeed, especially to low literate individuals, public rules and scheme on retirement may be hard to understand, particularly in lights of new reforms on welfare public system. As confirmed by Lusardi and Mitchell (2014), more financially knowledgeable people are also better informed about pension system rules, pay lower investment fees in their account and diversify their pension assets better, all actions fundamental to an efficient retirement planning.

Therefore, as shown by Lusardi and Mitchell (2014), financial literacy contributes to the individual's knowledge of pension rules, which in turn is essential to the development of an optimal decision-making process regarding retirement. Given that workers will increasingly receive retirement benefit from a mix of public and private resources, it is becoming more important that individuals are provided with the necessary information on the level of retirement income they can expect from

the state in order to plan accordingly by subscribing complementary pension plans programs or by building up private wealth. As shown by Bottazzi et al. (2006) studying the effect of Italian pension reforms of the period 1989-2002, individuals who are more informed about their future pension benefits show a higher offset between pension wealth and private wealth. In other words, people who are better informed about their future pension benefit are more likely to engage in planning activities finalized to increasing their private savings.

Other than exploring the relationship between retirement planning and literacy, a growing body of academic papers demonstrate how different individual characteristics are related to the propensity of retirement planning, depending on the country and system considered. For the Netherlands, Van Rooij et al. (2011) prove that the older the people, the more they tend to think about pensions because of the fact they are closer to the retirement event, whilst young perceive it as a distant event and as a consequence, they are less inclined to plan for it. Furthermore, they prove home ownership is positively correlated with the tendency to plan for retirement, because of the possibility to use home equity as source of financing. These results are also suggested for US younger generations (Lusardi & Mitchell, 2007). Moreover, the type of employment contributes to the propensity of planning: self-employed engage in thinking about their retirement status more than employee, due to their less public coverage on pension's matters (Van Rooij et al., 2011). This holds true also for Germany, where being self-employed and having an higher income contribute to planning activities propensity, while age, gender, education and family size are irrelevant (Bucher-Koenen & Lusardi, 2011). In France, college graduates and higher-income earners are significantly more likely to formulate a financial plan (Arrondel et al., 2013) as well as in Italy (Fornero & Monticone,2011) and also in the US (Lusardi & Mitchell, 2011b). In Sweden, retirement planning is linked to age (older individuals are more inclined to planning) and to high income (Almenberg & Säve-Söderbergh, 2011). For what Italy is concerned, several papers demonstrate the propensity of planning behavior by

analyzing the workers' participation to private pension plan3. The analysis provided by Fornero and Monticone (2011) reports that subscription to pension plans are more common among males, wealthy people, risk-tolerant individuals and workers expecting to retire earlier. Instead, according to a similar analysis by Guiso et al. (2014), also other factors might affect the propensity to join a pension plan, such as people's expectations on benefit level and pension risk. In particular, they proved higher expectations of pension are negatively correlated with the demand for private retirement saving and that people who experience greater public pension risk4 also choose to increase private retirement saving.

In conclusion, considering the new pension landscape characterized by a shift from DB to DC scheme and a general tightening of the system's generosity, it is important to understand whether people have sufficient knowledge to evaluate different situations and make decisions concerning their future retirement status. Several research show that financial literacy enables individuals to be more aware of the legislative context they are subjected to and increase the likelihood of thinking, planning and taking actions to manage present and future financial resources with regard to the desired (or allowed) retirement living standards. Unfortunately, many people still fail to appreciate the benefits of planning behavior due to scarcity of financial literacy. As a consequence, non-planning behavior caused by low literacy level and poor education may lead in the long term to under-savings and low wealth accumulation. Interestingly, in response to this new issue, many European countries are already trying to implement better and more direct communications towards their citizens for what pension is concerned, in order to boost people awareness and proactiveness (OECD, 2005). Still, a lot remains to do, especially on the domain of improving financial literacy and education, focusing on the most exposed group of the society.

3 In this case pension plan participation is interpreted as a proxy for retirement planning, especially considering the fact private market solutions are gradually been introduced due to the reconfiguration of the Italian public pension system.
4 Pension risk is determined by the elicited subjective distribution of the Social Security replacement rate.

2.3.   Retirement Expectations

2.3.1.   Analysis of the relationship between expected age and statutory age of retirement

Due to an increasing amount of pension reforms accumulated in the last decades, pensionable ages and pension benefits granted by the public systems have changed considerably. Contrary to the past, when retirement programs were mainly provided by public institutions and by the employers, nowadays retirement benefits are assigned to individuals thanks to a variety of different schemes. In particular, retirement pensionable ages have become more flexible specially to encourage people to work longer, while benefits received are subject to significant variations due to major shift towards DC pension schemes. For these reasons, today, the decision to retire is a complex choice which involves different kind of considerations, which are be based both on Social Security rules and on the individual's characteristics.

Among academic contributions on the subject of retirement decision-making process, lifetime utility maximization of financial resources and affordability of retirement are the concepts treated the most often. According to those concepts, individuals will retire based on when they could afford to do so financially, at the point where they maximize their lifetime stream of income or when the general outlook of economy favors it, independently of what they think about retirement (Feldman & Beehr, 2011). According to this point of view, personal wealth and income are deemed to be important factors considered when evaluating retirement. Indeed, wealthier workers can find it easier to retire earlier because of limited relevance of financial constraint, while workers with poor saving resources may be forced to work longer to afford retirement (Dwyer & Hu, 2000). Other than wealth, other individual's variables could influence the retirement decision. Firstly, age is deemed to be one of the most relevant factors considered when thinking about withdrawing from the working life, in particular within pension systems which have flexible retirement ages. Naturally, older people are more likely to pull out of the workforce in the near future and, according to Feldman and Beehr (2011), older ages can make the retirement option seem more socially appropriate. Secondly, also

individuals' health status can impact strongly the optimal retirement date, due to the fact poor health can make it difficult to keep working (Dwyer & Hu, 2000) (Dwyer D. , 2001).

Other than economic and individuals' physical factors, individuals facing retirement decisions may weight different aspects of their lifestyle, including personal preferences, family situation and job attachment. Motivational theories about retirement confirm how the decision of dropping out of the workforce can be influenced also by leisure time preferences. Indeed, individuals can gain several benefits from their retirement phase, including having more satisfying social relationships with friends, more time to spend with spouses, children and grandchildren, more availability to take care of close relatives, greater involvement in hobbies and leisure pursuits and lower level of stress (Feldman & Beehr, 2011). Even job satisfaction can influence the retirement decision, as shown by Schnalzenberger et al(2008): in particular, they prove that subjective job satisfaction is a strong predictor for early retirement as well as the individual's overeducation in relation to the job position held. For instance, workers stating they are not satisfied with their job are two times more likely to leave their career for retirement, while strongly dissatisfied workers are three times more likely to quit their job than the others (Schnalzenberger et al., 2008). Retirement decision can be influenced also by the partner's intentions, as shown by Ho & Raymo (2009), who proves how married individuals tends to synchronize their time of retirement to benefit together their retirement free time (Ho & Raymo, 2009).

Despite all these factors that could potentially impact the time of retirement, the age workers expect to leave the workforce and enter the pension regime must be necessarily coherent with the statutory pension framework. In other words, expectations regarding age of retirement can, on one side, be correlated with socio-demographic and personal characteristics, but on the other, expectations also need to be related to institutional rules governing pension programs. Since financial planning is based on expectations about pension, for an efficient retirement preparation, consumers must be necessarily aware of pension eligibility rules granted by the State, so that they can benefit the most out of it, while, at the same, considering their age, their own status of health, level of income and their personal

motivations to enter the phase of retirement. A complete lack of association between retirement expectation and Social Security rules would signal both poor knowledge of rules governing retirement and, most importantly, a random nature of retirement expectations formed by individuals. Consequently, planning behaviors which incorporate those expectations about age or benefit of pension cannot lead to an efficient preparation for the retirement stage of life and could eventually endanger the individual's economic independence when older. On the contrary, a strong liaison between pension regulation and expectations constitutes a good base for retirement planning. As already shown in the previous paragraphs, financial literacy is one of the drivers of pension knowledge, meaning that individuals who scored high on literacy questions are more likely to know the pension rules currently valid in their own countries. Besides this, a growing body of academic papers tried to analyze how much individuals know about their own retirement regime and which subjects are the most knowledgeable about pension matters. Overall, studies show people's poorly awareness of their social entitlements. For instance, Gustman and Steinmeier (2005), analyzing a US sample constituted by people in their working-ages, find out almost half of the respondents are unable to state what their future Social Security benefit will be. In addition, just 27% of those who do answer can in fact give an estimate which falls within the 25% of the benefit guaranteed by law (either people underestimate or overestimate the objective measure of a maximum of 25% of the objective measure). Men, married individuals and more educated people have clearer idea of benefits to which they are entitled. Furthermore, the study tried to shed some light on the determinants contributing to a wider awareness. Knowledge about retirement benefits results to be related to the information normally provided by union and in work environments (as having an occupational pension increase the likelihood of benefits knowledge). An interesting point supporting the relevance of retirement planning is that activities such as attending seminars, requiring information to the competent pension agency, taking about pensions with spouse and friends or simply thinking about retirement can positively influence the extent of pension knowledge of workers. On the opposite, the cost of getting information and the size of the benefits rewarded impact the extent of pension knowledge of individuals (Gustman & Steinmeier, 2005). In other words, people's knowledge about Social Security depends on the amount of

information they have collected and processed, an activity that is related, in turn, on the future benefit perceived (thus the future amount of pension benefit) and the cost of gaining additional knowledge (effort of the research, time spent looking for information, cost of formal education, etc.). Similar conclusions are drawn also by Mitchell, who assessed the widespread disinformation about the US company-provided pensions5 (Mitchell, 1988). Even shifting the focus to the European context, the conclusion remains quite pessimistic. Considering a Dutch sample, Van Duijn et al. (2013) report widespread lack of information on pension programs, and they confirm, in line with other research, the value of education and work experience for a correct estimation of future pension benefit. Moreover, they found evidence that large gaps between individual's expected benefit and the estimated values are caused specifically by poor knowledge of pension institutions rather than uncertainty about the future. For what Italy is considered, self-employed and South dwellers are the categories the most exposed to misinformation on retirement rules, according to Bottazzi et al. (2006). In line with previous results by Mitchell (1988), they find that, for an Italian sample, errors on knowledge of Social Security benefit are positively correlated with the age of entry into the labor market so that, ceteris paribus, less experienced workers form less accurate expectations. Similarly, the role of age is confirmed as found by Gustman and Steinmeier (2005), thus workers closer to retirement display a clearer picture of benefit calculation. Interestingly, living in a household of multiple earners or with a retired person enhance the likelihood of good knowledge of Social rules because acquiring information through word of mouth by relatives and friends is less costly.

Considering the fact many EU countries have undergone through deep reforms of pension system, several research have moved the attention on whether individuals revise their expectations according to the contents and implications of the changes introduced. Starting from Austria, Knell et al. (2015) show evidence of insufficient knowledge about the new pension system. More specifically, there is high uncertainty about the level of net replacement rate under the new rules: firstly, data shows that individuals' expectations on net replacement rate decreased on average

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5 It is necessary to take into consideration in the US system the role of company-employer pension is more central than in European pension system.

of 3.5%, which represents half of the actual reduction in replacement rate demanded by the reform implemented in 2004. Secondly, it is shown the expected gender gap recorded in 2014-2015 on retirement age (about 2.5 years) is set to persist for other 50 years, even though an equal threshold-age for retirement has already been approved and must be reached in 2034. Despite these data suggest reforms have not been understood properly, a more encouraging result is represented by the fact younger cohorts expect to retire later than what middle-age workers do. Although this effect is not particularly strong (every 13 years cohort gap, expected retirement age is estimated to increase of 1 year), it is enough to counterbalance the life expectancy growth for the next decades[6] (Knell et al.,2015). Evidence on the upward adjustment of expectation are found also in Germany, in response to pension reforms that since the '80 enhanced the pension eligibility conditions. In particular, the increase of the expected retirement age between 1987 and 2008 was stronger for low educated workers and blue collars[7], as they were the most targeted group of early retirement schemes, and when the latter were closed, they had to adapt the most to the new situations. Consequently, low educated-workers and blue collars expect a longer working life, now as much as their more educated peers, but only under more pressing financial constraints and more physically demanding job conditions. Hence, this situation may imply a sharpening of Germany social inequality phenomena, according to the author (Hess, 2018). In Italy instead, pension reforms introduced from 1992 to 2011 enhanced uncertainty about retirement rules. According to Baldini et al. (2019), individuals adapted their expectation to the new eligibility rules although with a delay and in an incomplete way. Analyzing the period 1989-1991 and 2000-2014, the authors compared workers' retirement age and benefits expectations with the statutory rules, both in a pre-form and post-reform settings. Evidence show workers' expectations on age grew from 58.8 in 1989 to 65.3 years in 2014 while workers' expectations on replacement rate decreased from nearly 80% in 1989 to approximately 65% in 2014. Over the same period, the statutory replacement rate also dropped, but less than expectations, from around 72% in 1989 to around 62% in 2014. The paper

[6] To note that the 2004 Austrian pension reform did not index retirement age to life expectancy measures.
[7] Manual workers, particularly in the industry sector

underlines a shift from a general overestimation of the generosity of the "old" pension system towards a pronounced tendency to underestimate it, particularly because individuals do not realize the continuous postponement of retirement ages following the life expectancy growth. Overall, the empirical analysis displays a gradual adjustment of expectations to the changes introduced. However, while the legislative changes occurred in the 1990s have been accepted for the most part, those post 2009 are still to be revised completely due to the most recent shocks. In addition, several socio-demographical variables determine the extent of pension knowledge, since, post-reforms, younger individuals appear to be the less optimist regarding their future benefit in comparison to older cohorts, along with women and self-employed, who are less likely to estimate correctly their future pension. A similar result is obtained also by Bottazzi et al. (2006), who confirms how the update of individuals' expectation to new reforms are limited and incomplete, due to the lack of understanding of the implications of new rules. The study, corroborating results by Gustman & Steinmeier (2005), shows pension information[8] improves as individuals approach retirement ages or when individuals live in the same household of a retired person or of multiple earners, due to the relevance of word of mouth. In addition, data suggest the precision of expectations falls after the reform, particularly for the groups that are the most affected by it. Comparing the pre-reform and post-reform period, authors notice how age expectations grow, in the direction implied by the reforms, for all middle-age workers, but are especially pronounced for public employee, self-employed, people living in the South and workers with a college degree. The empirical analysis on replacement rate expectations demonstrate instead that expectations are revised downwards according to the new rules, but among all employment categories only private employee change their plans as much as required by the reforms.

To sum up, the above discussion has underlined how an efficient financial preparation for retirement cannot exclude the knowledge of Social Security rules. Even though different studies prove the relatively poor awareness of workers in relation to their pension entitlements, financial literacy and actions undertaken to get information on Social security rules are important factors enhancing the

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[8] Defined as the difference between replacement rate expectations and statutory values

understanding of retirement rules. In addition, as exposed in the previous paragraph, financial literacy is an important driver to retirement planning attitude. Hence, pension knowledge may also be interpreted as a channel that might contribute to the relationship between financial literacy and retirement planning: since financially knowledgeable individuals are more likely to be aware of their pension entitlements, their expectations are more likely to be linked with valid retirement rules, leading to a planning behavior that is to be more solid and efficient.

2.3.2. Analysis of the relationship between expected age and actual age of retirement

As underlined previously, retirement planning is nowadays fundamental to prepare adequately for retirement. This paragraph will explore the relationship between expectations about retirement, upon which planning is set, and their subsequent realizations. Indeed, to the purpose of an efficient planning, the alignment between expectations and economic choice is as important as people's knowledge on Social Security rules. Undoubtedly, only a careful financial planning that is reflected in the individuals' financial choices would bring the desired benefit. On the contrary, the uncorrelation between expected and actual retirement age or the uncorrelation between expected pension benefit with the one obtained can significantly alter the desired retirement living standards.

A mismatch between expected and actual pensionable age can drive to potentially critical situations. For instance, the unexpected anticipation of retirement can yield individuals to exploit savings accumulated for a period of time longer than previously imagined, leading people to adapt to lower consumption level and lower living standards. Similarly, an involuntary postponement of the pension regime may cause low working motivations and less propensity of investment on human capital, which in turn could imply limitations and damages to the salary growth during the last part of the individual's career. For these reasons, many academic papers analyze the relationship between intentions and realization regarding retirement. Within these works, expectations are often tested against the rationality hypothesis. A rational expectation behavior is defined as the decision-making that corresponds to the best prediction of the final outcome and it is based on all available information

(Disney & Tanner, 1999). In other words, when considering people's expectations about retirement, economists assume these correspond to their optimal choice given factors such as current age, current family status, job held, wealth status possessed, etc. Indeed, the rationality of expectation has been tested by several studies. Among the pioneers in this field of research, Berheim (1989) proves how age expectations about retirement are rational, meaning that expectations are a reliable indicator to actual retirement events. Moreover, by comparing expected values of retirement ages elicited by workers and the actual decision taken, he assesses the variability of expectation accuracy in relation to socio-demographical characteristics that are commonly known to affect retirement, such as age, gender and wealth status. Departing from these results, the studies of Benitez and Dwyer corroborates the rational expectations hypothesis (Benitez-Silva & Dwyer, 2005) (Dwyer, 2001), and emphasized the fact retirement expectations evolves upon the receival of new information by the individual. A further consideration is presented by the research of Disney and Tanner (1999). Other than proving expectations have a role in the definition of actual retirement choice, they suggest current economic retirement behavior models can be upgraded by inclusion of expectations, simply because expectations data can be seen as a suitable proxy of unobservable variables such as preference for leisure and tastes for income (Disney & Tanner, 1999). A slightly different approach is taken by Ho and Raymo (2009), who proves how even couples' jointly retirement expectation provides useful information for projecting future retirement outcomes. Thus, not only at individual level, but also on a spouse couple level, intentions represent a strong predictor for the subsequent behavior, keeping constant all correlates. To give a measure of the phenomenon, the studies estimate that the odds of joint retirement were more than three times higher for couples in which both spouses expected to retire together with the partner relative to otherwise similar couples (Ho & Raymo, 2009).

Actual retirement decision can also diverge from the individuals' expectations, especially due to shocks that individuals are not able to anticipate. To sum up, a misalignment between expectation and realizations may happen either because not all information was considered when setting up the plan, or because new information that becomes available at a time when the plan is already concluded are not accounted by individuals. Indeed, since expectations are formed under

uncertainty about future health, labor force status and other household characteristics, it is clear that for retirement plans to be rational, they have to be updated with newly available information. Many factors can indeed affect the evolution of people's intentions. According to Benitez and Dwyer, individuals are able to anticipate almost all uncertain events when planning for retirement, except in the case of health shocks and job transitions. Thus, facing these situations is reported to enhance the likelihood of delaying retirement more than expected (Benitez-Silva & Dwyer, 2005). Several papers do support the view that unforeseeable changes in health status seem to trigger changes to retirement plans (Benitez-Silva & Dwyer, 2005) (Disney & Tanner, 1999) (Dwyer, 2001) (Dwyer & Hu, 2000). For instance, according to Dwyer, higher percentage of decline in health condition are reported by people who unexpectedly retire relatively to those who continue to work as planned (22.6% vs 9.8% declared health decline) (Dwyer, 2001) and similarly, Disney and Tanner found that a shock in health severity score is associated with individuals being 17% more likely to retire earlier than expected (Disney & Tanner, 1999). Along with the role of health shock, other factors like wealth, education and marital status are found to be particularly relevant in explaining a misalignment between expectation and the economic choice undertaken. For instance, individuals who are better off financially or have higher pension benefits are more likely to retire before because they can afford to do so even in the case of limited public pension allowances, particularly if they are subjected to health worsening too (Dwyer, 2001). Furthermore, as already proved by studies on couple joint expectations, marital status is shown to influence the timing of retirement. Other than joint planning efforts, there is a general tendency for single individuals (widows and widowers) to retire earlier than expected more frequently than married individuals (Bernheim, 1989), while according to Disney and Tanner (1999) being divorced or widowed both enhance the uncertainty over the retirement age and the likelihood of earlier retirement than expected, especially for men. The role of education is less clear, as different authors support different positions: on one side education appears to be inversely related to accuracy of retirement intentions (Bernheim, 1989), while other studies reported extreme values of education (both low and high attainments) are a predictor for accuracy (Dwyer & Hu, 2000). For what concerns the effect of gender and age on expectation

accuracy, results vary according to the period of time considered in the analysis and the context of reference. For example, Disney and Tanner (1999), studying a sample drawn from the UK Retirement Survey in 1988/89 and 1994, demonstrate men tend to retire earlier than expected on average, while Berheim (1989), referring to microdata of the American RHS[9] collected through the period 1969-1979, support the view women perform worse than their counterparts on expectation accuracy.

In conclusion, even though the mentioned academic paper refers to data drawn from the US survey, there is a growing interest about the role of retirement expectation as a reliable forecast of the future outcome. This is especially important on one side, to enhance the understanding of retirement behavior and its drivers, and on the other side, to corroborate economic theories based on the assumption of individual's rational behavior.

2.3.3. Analysis of the relationship between expected replacement rate and actual replacement rate of retirement

Many academic papers have devoted efforts into explaining the relation between expected retirement age and actual outcome, and only a strict minority of them have analyzed instead the linkage between expected Social Security benefit with the pension amount eventually received during retirement. One of the main reasons of the lack for research about this topic is the relative difficulty of obtaining thoughtful expectation data about actual and future perceived income. Indeed, individuals need to have a minimum preparation to answer the question about expected retirement income: they must be aware of Social Security entitlements and the functioning of the financial saving products they have purchased, if any. Moreover, individuals giving indications about their expectations on retirement income should be enough financially literate to understand the computation of their benefit according to the type and length of their own career. As seen before, the consequence of low financial literacy level and the unfamiliarity of pension scheme noticed especially among some portions of the society may result in low response level to survey analyzing the expectation on future pension benefits.

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[9] Social Security Administration's Retirement Survey

Among studies regarding retirement benefit expectations, Bernheim studied the accuracy of pre-retirement expectations concerning Social Security benefits by comparing benefit expectations to the actual pension value received. His major findings illustrate how individuals do not form expectations based on all information currently available, nevertheless, they respond rationally to new information available in the period before the retirement event, by changing their expectations. Decomposing the errors on retirement expectation on different population subgroups, he concludes single women and widows form the most accurate expectations presumably because they depend on the most from Social Security, while married men are the least precise category. Another relevant role is reserved to age, indicating that people approaching to retirement tends to form more thoughtful expectations (Bernheim, 1987). Adopting a different point of view, Mastrogiacomo (2003) investigates whether, for individuals around the retirement age, expectations about future financial situations match the related realization. His study underlines the fact that Dutch individuals approaching retirement tend to become overly pessimistic about their future income, and this is particularly evident for higher educated people. In addition, he confirms how both macro shock and micro shocks explain part of the gap between expectations and realization. Macro shock tends to assume different signs in the long run, while micro shock as status change, family composition and job change explain part of the gap between expected and realized income. For instance, experiencing a change of status related to health or job impacts negatively the evolution of future income expectations, while people who divorce or experience widowhood tends to have overly optimistic expectations.

2.4.   Aim and contribution of the thesis

In the last two decades, several European countries have reformed deeply their pension system intending to enhance their financial sustainability. Overall, new pension laws increased retirement ages, reduced benefit, harden accessibility conditions and shifted the responsibility for pension adequacy from the governments to the workers themselves. Nowadays, it is more and more crucial for workers to plan anticipately their own retirement by recurring to investment

products and saving solutions offered by the private market. Therefore, planning is an essential action that workers need to undertake with the goal of maximizing benefits received from the public programs and eventually integrate with other non-mandatory pension plans.

This thesis concerns the retirement planning decision process. More specifically, the following document aims to present the information contained in the retirement expectations of older workers, collected in the Survey of Health, Ageing and Retirement in Europe (SHARE). The analyses carried out are based on a representative sample of the European population, constituted by older workers aged 50-65, belonging to nine different European countries, among Austria, Germany, Sweden, Spain, Italy, France, Denmark, Switzerland and Belgium. Individuals' expectations about retirement may lead to a solid financial planning if they are strictly linked to current pension rules and are related to the economic choice eventually adopted. If these conditions are not satisfied, it is possible to question the role of expectations, and most of all, the process and the information used by individuals in order to form their own expectations. By eliciting the expected retirement age and the expected pension benefit from SHARE, the following pages investigate the reliability of expectations data considered by individuals to settle up their own retirement plans. The analysis is composed by two different parts, the first concerning the relationship between retirement expectations and pension reforms, and the second regarding the alignment between retirement expectations and retirement realizations.

Firstly, by comparing expected pensionable ages with statutory rules, the thesis verifies the awareness of European workers about their Social Security entitlements. In light of the new pension reforms introduced, the analysis highlights the extent to which people expectations are revised according to new statutory provisions introduced by pension reforms. In this context, the major contribution of the thesis with respect to the current literature is the inclusion in the analysis of several countries, studied in the same reference period. Taking advantage from the variability of pension reforms that took place in European countries from 2004 until 2015, this section of the thesis will demonstrate the extent to which European workers revise their retirement age expectations in relation to the changing pension

regulations to which they are subjected. Secondly, the latter part of the analysis is focused on assessing the gap between how individuals imagine handling retirement and what they actually do. As seen, the alignment between plans and economic choice eventually taken is essential for pension adequacy. The objective of the second part of the analysis is to verify whether the expectations formulated by workers, and used as input for retirement planning purposes, are informative with respect to the behavior adopted. In particular, the analysis underlines the role of people's expectations about retirement age in relation to the subsequent realization. Following, the same approach is used to study the role of people's expectation on retirement replacement rate, with regard to the replacement rate eventually perceived. The research is carried out by inclusion of workers from nine European countries, therefore considering a broader framework than that one used in the current academic papers on the same subject.

In conclusion, the aim of the analysis between expected and realized values is to understand, in relation to the sample selected, how much expectation information on pension age and benefits correlates with the choice eventually adopted by individuals.

III. Data and Results

3.1. The SHARE database

3.1.1. The SHARE Project

Ageing process is one of the greatest social and economic challenges of the twenty-first century. According to the World Health Organization, by 2025 about one third of the European population will be aged 60 or over, with a particularly rapid increase in the number of oldest citizens (World Health Organization, 2002). To cope with this situation, policy makers and research from different fields urged on the importance of achieving a better understanding about the consequences of this phenomenon. In response to the European Commission need to obtain scientific evidence on the ageing process on its members states, in 2002 the SHARE was created as a longitudinal and multidisciplinary survey exploring issue related to health, ageing and retirement among Europeans. Since 2011, the project has become the first European Research Infrastructure Consortium, with a long-term perspective up to 2024 (Börsch-Supan, et al., 2013). The SHARE database collects, on an individual and household level, cross-country comparable micro data on several attributes of the life of individuals aged 50 or more. In particular, data gathered range from demographical variables to information on health, socio-economic status, social and family network of older European population. The EU Commission funded the data collection phase for the most part, allocating enough resources so that in each country at least 1500 household would have been interviewed. The procedure followed for the survey design phase granted that the sample selected was representative of the population of people aged at least 50 years old and their partners, living within the EU.

To date, SHARE has collected seven waves of panel data, involving in the analysis 27 European countries and more than 140,000 people. The first wave was carried out in 2004 and it collected data from 22,000 individuals belonging to 15,000 households in 10 different countries. The 7th wave, released in April 2019, took place in 2017 and involved more than 60,000 individuals in 28 countries, reaching full coverage of the EU countries. Whereas the regular waves of SHARE, corresponding

to wave 1,2,4,5 and 6, regards the respondents' current living situations, wave 3, called SHARELIFE, and wave 7, have been conducted as a retrospective study to collect individual's life-history events10. The structure of the SHARE survey has been adopted by the US Health and Retirement studies (HRS) and the English Longitudinal Study of Ageing (ELSA), to whom SHARE is also harmonized with. Yet, SHARE features an additional dimension: it is the first European database to gather extensive information on a cross-country basis, with the objective to represent Europe's diversity in terms of social, economic, institutional and cultural perspectives, ranging from Scandinavia across Western and Central Europe to the Mediterranean. Indeed, one of the most important aim of SHARE is to deliver truly comparable data that can be used to study how culture, living conditions and policy approaches could shape European living standard pre and post retirement. Unfortunately, due to its cross-country and multidisciplinary nature, the SHARE dataset is to be more complex than other comparable survey. The progressive inclusion of additional countries and the introduction of retrospective life history data collection enhanced substantially the complexity of database. Hence, to ensure and easy and fast use of data, SHARE directly provided some variables of main interests, especially those which allows a straight comparison between countries, such as for example, the International Standard Classification of Education (ISCED) or the International Standard Classification of Occupations (ISCO-88, by the ILO), related respectively to the respondents' education and type of employment. Besides variables explicating international standard, the dataset contains also further generated variables that facilitate or enhance working with SHARE data as well as different type of weights and multiple imputations. For instance, imputed variables on different demographical characteristics (civil status, level of income, level of wealth, etc.) were defined to provide users with accurate statistical variables to be used directly. On top of that, SHARE minimize the challenge of an increasing complexity by extensive data cleaning, provision of generated variables (as, for instance, the variable indicating the respondent's type) and readily available support documentation to all users. A second weakness of any large-scale survey is

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10 In SHARELIFE wave, information collected are related mostly to childhood living circumstances, partners, children, housing, employment, socio-economic and health conditions, from a retrospective point of view.

that sometime, relatively low response rate and moderate level of attrition (defined as the amount of sample lost throughout the waves) are recorded. Despite the fact the average response rate is quite high in comparison to other EU and US sample studies (Börsch-Supan, et al., 2013), SHARE created a system of ex-post calibrated weights to adjust the selection bias caused by non-response items.

3.1.2. The Data

The analysis is run using data from SHARE survey. Specifically, the data are drawn from the 1st to the 6th wave, with individuals interviewed respectively in years 2004-2005 for the 1st wave, in 2006-2007 for wave 2, in 2011 for wave 4, in years 2013 for wave 5 and in 2015 for wave 6. Data from the SHARELIFE wave (3rd wave) and from wave 7 are considered only by means of their reorganization into the Job Panel, which is a generated dataset based on information of wave 3 and wave 7 of SHARE combined in a retrospective long panel (Brugiavini, Orso, Genie, Naci, & Pasini, 2019). Since the aim of the following analysis is exposing information contained in retirement expectation, the research is addressed to employed workers closer to the retirement event, who might be thinking or planning for it. Specifically, the analysis is focused on employed workers, both in the private and public sector. Self-employed are excluded from the scope of the analysis because traditionally they are subjected to different pension rules than employed workers. In addition, they constitute a very heterogenous group, who have much larger flexibility in terms of labor supply and retirement choice. Consequently, partial retirement solutions are widely adopted among self-employees, allowing them to be associated to the status of a retiree, even though they may still carry on either formal or informal works, for instance in the context of family run business or providing consulting services (Hochguertel, 2015). Therefore, in order to obtain a more homogenous sample, the thesis is focused on employed workers only, whether they belong to the public or private sector. Hence, the sample of reference is composed by employed individuals aged between 50-65 years old who are living in one of these 9 European countries: Austria, Belgium, Denmark, France, Germany, Italy, Spain, Sweden and Switzerland. These countries are selected firstly because they all belong to the Western Europe geographical area, and secondly because they all took

part to the SHARE project since its beginning in 2004, without dropping out until 2015, which corresponds to the period covered by the analysis. Moreover, the research focused only on expectations about first tier public pensions, namely old-age pension and early retirement pension schemes, which are at the basis of Social Security systems supporting elderly population. In addition, first pillar pension schemes are the most common type of pension among European countries, while retirement programs related to the second and third pillars are subjected to a more heterogeneous country distribution. For instance, in countries such as Denmark, the Netherlands and Sweden private schemes provided by industrial-relations agreements ensure coverage of most of the workforce (around 80%), while in other countries, as Italy, such programs are very rarely adopted (Martin & Whitehouse, 2008).

Therefore, to the purpose of this thesis, only expectations about old-age public pension or early retirement pension schemes are considered. Old-age pension is defined as "a type of benefit for which entitlement is primarily based on some form of prior record of 'performance' establishing the right to claim" (European Commission, 2018). Indeed, old-age schemes are generally based on years of contributions or residency, or, partially, they can also be based on proven needs of individuals or derived rights (as for example in the case of pension allowance for a spouse). Despite the existence of heterogeneous pension programs, the common feature of old-age pension programs is represented by its aim to grant minimum income provision to older people. Differently, early retirement schemes are pension allowances granted to individuals retiring before the legal or standard retirement age, due to several kind of causes: personal motivation, unemployment or redundancy resulting from economic reforms addressed to specific sector or industry (Eurostat, 2019). Expectations data about both old-age and early retirement schemes are extracted from several questions of the module "Employment and Pension" of the SHARE survey. As previously discussed, this thesis focuses on public early retirement and old-age pension schemes. Respondents currently at work who declare to be entitled to receive at least one of these public benefits in the future are asked to report the age at which they expect to start receiving these benefits and their expected replacement rate from this type

of pension benefit. Information on expected age of retirement is stored in the question ep106, which is phrased as follows:

"At what age do you expect to collect this pension?"

Obviously, the question is referred to the type of pension individuals think to receive when older. Following, with the same method, individuals are asked to elicit the expected replacement rate relative to the pension they think to perceive in the future. The retirement replacement rate is defined as the percentage of the individual's annual employment income that is replaced by retirement income when the individual retires. The data about expected replacement rate is expressed, for waves from the 1st to 5th, in the question ep109 and it is reported below:

"Please think about the time in which you will start collecting this pension. Approximately, what percentage of your last earnings will [your public old-age pension/your public early retirement or pre-retirement pension] amount to?"

Clearly, the answers require individuals to report a percentage estimation. Exceptionally, for wave 6, the expectations data about replacement rate is explicated in question ep609. In contrast with the other wave of panel data, the question is posed slightly differently to ease its understanding to individuals. Instead of demanding a net replacement rate, the question asked directly the expected amount of the first pension, as follows:

"Please think about the time at which you will start collecting this pension. How much will be your first monthly benefit after taxes from [your public old-age pension/ your public early retirement or pre-retirement pension]?"

Clearly, further calculation is to be performed to estimate the retirement replacement rate relative to the individual interviewed. Thus, in order to make this information comparable with the preceding wave data, it will be sufficient to relate the expected amount of the first pension benefit with the last working income, also available among the SHARE imputed variables (variables created by SHARE directly). For further details about the SHARE questions o the expectations data, see appendix A.

Other than expectations data, information collected from the survey questions to the purpose of the analysis regard demographical variables (as gender, age, year of birth, country), economic information (as personal and family wealth, working income and retirement income), health variables, household composition (as the civil status), relationship information (as family size, number of children or number of grandchildren) and other variables, like education variables and literacy measures (as level of education attainments and estimated cognitive abilities).

3.2   Relationship between expected age and institutional age of retirement

3.2.1.   The Sample

As underlined previously, nowadays an efficient financial planning is central to prepare for retirement. Since the relevant role played by expectations in the definition of an efficient retirement planning, we investigate in more details the information contained in individual's expectations. More specifically, the analysis presented in the next pages aims to illustrate the evidence on the relation between individuals' expectation on retirement age and the institutional rules introduced by pension reforms to access whether individuals revise their retirement plans to new retirement rules.

The sample of the analysis includes, for each wave and country considered, all the employed workers who think they will be entitled to a public pension in the future (either old-age or early retirement pension) that are aged between 50 and 65 years old and who provided an expectation about their future age of retirement. In case of "don't know" or refusal answers to the expectation question, the observation is dropped from the sample. On top of that, are excluded from the sample all the individuals whose estimates are clearly non-sensical or observations for which important variables are missing. However, it is relevant to notice how this sample methodology allows the inclusion of more than one observation for each respondent, depending on her participation in the survey, as expectations data are gathered at each wave, also on people already interviewed in the past. In conclusion, the resulting dataset is configured as a longitudinal panel including all individuals,

interviewed through the period 2004-2015, who expressed an estimation of their future age of retirement. The initial sample, constituted by individuals living in the European countries selected and aged 50-65, counted 79.653 people. The majority of those who declared themselves as "workers" (40.693 individuals), are employee or civil servants, counting for a population of 34.118 individuals. Among them, 28.916 people thought to be entitled to at least to one public pension by the time of their retirement, while expectations data on retirement ages were valid in 28.183 cases, which constitute the final sample for the analysis that follows. All in all, more than 95% of individuals within the perimeter of the analysis were able to report their intentions about retirement age. Only for individuals of the "final" sample, a new variable called *eAGE* was defined. *eAGE* summarizes the information on the expected age of retirement elicited by individuals and reported in the answers of the survey. In those cases where people expressed different retirement ages because they declared to be entitled to more than one public retirement program, only the expectation referring to old-age pension is considered to the purpose of the analysis[11]. The distribution of the variable *eAGE* is summarized in *Table 1,* which reports the amount of observations, mean, the first, second and third quartiles of the variable's distribution, for each country and separately for each gender.

Table 1: Mean and percentiles of the expected age of retirement

	(a) Male					(b) Female			
Country	N	mean	p25	p50	p75	N	mean	p25	p50	p75
Austria	952	62,59	60	62	65	958	60,35	60	60	61
Germany	1881	64,34	63	65	65	2157	64,28	63	65	65
Sweden	1561	64,61	65	65	65	2126	64,65	65	65	65
Spain	662	64,23	65	65	65	605	64,15	63	65	65
Italy	841	63,19	60	65	65	903	62,81	60	63	65
France	1550	60,84	60	60	62	1908	61,46	60	61	62
Denmark	2230	65,90	65	65	67	2478	65,85	65	65	67
Switzerland	1504	64,53	65	65	65	1617	63,88	64	64	64
Belgium	2126	62,54	60	63	65	2124	62,62	60	63	65
Total	13307	63,75	62	65	65	14876	63,60	62	65	65

[11] The choice is done to include as many countries as possible and preserve cross-country comparability as much as possible, since non all of them foresee the early retirement pension schemes and explicitly include this option in the questionnaire.

From the above table, it is possible to notice how expected ages of retirement are relatively close to standard peak retirement ages, generally around 63 or 65 years old. Among the countries where people expected to work longer, there are Germany and Sweden, topped by Denmark, with an average expected age of retirement above 65,5 years old. Surprisingly, there is no sharp disparity between expectations of the female and the male samples, except for few cases where the expected age gender gap, judged by median values, is equal to one year, as in the cases of France and Switzerland, or it overcomes a difference of one year, as in the case of Italy and Austria. However, previous research on consequences of the Austrian reforms also highlighted a sharp difference of age in expectations between men and women (Knell, Segalla, & Weber, 2015).

3.2.2.   MISSOC Database and institutional variables

In order to relate individuals' reports on retirement age with pensionable ages calculated according to public pension systems, information on Social Security rules valid in European countries has been drawn from the Mutual Information System on Social Protection, also called MISSOC database.

The project was firstly created in 1990 to spread information on social protection among European countries and it then grew into a central database for several users, including public authorities, institution and professional users. Currently, by MISSOC it is possible to get up-to-date information on social security legislation, benefits and conditions valid in all 28 countries of the European Union, plus the countries belonging to the European Economic Area and Switzerland. Given its multi-dimensional nature, the database allows a straight comparison among different systems on the matters of health care, support to maternity, paternity and family benefits, unemployment, guaranteed minimum resources, accidents at work, occupational diseases and, most importantly, to all subjects related to old-age pension, invalidity and survivor pension. Therefore, in this thesis, MISSOC database was used to access information regarding national rules governing old-age and early retirement pension schemes, which are illustrated into details for each country and each year of the analyzed period. Thanks to the readily available information contained in MISSOC comparative tables, it was possible to associate to each

individual belonging to the sample, his age of retirement, as prescribed by pension rules valid at the time intentions were formed. The institutional age of retirement is assigned according to the country of domicile and demographical characteristics of the individual considered: that is, based on the subject's gender, current age, year of birth, job and sector of occupation (public or private sector), it was possible to associate to each unit of the sample a minimum age of retirement, starting from which the individuals can claim their pension entitlements.

Since most of the pension reforms have introduced more flexible retirement ages within pension schemes, individuals' expectations have been compared to different statutory age variables, generated on the basis of slightly different criteria. Specifically, four variables indicating statutory retirement ages were defined thanks to information available in the MISSOC database, namely the variables *erpAGE* and *earlyAGE*, which embody early retirement rules, and the variables *opAGE* and *oldAGE*, which represent old-age pension provisions. In countries where both old-age pension and early retirement pension schemes are in place, the variables *erpAGE* and *earlyAGE* represents rules on early retirement schemes, and *opAGE* and *oldAGE* gather the information on old-age retirement provisions. Differently, in countries where only old-age pension is admitted, old-age pension rules are considered for the definition of all the variables listed above, as the minimum threshold-age required to access retirement coincided with old-age pension rules.

The first group of variables, that includes *erpAGE* and *opAGE*, gather information on the minimum age starting from which individuals can claim respectively, either early retirement pension or old-age retirement pension. The variables are defined as follows:

- *erpAGE* is defined as the minimum age starting from which individuals can claim early retirement pension, also accepting reduction in benefit received. The variable generated takes into consideration several individual's characteristics, as gender, age, year of birth, job and sector of occupation.
- *opAGE* is defined as the minimum age required by the law to be entitled to an old-age pension, also considering possible reduction of the benefit perceived.

The variable generated take into consideration several individual's characteristics, as gender, age, year of birth, job and sector of occupation. While the variables defined above account for the lowest retirement age valid in each country, they do not consider any of the individuals' qualifying conditions that may allow them to access retirement. One of the most important factors affecting the possibility to access pension is the individual's contribution period, thus the span of time over which the appropriate Social Security contributions have been paid under the legislation considered. As reported by OECD data, minimum pensions based on individual contribution history exist in one-third of OECD countries. On average, pension laws provide a partial benefit pension after 20 years of contributions, while full minimum benefits require 26 years (OECD, 2015). For instance, across European countries, in 2004, a period of 35 years of Social Security contribution allowed individuals to access the early retirement pension at 60 years old in Belgium, at 63 years old in Germany and at 57 years old in Italy (MISSOC, 2019). Therefore, to account the individuals' possibility to enter retirement, we introduce a new set of variables indicating minimum ages of retirement while accounting the information on the length of the individual's contributive life. This second group of variables, that includes *earlyAGE* and *oldAGE*, other than considering the individual's demographic characteristics, account the information on personal working contributions. To this purpose, the most recent release of the SHARE Job Panel[12], which gathers data on the individual's entire working life, was useful to define the period over which working contributions have been paid by each individual. Since contribution is one of the most important factors determining at which age one may enter retirement, its inclusion in the variables *earlyAGE* and *oldAGE* enhance the accuracy of the latter statutory variables. The variables described above are defined as follow:

- *earlyAGE* is defined as the minimum age starting from which the individual can claim the early retirement pension, considering both the individual's characteristics and the length of his contributive life.

[12] The latest release of the SHARE JEP is based on SHARE release 7.0.0., available since April 2019.

- *oldAGE* is defined as the minimum age required to be entitled to an old-age pension, determined on the basis of the individual's characteristics and the length of his contributive life.

The contribution condition is deemed to be a relevant information due to the fact it concours to the determination of the type of pension program an individual could be subjected to. Often, early retirement regime is an option only for workers with longer working life or with an early start into the job market: therefore, not all individuals can expect to enjoy the benefits given by early retirement pension schemes, but usually, just those with longer working contribution period. This aspect will be further analyzed later, in paragraph 3.2.5.

An overview of the "statutory" variables' distribution in our sample is reported from *Table 2* to *Table 5*, analyzing the dynamics of different statutory age variables over the period referring to wave1 (2004), wave 2(2007), wave 4(2011), wave5(2013) and wave 6(2015). As it can be noted from *Table 2*, *erpAGE* is, in most cases, stable. Increases in the minimum age for early retirement schemes are limited to three instances: Austria for both gender, women in Germany and Switzerland, and Italy, where changes are implemented from 2013. Yearly increases are limited mostly because pension reforms changes were introduced gradually, foreseeing different application across cohorts: older workers, which constitute the majority of the sample selected, are usually the least impacted by new provisions. A different pattern is reported by *Table 3*, describing the trends related to the minimum age of retirement for old-age pensions. An upward growth of the retirement ages is recorded for several countries, as Germany, Spain, Italy, France and even though uniquely for women, also in Switzerland and Belgium. Both in Belgium and in Italy, the pension reforms aimed to reduce the gender age gap, contributing to the alignment of retirement conditions between men and women. In counter tendency, Sweden and Denmark are the only case where minimum retirement age is lowered between the 1st and the 2nd wave. In Sweden, the decrease of pensionable ages is the consequence of the 2006 introduction of a flexible old-age retirement schemes; in Denmark instead, lower retirement ages are explained by the application of a transitory pension regime related to the pre and post 1999 pension reform (MISSOC, 2019) (Minstry of Social Affairs, 2002).

Table 2: Means by country and wave – erpAGE

	(a) Male						(b) Female				
	Waves						Waves				
Country	1	2	4	5	6		1	2	4	5	6
Austria	61,5	62,3	62,9	62,9	62		56,5	57,25	57,9	57,9	62
Germany	63	63	63	63	63		60	61,1	61,7	62,5	62,8
Sweden	61	61	61	61	61		61	61	61	61	61
Spain	60	60	60	60	60		60	60	60	60	60
Italy	51	51	54	56,4	56,5		51	51	54	55,4	55,5
France	55	55	55	55	55		55	55	55	55	55
Denmark	65	65	65	65	65		65	65	65	65	65
Switzerland	63	63	63	63	63		61	62	62	62	62
Belgium	60	60	60	60	60		60	60	60	60	60

Table 3: Means by country and wave – opAGE

	(a) Male						(b) Female				
	Waves						Waves				
Country	1	2	4	5	6		1	2	4	5	6
Austria	65	65	65	65	65		60	60	60	60	60
Germany	65	65	65	65,4	65,5		65	65	65	65,4	65,6
Sweden	65	61	61	61	61		65	61	61	61	61
Spain	65	65	65	65,1	65,3		65	65	65	65,1	65,3
Italy	65	65	65	66,3	66,3		60	60	60	64,4	65,0
France	60	60	61,4	61,5	61,8		60	60	61,4	61,6	61,9
Denmark	65,1	65	65	65	65		65	65	65	65	65
Switzerland	65	65	65	65	65		63	64	64	64	64
Belgium	65	65	65	65	65		63	64	65	65	65

Trends referring to the variables *earlyAGE* and *oldAGE* are instead reported in *Table 4* and *Table 5.* Both *earlyAGE* and *oldAGE,* as seen previously, define the statutory age of retirement by including the information on the individual's contribution period, such that individuals with longer contribution history will be more likely to be entitled to younger age to collect their pension, while people entering in the job market later are more probable to retire when older. In addition, it is important to recall how recent pension reforms have generally increased the contribution period required to access Social Security schemes, impacting upward the threshold-age to collect public pension. In this context, as shown by descriptive statistics of *Table 4,*

most of the countries analyzed are subjected to an increase of the pensionable age referring to early retirement schemes: Austria, Germany, Spain, Italy, Switzerland (for women) and Belgium all expose, for the sample selected, a more or less pronounced growth in legal age or retirement. Changes over time are not always constant because the variable *earlyAGE* depends on the composition of the sample analyzed, thus on characteristics of the individual's contributive life. In a similar fashion, threshold-age for old-age pension regime, reported in *Table 5*, have grown in most of European countries analyzed, with exclusion of Austria, where retirement age is stable, and in Denmark and Sweden, where pensionable age is lowered. Individuals from Germany, Spain, Italy and France are subjected, in the period considered, to an increase in the minimum age to access old-age pensions for both genders, while in Switzerland and Belgium this shift concerns only women.

Table 4: Means by country and wave – earlyAGE

	(a) Male						(b) Female				
	Waves						**Waves**				
Country	1	2	4	5	6		1	2	4	5	6
Austria	61,5	62,3	62,9	62,9	62		56,5	57,3	57,9	57,9	62
Germany	64,2	63,8	63,5	63,9	63,8		62,8	62,9	63,1	63,9	64,0
Sweden	61	61	61	61	61		61	61	61	61	61
Spain	65	65	65	65,0	65,0		65	65	65	65,0	65,1
Italy	61,9	59,2	61,9	64,6	64,3		59,7	59,9	61,3	63,2	63,3
France	56,2	56,4	56,6	56,8	56,5		56,7	56,5	56,7	56,6	56,8
Denmark	65	65	65	65	65		65	65	65	65	65
Switzerland	63	63	63	63	63		61	62	62	62	62
Belgium	62,4	61,6	62,6	63,1	63,5		61,5	61,5	62,8	63,2	63,7

Table 5: Means by country and wave – oldAGE

	(a) Male						(b) Female				
	Waves						**Waves**				
Country	1	2	4	5	6		1	2	4	5	6
Austria	65	65	65	65	65		60	60	60	60	60
Germany	65	65	65,0	65,3	65,5		65	65	65,1	65,4	65,6
Sweden	65	61	61	61	61		65	61	61	61	61
Spain	65	65	65	65,0	65,0		65	65	65	65,0	65,1
Italy	65	65	65	66,3	66,3		59,9	59,9	59,9	64,4	65,0

	(a) Male						(b) Female				
	Waves						**Waves**				
Country	1	2	4	5	6		1	2	4	5	6
France	60	60	64,0	64,0	64,2		60	60	63,9	64,1	64,1
Denmark	65,0	65	65	65	65		65	65	65	65	65
Switzerland	65	65	65	65	65		63	64	64	64	64
Belgium	65	65	65	65	65		63	64	65	65	65

To verify the correlation between the individual's expectations and the statutory age variables, a scatterplot is reported for each institutional variable in *Figure 7*. In the following graphs, each point indicates the mean value of age expectations on the y-axis, and the statutory age variable selected, on the x-axis. Points are drawn for each wave, country and gender. As noticeable, all the charts suggest the existence of a positive correlation between expectation and statutory minimum retirement age, as the line interpolating the points is always positively sloped. That is, a growth in minimum legal retirement age corresponds to increasing individuals' expectations on age. Even though this relationship seems to hold for each statutory age variable considered, the slope of the lines indicates the increase of a one-unit change in the statutory variable (whether it is *erpAGE*, *opAGE*, *earlyAGE* or *oldAGE*) does not imply a change of the same extent in the individuals' expectations.

Even though all the graphs suggests the existence of a positive impact of statutory pension rules on individual's expectations, the descriptive analysis reported do not consider any of the individual's features that may vary with time and across countries, like age and health status, which may influence the expectations on retirement age. Furthermore, others individual's characteristics, as cohort and employment, may impact both the individuals' expectations about retirement and the statutory ages to which individuals are subjected. Consequently, the descriptive analysis, not considering any of the sample features, may lead to spurious results. To overcome these limits and deepen the analysis on the relationship between expected and statutory ages, an OLS regression analysis is carried out in the next section.

Figure 7: Scatterplot of the expected age versus the institutional age of retirement
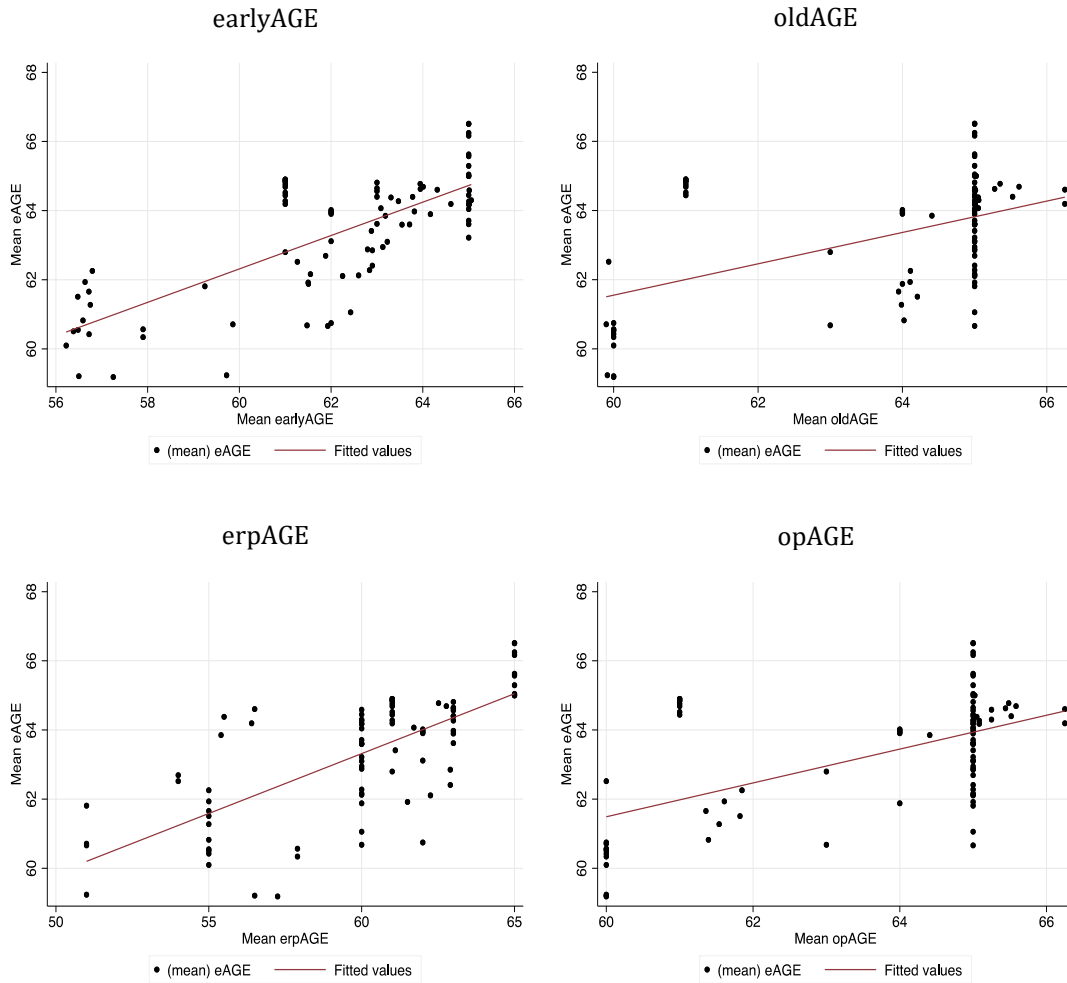
3.2.3.   Regression analysis

To further investigate the relationship between expected age of retirement and institutional age granted by pension provisions, we estimate a multiple linear regression analysis using OLS estimation. The objective of the regression analysis is to investigate the influence of institutional rules on the expected retirement age of individuals, at the net of other variables that may affect workers' plans for retirement. Therefore, answers to the survey question about the expected retirement age are regressed on the statutory age variable, and, on other control factors, thus on standard socio-demographic characteristics. More specifically, for each one of the institutional age variables defined for the sample, there is a correspondent regression analysis on the *eAGE* variable. Eventually, the objective is

to verify the extent to which individuals' expectations are revised according to new pension provisions.

In order to control for other factors that may influence retirement expectations, the regression analysis includes several standard socio-demographic characteristics. These control variables include the individuals' nationality, age, cohort, level of perceived health, educational attainments and cognitive abilities, household composition (marital status and the number of children and grandchildren), financial situations (individuals' income and household wealth) and sector and type of employment. As proven by several academic papers on the matter (Bottazzi & al., 2006) (Gustman & Steinmeier, 2005) (Knell & al., 2015) (Ho & Raymo, 2009) (Dwyer D., 2001) (Van Duijn & al, 2013) (Mitchell, 1988) (Baldini & al, 2019), all the factors listed above may affect the individuals' retirement plans. Controls on the country of residence, age and cohorts are imposed to differentiate among individuals subjected to different national frameworks, who are consequently touched by different retirement incentives and disincentives; other control variables, like education and cognitive abilities, are introduced to keep account of the individuals' different retirement planning and pension literacy propensity; similarly, controls related to occupation type and household composition are useful to account for motivations that may influence the choice to drop out of the workforce; moreover, health status is reported as a control factor especially because poor level of health may constitute an incentive to drop out of the workforce earlier than average; lastly, working income and wealth level are included among the control factors because they may be an incentive or a disincentive to keep on working. Taking into account what have been listed above, the complete regression equation used is reported as follow:

$$eAGE = X\beta + \epsilon$$

where the vector X includes all the regression covariate, including the variables for the institutional minimum age, the country of residence, the age of the respondent at the time of the interview, the respondent's cohort, his level of education and cognitive abilities, the respondent's household composition(having a partner, a

children or a grandchildren), level of health, his type of occupation and sector of employment, and lastly, the respondent's income and family wealth.

A separate regression is run for each one of the institutional retirement ages defined previously, namely *erpAGE*, *opAGE*, *earlyAGE* and *oldAGE* variables. As said, to consider also the individual's characteristics on expectations, the regression analysis includes a series of explicative variables, which are defined as follows:

- Among the demographic regressors, the variable *age* reports the respondent's age at the time of the interview;

- The *country* of residence of the individuals is reported by nine different country dummy variables, one for each of the European state included in the sample;

- The information on the individual's *cohort* has been summarized in several dummy variables, which indicate different generational cohorts. Since the final sample contains people born between 1938 to 1965, a dummy variable has been defined for the cohort of people born before 1945, the cohort of people born between 1945-1950, the cohort of people born between 1950-1955, the cohort of people born between 1955-1960 and for the cohort of people born later than 1960[13].

- The variables regarding *education* are based on a variable generated directly by SHARE and called *isced*, which classify the degree of education attainments according to an international standard. Three dummy variables have been defined to express the level of the individual's education, indicating by the first dummy primary and lower secondary education, by a second dummy upper secondary and post-secondary education and eventually, a dummy variable for tertiary education.

- The variable *partner* is a dummy variable, which reports the information on the individuals' relationship status: it takes the value 1 if a person has a partner (both in case of a domestic partner or spouse) and the value 0 if the respondent is single.

- To account for the individual's variability on cognitive abilities, several variables have been defined. Among them, the variables *numeracy* corresponds to the

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[13] As it is typical of longitudinal datasets, age of respondents, year of birth (represented by the variable on cohorts) and year of interview are perfectly collinear. As a result, we cannot control for all these three dimensions but only for two of them.

individual's ability to deal with basic numerical operations and it is measured on a scale from 1 to 5. Numeracy is based on the scored obtained in a mathematical test involving basic calculations, as finding percentage of a certain number or executing simple operations. All in all, higher value of the numeracy variables indicates better calculation abilities.

- The variable *fluency* measures the individual's executive functions, which influence the ability to read and understand written texts. The test for fluency requires individuals to name as many words as possible of a certain category, such that the higher is the number of items recalled, the higher is the variable value, and therefore also the individual's ability.

- The variables *short recall* and *long recall* measure memory and learning abilities. Both the variables range on a scale from 0 to 10 and the score is based on the individual's ability to recall immediately (short *recall*) or sometime after (*long recall*) a list of words previously given to him. Again, the higher the index, the more developed are the individual's abilities.

- The individual's *self-perceived health status* has been indicated by the definition of several dummy variables. There are dummy variables for health status labeled as "Very good", "fair", or "poor" status.

- The information about the type of employment is collected by a categorical variable, indicating whether the respondent is a white collar or a blue collar. The individuals' job title is assessed thanks to the survey question ep016.

- The *sector* of employment has been defined thanks to two dummy variables, one indicating the private sector, and the other indicating the public sector. The sector of each worker can be assessed through the response to the survey question ep009.

- The variables *grandchildren* and *children* are both dummy variables indicating family composition. The variable *child* takes the value of 0 for respondents who do not have any children and the value of 1 if the respondents have children, whether they live in the same household or not. Likewise, the dummy variable for *grandchildren* takes the value of 0 for respondents who do not have any grandchildren and the value of 1 if the respondents have at least one grandchild.

- The information about the individual's working net income has been accounted for thanks to the several dummy variables. A first dummy indicate the

individual's income within the first quartile of the corresponding country working income statistical distribution (*low income*), a second dummy for income between the 1st and the 2nd quartiles (*low-intermediate income*), a third dummy for income between the 2nd and 3rd quartiles(*upper-intermediate income*), and a fourth dummy for income above the 3rd quartile of the corresponding country income distribution(*high income*). Therefore, personal working incomes are always valued to the standard of the corresponding country of residence.

- The information on family wealth is recorded for by four dummy variables. Likewise the case of personal income, there are four dummy variables for household wealth values within the first quartile, for values between the 1st and the 2nd quartiles, for values between the 2nd and 3rd quartiles and for values above the 3rd quartile of the corresponding country household wealth distribution. Therefore, dummy variables represent *low, low-intermediate, upper-intermediate* and *high family wealth* relative to the individual's country of residence standards.

Throughout this thesis regression models are estimated by OLS and inference is conducted by taking into account the presence of potential correlation in the error term at the individual level resulting from the presence of more than one observation for each respondent interviewed in different waves. Besides, to the purpose of the regression analysis, among the previously described group of dummies, we always declare one less dummy variable than the categorical values available, to avoid perfect collinearity issues. Taking into account all the variables described is necessary to screen the influence of retirement rules and pension reforms on people's expectations. Instead of presenting the complete regression outputs, *Table 6* reports only the regression coefficients of the institutional variables selected.

Indeed, as can be noted in *Table 6*, the coefficient of the *erpAGE* variable is positive and statistically significant for both genders. In other words, retirement rules do affect the individual's expectations about the timing of retirement, and in an upward direction. In particular, the regression output indicates how a unit increase in

minimum age required for early retirement pension affects individual's expectation positively, of about one third. Moreover, as shown by the magnitude of the *erpAGE* coefficients, men's expectations incorporate early retirement rules to a bigger extent than their female counterparts.

Differently, the regression variable *opAGE* aims to determine the extent of the relationship between statutory changes to old-age retirement pensionable ages and expectations. In this case, the impact of the statutory ages to retirement expectations is significant and positive only for the female sample, while results regarding men suggest the relationship is not relevant. Evidence shows women's expectations are more responsive than men's to changes in minimum pensionable age related to old-age retirement programs, most likely because their more frequent interruptions to the working career force this group to consider, in the first place, old-age eligibility rules rather than early retirement eligibility conditions, which are met in a minority of the situations. On the opposite, men are responsive only to statutory changes about early retirement pension scheme, while rules changing old-age retirement rules do not affect their expectations. This difference can be explained by the fact that, traditionally, men rely more frequently on old-age pension programs, so they tend to be more careful about pension reforms and regulations only in the case they plan to benefit other types of pension, as for instance, early retirement schemes.

However, it is important to remind that the variables of institutional retirement age used so far could be subjected to strong approximations, since the variables *erpAGE* and *opAGE*, used as inputs for the previous regression, do not consider the working contribution period related to each individual included in the sample. Considering this information, as variables *earlyAGE* and *oldAGE* do, drive to a more accurate definition of the old-age and early retirement statutory age to be associated to individuals, and on the other side, could enhance the variability of the institutional ages of the sample, leading to more precise estimations. The results of regression analysis performed including the contribution period data, are presented in the lower part of *Table 6* . In this case, the statutory variables are in all cases significant and positive. First of all, pension provision regarding early retirement schemes

influence the retirement age expectations both of men and women, as the regression coefficient of the variable *earlyAGE* shows. Even though both gender expectations are revised upward as pension reforms increases the early retirement ages, expectations of women grow (about 0,09) less than that one of their male counterparts (about 0,15).

Retirement expectations are revised upward also in case of increasing old-age pension ages, as the coefficients of the variable *oldAGE* shows. Although the coefficient of *oldAGE* is particularly small for the male sample, the relationship between expectations and the legal old-age retirement threshold is positive and significant both for the male and the female groups. Women have more responsive expectations to changes in old-age pension rules than men, since a one-unit change of the minimum age eligibility affects their expectations of about 0,21 versus a limited change of 0,05 of the male sample. Indeed, the increased variability of the variable *oldAGE* has led to better accuracy in the estimation results, and as a consequence, to the significance of the statutory age coefficient for the male sample. Also, the inclusion of the information on the individual's contribution has determined a reduction of the early retirement age coefficient for women, which drop from the value of almost 0,30 to 0,09, while the coefficient on old-age pension remains almost constant.

To sum up, the results obtained support the views according to which women are more likely to rely on old-age pension in order to access retirement, and therefore they are naturally more aware of its eligibility conditions. The complete regression results are available in the appendix B. Among the individual's characteristics control added in the regression, the most relevant are the respondent's demographical information, as the country of residence, age at the time of the interview, cohort and education. In addition, variables concerning the health status, employment, having grandchildren and household wealth influence significantly the retirement age expectations formed by older workers. In a nutshell, data presented in this thesis confirm younger cohort tends to be less optimist[14] regarding their

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[14] They expected to access pension later than older cohorts

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future age of retirement as proved by Knell et al., (2015), along with workers with higher education, as in Bottazzi et al. (2006). In addition, individual's bad health conditions impact expectations downward, corroborating the evidence found in Knell et al. (2015).

Table 6: Determinants of retirement age expectations. Ordinary Least Squares regression estimation.

eAGE	MALE	FEMALE
erpAGE	0.3821***	0.2973***
	(0.0529)	(0.0269)
Observations	12,334	13,438
opAGE	0.0463	0.2546***
	(0.0289)	(0.0207)
Observations	12,334	13,438
earlyAGE	0.1465***	0.0903***
	(0.0188)	(0.0151)
Observations	12,190	13,284
oldAGE	0.0499**	0.2147***
	(0.0220)	(0.0176)
Observations	12,166	13,273

Notes:
*** p<0.01, ** p<0.05, * p<0.1

Robust standard errors (in parentheses) allows the arbitrary correlation in the error term at the individual level.

Full set of results is reported in Table 6 in the Appendix B.

(1) *erpAGE* indicates the minimum age of early retirement pension, accounting the individual's characteristics.

(2) *opAGE* indicates the minimum age of old-age retirement pension, accounting the individual's characteristics.

(3) *earlyAGE* indicates the minimum age of early retirement pension, accounting the individual's characteristics and contribution history.

(4) *oldAGE* indicates the minimum age of old-age retirement pension, accounting the individual's characteristics and contribution history.

3.2.4.   The "mixAGE" variable

So far, different variables have summarized pension rules according to the kind of pension schemes considered. In other words, rules about old-age pension schemes were represented in the variables *opAGE* and *oldAGE*, whether rules on early retirement pension schemes were summarized in the variables *erpAGE* and *earlyAGE*.

Instead of considering pension rules separately by retirement programs, the following paragraph illustrates the evidence obtained by gathering all the information on retirement rules into a unique variable. The variable so defined, called *mixAGE,* collects, on an individual basis, the minimum retirement age provided by the ensemble of valid pension rules. In particular, *mixAGE* indicates the minimum retirement age the closest to the individual's actual age, considering both the demographical and working life characteristics of the individual. Indeed, values of minimum ages are assigned based on the country of residence, age at the time of the interview, cohorts, sector, type of employment and length of the contributive working life. For instance, considering the Belgian pension rules in 2004, individuals could access early retirement pension at age of 60 years old, on the condition of having 35 years of Social Security contribution. Differently, individuals can also opt for old-age pension retirement, starting from the age of 63 years old. In this context, the variable *mixAGE* will assign a legal retirement age of 63 to a Belgian woman aged 58 years old with 30 years of contribution, due to the fact the she will not be able to reach age 60 with a contribution length of 30 years. Similarly, the variable *mixAGE* will assign a minimum legal retirement age of 60 years old to a Belgian man aged 59 years old and with a contribution period equals to 34 years, in line with the pension provisions in place. As a consequence, the age assigned to individuals corresponds to the minimum age required by the law to access either old-age pension programs or early retirement pension schemes.

The distribution of the variable, called *mixAGE,* is reported in *Table 7*. Despite the data does not highlight the legislative changes of the last decades, in all the countries analyzed, except for Denmark, retirement ages tend to increase, although not at a constant pace. The general pattern of retirement ages is explained by the

consequences of European pension reforms which modified eligibility rules for both early retirement and old-age pension schemes in the period analyzed. Following, the scatterplot in *Figure 8* analyzes the relationship between retirement age expectations and the variable *mixAGE.* As can be appreciated from the chart, the same positive trend revealed for the previously seen institutional variables, holds also for the relationship between expectation and the *mixAGE* variable.

Table 7: Means by country and wave – mixAGE

	(a) Male						(b) Female				
	Waves						**Waves**				
Country	1	2	4	5	6		1	2	4	5	6
Austria	61,6	62,3	62,9	62,9	62,1		56,9	57,7	58,2	58,0	62,0
Germany	64,2	63,8	63,6	64,0	65,5		62,8	63,4	64,4	65,1	65,6
Sweden	61,5	61,7	62,4	62,1	62,5		61,5	61,7	62,2	62,0	62,1
Spain	65	65	65	65,0	65,01		65	65	65	65,0	65,05
Italy	61,9	61,7	63,7	64,6	64,3		59,7	59,8	60,6	63,2	63,3
France	57,5	57,6	61,2	63,2	62,5		58,2	57,9	61,4	62,8	62,7
Denmark	65,0	65	65	65	65		65	65	65	65	65
Switzerland	63,0	63,1	63,1	63,1	63,1		61,1	62,1	62,1	62,1	62,2
Belgium	62,4	61,6	62,6	63,1	63,3		61,5	61,5	62,8	63,2	63,4

Therefore, when a growth in statutory retirement ages takes place, the individual's expectations are revised upward, or in the opposite direction in case of reforms lowering retirement threshold-ages. This result is also confirmed by the regression results presented in *Table 8.* The regression coefficient of *mixAGE* is positive and significant both for male and female population. In addition, the extent of the impact of the variable *mixAGE* on the individua's expectation does not vary much by gender: in both cases, a unit increase in legal retirement age influence a slightly upward revision of expectation of about 0,08. For the complete regression results, see appendix B.

Figure 8: Scatterplot of the Expected age versus the Statutory age of retirement (mixAGE)
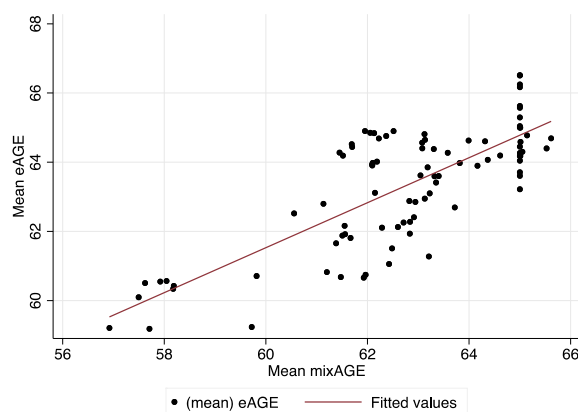
Table 8: Determinants of retirement age expectations. Ordinary Least Squares regression estimation.

eAGE	MALE	FEMALE
mixAGE	0.0785***	0.0759***
	(0.0118)	(0.0103)
Observations	12,263	13,337

Notes:
*** p<0.01, ** p<0.05, * p<0.1

Robust standard errors (in parentheses) allows the arbitrary correlation in the error term at the individual level.

Full set of results is reported in Table 8 in the Appendix B.

(5) mixAGE indicates the individual's minimum age of retirement (either old-age or early retirement pension)

The complete regression results are available in the appendix B. Among the individual's characteristics controls added in the regression, the respondent's demographical information, as the country of residence, age at the time of the interview, cohort and education have all a significative impact on the expected age of retirement. Besides, variables concerning the health status, employment, having grandchildren and household wealth influence significantly the retirement age expectations formed by older workers. Therefore, control factors affecting expectations remain almost unvaried when considering statutory age variables defined in different manners.

From the results obtained so far, it emerged a strong relationship between retirement age expectations formed by individuals and institutional rules. In other words, people seem to change their expectations according to new pension provisions, even though, the regression coefficients confirm the revision of expectations do not display the same variations of the statutory age changes. As new pension reforms increase the threshold retirement age of one year, individual's expectations do not increase of the same amount, but of a lesser extent. Therefore, expectations are revised only partially, probably as the results of the limited knowledge of individuals about pension rules, by the fact workers expect further changes in retirement rule before their retirement, or, more simply, given the approximation errors in the assignment of the statutory individual minimum age to each responds of the sample[15].

3.3. Relationship between expected age and realized age of retirement

3.3.1. The Sample

As recent pension reforms have overhauled many Social Security system, nowadays an efficient financial planning is central to prepare for retirement. In turn, a correct planning is based on the individual's expectation on the Social Security system they are subjected to. Thus, in the following paragraphs, we investigate the information contained in the individual's expectations, focusing on the comparison between expected and realized age of retirement. The sample for the following analysis is structured as a longitudinal panel, since it includes individuals both at the time when they plan their retirement and at the time of their actual retirement choice. Therefore, the sample is constituted by all dependent workers of each wave, aged between 50-65, living in one of the 9 European countries selected, and who have answered the survey question about retirement age expectations. Besides, the group of individuals gathered in each wave, is followed during the analyzed period, and they are included in the sample only if they become retired throughout wave 2

[15] The approximations are sourced in the MISSOC dataset to ease the understanding of pension regulation

to wave 6. Thus, by using this methodology, it is possible to have more than one observation for each individual. The initial sample counts 6983 individuals, who are recorded as workers during the first interview taken and, by the time of the 6th wave, they become retired. The observations with missing or non sensical information on age expectations, which are 1267, are dropped from the sample. Similarly, from this group, other 39 observations are taken out of the sample due to missing or non sensical indication on realized retirement age. Therefore, the final sample, composed only of individuals aged between 50-65, is constituted by 5.512 individuals.

In SHARE survey, whenever a person becomes retired, a set of questions are asked, regarding mainly the timing and the reasons for the retirement. Specifically, questions about the retirement year is assessed through question *ep329* of the survey section "*employment and pensions*". Therefore, combining data about the time of retirement and the individual's demographic characteristics, it is possible to define a variable indicating the age at which the individual dropped out of the labor force. The statistical distribution of the realized retirement age (or, noted as *rAGE*) of the sample selected is reported, separately for men and women, in *Table 9.* As noticeable, the realized age of retirement does not change much by gender. For all countries, median values of retirement ages of women correspond to those of men. Overall, retirement ages averages (but also medians) are the highest for Sweden and Switzerland for both genders, while among countries with a retirement age lower or around 60-year-old, there are Italy and France for men, and Austria and Italy for women.

Table 9: Means and quartiles of realized age of retirement

Country	(a) Male				(b) Female			
	mean	p25	p50	p75	mean	p25	p50	p75
Austria	60,3	60	60	62	59,0	57	60	60
Germany	62,7	62	63	65	62,1	60	63	64
Sweden	64,1	63	65	65	63,9	63	65	65
Spain	62,4	61	63	65	62,4	60	63	65
Italy	60,0	57	59	63	59,4	58	59	60
France	59,9	59	60	61	60,5	60	60	61
Denmark	62,7	61	62	65	62,1	60	62	64

	(a) Male				(b) Female			
Country	mean	p25	p50	p75	mean	p25	p50	p75
Switzerland	63,1	62	64	65	62,6	61	64	64
Belgium	60,1	58	60	62	60,4	58	60	62
Total	61,7	60	62	65	61,7	60	62	64

To analyze further the relationship existing between expected and realized retirement age, *Figure 9* illustrates, by a scatterplot, the relationship between the respondent's expected retirement age and their actual retirement age. In the following graph, each point indicates the mean value of age realizations on the y-axis, and of the expected retirement age, on the x-axis. Points are drawn for each wave, country and gender. The chart shows a clear upward trend: individual's expectations on retirement age are positively correlated with the economic choice eventually undertaken, or in other words, individuals who expect to retire later do also retire later than other individuals, while individuals thinking of retiring at younger ages tends to retire when younger. All in all, the graph emphasizes a rough alignment between expectations and realizations, thus supporting the view individual's expectations should be valuable to the retirement planning purposes. However, it should be noticed from the graph that the relationship between the two variables is not perfectly proportional. If expectations grow of one unit, realization increase in the same direction, even though of a smaller amount.

Figure 9: Scatterplot of the Expected age versus the Realized age of retirement (rAGE)
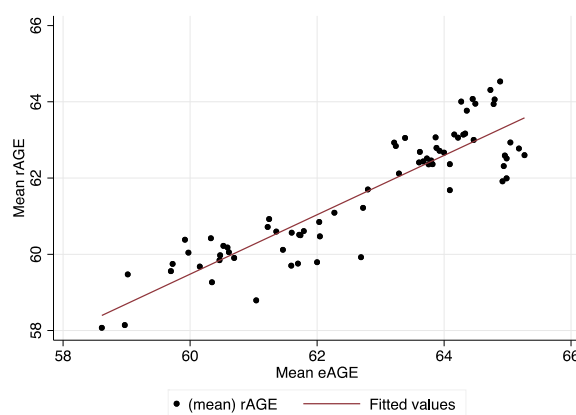
3.3.2. Regression analysis

Even though the descriptive analysis suggests, at an aggregate level, the existence of a positive impact of expectations on realized age of retirement, it still do not consider any of the individual's features, as the respondent's age, education, personal income, health status and family size, all relevant variables which can influence the retirement decisions. Hence, the analysis excluding individual factors could drive to spurious results, since the model neglects those individual's difference. To test further the extent of the correlation between expectation and realization, controlling, at the same time, for other influences on retirement outcomes, a regression analysis is run separately for men and women. In particular, the realized age of retirement is regressed on the prior expectations of each individuals and other control factors. As shown by academic papers (Disney & Tanner, 1999) (Dwyer & Hu, 2000) (Dwyer D. , 2001) (Ho & Raymo, 2009) (Benitez-Silva & Dwyer, 2005) (Bernheim, 1989), factors which may affect the retirement choice of individuals includes demographical characteristics, cognitive functions, household composition, health status, employment and economic characteristics of individuals. The following regression equation is used:

$$rAGE = X\beta + \epsilon$$

where $rAGE$ corresponds to the realized age of retirement and the vector X corresponds to the regressor vector, which includes the individual's age expectations extracted from the SHARE survey, along with all the variables indicating the individual's characteristics.

The model is estimated by OLS and inference is conducted by considering the presence of potential correlation in the error term at the individual level resulting from the presence of more than one observation for each respondent interviewed in different waves. The control factors used for the following analysis are the same used in the previous regression, reported in section 3.2.3. There are country variables, demographical indications referring to the respondent's age, cohort and education level, variables measuring the individuals' cognitive functions, like fluency, short recall, long recall and numeracy abilities, variables indicating the household composition, like having a partner, having children and grandchildren,

variable indicating the health status, and finally, economic variables accounting for working income and family wealth. All those variables are defined into more details in section 3.2.3.

The results of the regression, reported in *Table 10*, confirm the pattern found previously. The positive sign of the expectation variable coefficients implies that people expectations (both of men's and women's) have a significant role in determining the outcome of the retirement event, and that increasing expectations would impact positively the choice eventually taken by individuals regarding their time of retirement. Other than expectations, full regression results reported in the appendix demonstrate actual age of retirement is influenced also by the respondents' characteristics, as age at the time of the interview, country of residence, cohort, poor health status. Evidence also confirm poor health status triggers a fall in age realization, in line with previous results on the effect of health shock proved by Disney & Tanner (1999), Dwyer (2001) and Dwyer & Hu (2000). According to the data obtained, having a partner and/or a grandchild affect negatively the retirement outcome only for the women sample, while having a child or perceiving a high income, impact positively women age realizations.

Table 10: Determinants of retirement age realization. Ordinary Least Squares regression estimation.

rAGE	MALE	FEMALE
eAGE	0.3140***	0.3219***
	(0.0227)	(0.0252)
Observations	2,669	2,621

Notes:
*** p<0.01, ** p<0.05, * p<0.1

Robust standard errors (in parentheses) allows the arbitrary correlation in the error term at the individual level.

Full set of results is reported in Table 10 in the Appendix B.

(1) *rAGE*, the realized retiremenet age, is the dependent variable.

Furthermore, the correlation of the individual's expectations with the realized age of retirement tends to be sharper as much as individuals get closer to the retirement event. As shown by *Table 11*, individuals whose age is higher than the median age of the total sample, and therefore who are closer to the retirement event, exhibits a

bigger influence of age expectations on the retirement realization. The higher responsiveness of expectations data could be given by the fact individuals approaching to retirement tends to think more about their retirement, they are more informed about their pension options and they rely more on their retirement plans, therefore having more accurate expectations than younger people who feel relative distant to their retirement choice. This evidence is also consistent with the results found by Van Rooij et al. (2011) and Almenberg & Säve-Söderbergh (2011), who reported how people approaching to retirement tends to think more about old age, and by Bernheim (1987), who proved people closer to retirement form more thoughtful expectations. Nevertheless, the coefficient of the retirement age expectation for younger cohorts remains statistically significant, although it has a fewer impact on realization than those of older cohorts. Evidence seems to suggest that although younger generations have less accurate expectations, they possess a broad idea about their future time of retirement. This is particularly relevant on one side, as it supports the views that expectation data can be read as a proxy for unobservable preference over income and leisure/work time allocation.

Table 11: Heterogeneity analysis on the age expectation coefficient

| | MALE | | FEMALE | |
	AGE<=58	AGE>58	AGE<=58	AGE>58
eAGE	0.2554***	0.4024***	0.2725***	0.4001***
	(0.0277)	(0.0360)	(0.0330)	(0.0379)
Observations	1,391	1,278	1,409	1,212

Notes:
*** p<0.01, ** p<0.05, * p<0.1
Robust standard errors (in parentheses) allows the arbitrary correlation in the error term at the individual level.

To conclude, we present the analysis of the difference between expectations and realizations. *Table 12* illustrates the percentage of the population, grouped by country, who estimate correctly, overestimate or underestimate their future age of retirement. In particular, the central column of the table reports the percentage of expectations that are in line with the subsequent outcome, or that diverge of a maximum of one year. The percentage of the population who instead overestimated

their retirement age of at least one year are listed in the left column. Likewise, the column on the right report the portion of individuals who underestimated their retirement age of at least one year. Overall, more than half of the observation corresponds to accurate expectations. More than 60% of people demonstrate an error of 1 year or less, with France reaching more than 75% of correct estimation, followed by Sweden, where the percentage of accurate expectation stands nearly at 70%[16]. Despite the country variability, the trend emerging underlines how other than a majority of correct estimation, it is more common to overestimate the retirement age rather than underestimate it, which may lead individuals to future potential financial issues. Among the high rate of overestimation there are the cases of Spain and Germany, which are almost in line with the total average, and Denmark, for which more than 60% of individuals expected to perceive a pension later than when they actually perceive it. This situation is explained on one side by the application of a transitory pre-1999 pension regime rule which lowered the retirement ages for older cohorts, and on the other side, by the existence of voluntary early retirement program, related to unemployed insurance, which provide benefits between the ages of 63 until the normal pensionable age of 65. Therefore, in addition to the more generous reforms that decreased retirement age, respondents who were not formally into retirement, could declare to perceive a Social Security benefit starting from a younger age than the standard retirement age threshold initially expected[17] (MISSOC, 2019) (OECD, 2017).

Table 12: Gap between expected and realized age by countries

Country	rAGE < eAGE-1 (%)	rAGE= eAGE±1 (%)	rAGE > AGE+1 (%)
Austria	27,73%	66,82%	5,45%
Germany	32,04%	63,54%	4,42%
Sweden	18,64%	69,90%	11,46%

[16] Considering an interval of ±3 years from the actual time of retirement, the amount of accurate expectations grows at 83,40%; considering an interval of ±4 years from the actual time of retirement, the amount of accurate expectations grows at 87,75%; Eventually, considering an interval of ±5 years from the actual time of retirement, the amount of accurate expectations grows at 95,22%.
[17] For what the Denmark is concerned, considering an interval of ±3 years from the actual time of retirement, the share of individuals who overestimate the retirement age declines to 34,36% (the country average is 14,91%) and considering an interval of ±5 years, to 5,19% (the country average stands at 4,49%).

Country	rAGE < eAGE-1 (%)	rAGE= eAGE±1 (%)	rAGE > AGE+1 (%)
Spain	33,33%	58,19%	8,47%
Italy	25,00%	60,92%	14,08%
France	12,00%	78,21%	9,79%
Denmark	66,38%	30,28%	3,34%
Switzerland	29,30%	65,75%	4,95%
Belgium	31,90%	59,28%	8,82%
Total	30,66%	61,50%	7,84%

To sum up, the above table supports the alignment of retirement age expectations with their subsequent realizations, since more than half of the respondents can predict correctly the time they will drop out of the workforce. Despite a vast majority displays accurate expectations, still more than 30% overestimate their future retirement age, while almost 8% underestimate it.

3.4. Relationship between expected replacement rate and realized replacement rate

3.4.1. The Sample

The following section will emphasize the relationship existing between expectations on net replacement rate and the net realized replacement rate. The retirement replacement rate is defined in the SHARE survey as the percentage of the last working income of the individual that constitutes the total amount of the first pension received. The sample used for the following analysis between expected and realized replacement rate is the same used in paragraph 3.3. The sample studied is therefore constituted by all individuals, who at the time of the first interview were working, and by the time of wave 6 become retired. Besides, are excluded from the sample all the observations with missing or non sensical data both on expected and realized replacement rate.

First of all, the individual's expected retirement replacement rate is elicited by question ep_109 of the SHARE survey. The question requires workers to indicate a percentage value they think their amount of pension will be, in comparison to the last working salary. Moreover, in most of the waves, the answer is limited to a percentage ranging from 0% to 100%. Of the 5512 cases where age expectations are available, just 4008 observations have valid expectations data both on retirement age and on replacement rate. In particular, the response rate to the question about the replacement rate expectation varies between 60% and 80% depending on the country considered[18], as shown in *Table 13.* The following data also emphasize how generally, male respondents are more likely than female individuals to give an estimation about their net pension benefit.

Table 13: Percentage of survey observations with valid data on expected replacement rate

	% of observations with eRR		
Country	Male	Female	All sample
Austria	86,70%	78,43%	82,70%
Germany	83,28%	78,13%	80,85%
Sweden	69,58%	59,51%	63,98%
Spain	67,80%	59,32%	64,97%
Italy	79,19%	81,48%	80,28%
France	75,82%	65,48%	70,50%
Denmark	82,15%	71,03%	76,27%
Switzerland	77,94%	60,75%	69,60%
Belgium	79,04%	65,01%	72,96%
Total	77,91%	67,39%	72,71%

The fact the response rate can be low may be explained by the relative hardness of the question: individuals need to have a general idea of what type of pension and what rules they are eligible for, they need to account personal characteristics as contributive life and household composition, they need to predict the growth of their salary until the retirement event and equally important, they need to be "enough" financially educated to give an estimation of their future retirement

[18] To information purposes, even though sample criteria are different from those used here, Gustman & Steinmeier (2005) find a response rate of 51% when asking individuals to estimate their future Social Security benefit.

benefits. In addition, the introduction of flexible retirement regimes, where benefits received are linked to the age of retirement, may further harden the workers' understanding of future retirement benefits.

In order to compute the realized replacement rate, or the pension benefit eventually received, the analysis uses imputed data provided by the SHARE database. The realized replacement rate is computed by dividing the imputed data on the individual's retirement income, corresponding to the variable "*ypen1*", with the imputed data on the individual's working income, or the variable "*ydip".* This fraction is computed only for retired individuals perceiving a public pension at least for a year (either old-age or early retirement pensions), who have never benefitted other forms of pension scheme during their working lives. So far, data on pension benefits received are available for 3092 individuals. In addition, 161 observations which were associated with cases of minimum pensions are excluded from the sample, along with 298 cases associated with low working incomes. Indeed, minimum pensions resulting from low working income are often subjected to Social Security integration, thus the related net replacement rate is not comparable with those of the remaining sample. As a result, valid data on realized replacement rate is counted for 2633 cases. Moreover, since the expectations on replacement rate drawn from the SHARE survey are expressed in percentages ranging from 0 to 100, values of realized replacement rate are forced to the same range for comparability purposes. Considering the group of respondents for which both the realized replacement rate and the expected replacement rate are available, the final sample counts 1974 cases, which constitutes the final sample for the following analysis.

Concerning the final sample, *Table 14* and *Table 15* report the means and the main quartiles of the distribution of the expected replacement rate and the realized replacement rate variables.
From a first glance, expectations on retirement replacement rate do not display sharp variations by gender but instead, variations are noticeable based on countries. Low replacement rates are expected in Switzerland and in Northern European countries, like Denmark and Sweden, while in all the remaining continental countries people expect to perceive at least 65% of their working income as

retirement pensions. Low expected replacement rates are justified by the major role of second and third pillars pension programs within the country retirement system. Indeed, individuals expecting low pension benefit can usually counts on programs such as occupational pensions or mandatory private pension schemes. For instance, the percentage of retirees who also receive an occupational benefit is on average, 73,87% in Sweden, 51,16% in Switzerland and 37,69% in Denmark, while much smaller share are reported for countries where first pillar pension schemes are the most relevant, as in Italy, France and Spain, where the average percentage of retirees holding an additional occupational pension is, correspondingly, just 2,18%,2,14% and 2,87% (Belloni, et al., 2019). The same trend can be verified by looking at *Table 15,* reporting the distribution of realized replacement rate, with Switzerland and Northern countries having rate about 50% or less.

Table 14: Means and quartiles of the expected replacement rate distribution

country	(a) Male				(b) Female			
	mean	p25	p50	p75	mean	p25	p50	p75
Austria	73,30	70	78	80	72,93	60	75	80
Germany	65,51	60	65	71	64,40	55	65	72
Sweden	56,42	50	60	65	54,28	50	50	60
Spain	81,25	72.5	80	100	87,00	75	80	100
Italy	79,77	75	80	90	78,68	70	80	90
France	65,17	51	70	75	63,46	50	65,5	75
Denmark	29,40	15	25	35	35,63	20	28	50
Switzerland	40,41	20	30	60	43,65	30	40	55
Belgium	67,75	60	73	75	68,02	60	70	75
Total	57,70	40	60	75	57,58	50	60	75

Table 15: Means and quartiles of the realized replacement rate

country	(a) Male				(b) Female			
	mean	p25	p50	p75	mean	p25	p50	p75
Austria	68,85	46,85	75,93	89,82	63,03	36,40	69,82	86,67
Germany	62,17	33,95	62,65	94,79	69,70	49,56	74,60	98,06
Sweden	56,78	35,00	58,68	74,50	53,72	29,75	57,31	75,95
Spain	60,86	40,72	56,43	85,92	56,83	31,86	56,99	90,43
Italy	82,18	72,22	97,94	100,0	82,33	75,42	93,33	100,0
France	72,05	52,73	78,00	100,0	74,82	53,30	83,63	100,0
Denmark	41,71	24,69	37,80	57,78	49,17	26,37	44,98	68,21
Switzerlan	40,23	22,07	32,98	47,88	58,07	32,48	55,40	94,41
Belgium	74,47	53,16	85,07	100,0	68,50	51,75	74,81	93,66
Total	60,94	34,87	62,24	90,07	63,13	38,17	67,69	90,09

The suggestions of the descriptive analysis can be partially corroborated by the scatterplot in *Figure 10*, which pictures the relationship between the two variables analyzed. Points are drawn for each country, wave and gender. As can be notices from the plot below, the relation between expected and realized replacement rate seems to be positive: higher expectation corresponds to higher realization on retirement benefits.

Figure 10: Scatterplot of the Expected replacement rate versus the Realized replacement rate
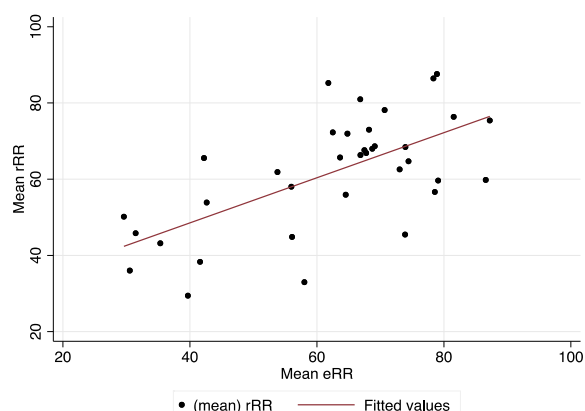
3.4.2.   Regression Analysis

Even though the descriptive analysis suggests, at an aggregate level, the existence of a positive impact of expectations on realized replacement rate, it still do not consider any of the individual's features that could influence the retirement options, for instance, the respondent's age, education, personal income, health status and family size. Therefore, the regression analysis aims to measure the extent of the relationship between expectations and realizations about the retirement replacement rate, and to avoid spurious results, it accounts for the variability in the individual's characteristics. Thus, the data on pension benefit realizations are regressed on the individuals' expectations and on other control factors, which corresponds to the control variables used throughout the previous analysis. As before, regressions are run separately for men and women in order to pick any influence which may have a particular effect on gender. Following, the regression equation is reported:

$$rRR = X\beta + \epsilon$$

where rRR corresponds to the realized replacement rate, as computed from the imputed variables drawn from the SHARE database and the vector X represents the regression covariates, including the individual's expectation variable on the pension benefit. The remaining regressors correspond to the control variables used through the thesis: they stand to account the effects of the individual's demographical characteristics, cognitive abilities, household composition, type of employment, health status and economic characteristics. Demographical variables may influence the realized rate of replacement due to the consequences of pension reforms applied differently by cohort, the existence of benefit penalizations or pension incentives linked to age. Also, as previous studies show (Bernheim, 1987) (Mastrogiacomo, 2003), education and good cognitive abilities may contribute to adequate financial planning, which in turn lead to higher pension benefits. Higher or lower replacement rates could also be motivated by type and sector of employment, unexpected retirement events, personal health conditions and family composition. Lastly, personal income and wealth are also accounted to differentiate between individuals, because, on one side, healthier individuals can afford to retire earlier

even though their pension benefit is limited, and on the other, poorer people tend to be more financially protected by laws than wealthier individuals. Considering all those factors, the regression results are reported in *Table 16*. As the analysis is characterized by a limited number of observations for some countries, to avoid multicollinearity issues, individuals are grouped into wider geographical areas, as can be noted by the full regression results in the appendix B.

Table 16: Determinants of retirement replacement rate realizations. Ordinary Least Squares regression estimation.

rRR	MALE	FEMALE
eRR	0.4192***	0.3035***
	(0.0503)	(0.0542)
Observations	1,014	886

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

Full set of results is reported in Table 16 in the Appendix B

Robust standard errors (in parentheses) allows the arbitrary correlation in the error term at the individual level.

(1) rRR stands for the realized replacement rate.
(2) eRR stands for the expected replacement rate.

The regression results confirm a positive and significant correlation of replacement rate expectation with the correspondent realization, both for men and women. Data emphasize the fact that, at the net of all other factors that may influence the actual benefit values, expectations are aligned to realizations regarding the pension benefit received by Social Security programs. Besides, the complete regression results signals that realized benefit are influenced not only by expectations but also by the respondent's age, his cohort and his level of working income. We do find that higher personal working income affects negatively the realization on replacement rate, mostly due to the fact wealthier individuals can afford to retire earlier at lower benefit, and at the same time, they may be subjected to less generous pension provision. Besides, only for women, realizations on replacement rate are influenced also by their job type (being blue collar) and the geographical area they belong.

Following, *Table 17* analyzes whether the relevance of the individual's expectations on the replacement rate coefficient changes considering older cohorts of individuals. Overall, expectations data about replacement rate remain significant for both sample subgroups, meaning that even younger workers form meaningful expectations about pension benefit. Besides, while the expectations' influence on the realized benefit remains almost constant for men, it increases for women who are closer to the retirement event, probably because they tend more often to inform themselves about their future retirement status and to plan for it.

Table 17: Heterogeneity analysis on the replacement rate expectation coefficient

	MALE		FEMALE	
	AGE<=58	AGE>58	AGE<=58	AGE>58
eAGE	0.4316***	0.3978***	0.2690***	0.2874***
	(0.0663)	(0.0702)	(0.0812)	(0.0673)
Observations	596	418	441	445

Notes:
*** p<0.01, ** p<0.05, * p<0.1
Robust standard errors (in parentheses) allows the arbitrary correlation in the error term at the individual level.

In conclusion, I analyze the gap between expected and actual replacement rates. *Table 18* presents the fraction of observations, for each country, that underestimate or overestimate the actual replacement rate by at least 25 percentage points (respectively in the first and the third columns) and, in the central column, the fraction of expectations with an error within the 25%. As noticeable, in half of the country selected the majority of observations indicate a fairly accurate expectation. Among the countries with the highest percentage of accurate expectations, there are Italy, Austria and Belgium. Differently, in Spain, Germany and Switzerland at least 40% of the population tends to overestimate their pension benefit, while in Denmark the biggest share of expectations corresponds to underestimations of the actual benefit eventually perceived.

Table 18: Gap between expected and realized value of replacement rate

country	eRR/rRR≤0,75	0,75 ≤ eRR/rRR ≤ 1,25	eRR/rRR≥1,25
Austria	15,63%	51,04%	33,33%
Germany	26,12%	33,58%	40,30%
Sweden	27,27%	43,18%	29,55%
Spain	3,13%	46,88%	50,00%
Italy	14,04%	64,91%	21,05%
France	36,60%	39,69%	23,71%
Denmark	58,17%	17,31%	24,52%
Switzerland	32,00%	26,67%	41,33%
Belgium	35,07%	42,54%	22,39%
Total	33,71%	37,01%	29,28%

To sum up, data indicated a high rate of non-response among individuals who were not able to state their expectations regarding future benefit, and secondly, that among individuals who do respond to the expectations question, around two-thirds are not able to estimate correctly their future amount of pension benefit. Thus, the picture emerging confirms the widespread uncertainty in the estimation of the replacement rate. Consequently, the poor awareness of individuals about their future retirement replacement rate may impact primarily the efficacy and quality of the individuals' retirement planning.

IV.   Conclusions

Many European pension systems have undergone strong reforms in the last decades. Early retirement pathways were deterred, statutory retirement ages were raised, eligibility conditions strengthened and generally, benefit pension lowered. Reforms not only influenced the retirement behavior of today's retirees but also future pensioners' expectations of when to retire. This thesis explores the information contained in retirement expectations of older Europeans, collected by SHARE, a cross-country survey gathering information on the health and socio-economic status of the EU population over 50 years old. By using the first six waves of the SHARE database, this thesis evaluates whether and to what extent individual's expectations about retirement are correlated with the statutory retirement provisions and with the actual decision taken by individuals about when and how to retire. The sample used for the analysis includes all the employed workers aged between 50- and 65-years of age living in nine European countries, namely Austria, Sweden, Germany, Spain, Italy, France, Denmark, Switzerland and Belgium.

The first part of the analysis reported in this thesis evaluated the correlation between the individuals' retirement age expectations and the eligibility age set by each country public pension schemes. The main results of this analysis were assessed by a linear regression model where expectations about retirement age were regressed on the legal age prescribed by the Social Security system as well as several individuals' social and demographical variables gathered at the time expectations were formed. Institutional eligibility ages of each country were collected thanks to the MISSOC tables, a database proving up-to-date information on European Social Protection systems.

Evidence from the analyses carried out suggest individuals do revise their expectation consistently to changes in the age eligibility rules set by Social Security systems. On the other hand, the revision of the expected retirement ages is incomplete, as it offsets only partially the changes implied in pension reforms. For instance, considering both the characteristics and the working history of individuals, results show how a one-year age increase demanded by public Social

Security system implies, on average, just a 2 months change in the age expected by men to access early retirement pension programs, while women rise their expectations even less, of approximately one month. Similarly, the effect of a one-year increase in the pensionable age for old-age pension schemes is perceived as a change of less than one month in men's expectations and a change of almost two months and a half for women's expectations. Therefore, even though these findings show that retirement expectations vary along with changes in the pension age eligibility set by the Social Security systems, this revision process is far from being complete. Reasons explaining this situation are not straightforward. A possible avenue to interpret this result is resorting to empirical evidence proving workers low level of financial and pension literacy. Klapper & al. (2015) define a person as financial literate if he or she scores at least 3 out of four correct answers about concepts as risk diversification, inflation, numeracy and compound interests. According to them, even though developed countries score on average higher than the rest of the world, fact supported also by Batsaikhan (2018), on average, just 52% of adults in the EU economies[19] are classified as financially literate, against the 33% of adults individuals worldwide (Klapper & al., 2015). Analyzing further the issue, they demonstrate that elderly Europeans lack the financial skills to deal with the economic challenge of retirement, as just 47% of those who do not save for old-age show understanding of basic financial concepts. On a similar note, OECD also provides comparable data on financial behaviour among European countries. The OECD/INFE financial literacy report (2016) estimates only half of the respondents do not set long-term financial goals in the majority of the 17 participating European countries (OECD, 2016). This evidence is particularly worrisome especially considering that, after recent reforms, individuals have more responsibility for accumulating by themselves the appropriate amount of resources to finance their retirement years by resorting to often voluntary schemes, as occupational and private pensions rather than to public pensions. Consequently, an adequate retirement income can be obtained only by an efficient financial planning, which in turn requires the possession of basic financial concepts that, according to the data presented, are ignored by half of the European population. Considering the above

[19] Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States.

point, the inability to process financial information, engage in computations, deal with interest rates and the low propensity for long term planning of Europeans adults may be connected with the understanding of pension institutions and the rules applied. As a consequence, individuals who do no not fully understand pension reforms contents and retirement rules are most likely to revise their expectations imprecisely. For instance, individuals may adjust their age expectations imprecisely because they fail to appreciate how new provisions are phased over time, they ignore most of the contents of new reforms, or because they find it difficult to understand new retirement regulations. Furthermore, limited revision of retirement age expectations can occur because of workers discounting the effect of future potential pension reforms. In other words, individuals who believe the Social System will be modified further before the time they will be retirees, tend to be less reactive to current change of statutory rules, and consequently, form either more approximated expectations on the time they will drop out of the workforce, or state expectations which may not be linked with current valid statutory rules. Other than economic considerations, it is also relevant to mention the limits imposed on the analysis, which may have influenced the results too. For instance, final outputs may have been partially influenced also by duly approximations of the MISSOC comparative tables (from which statutory age were extracted), which are finalized to communication and summary purposes.

Nevertheless, results obtained on the relationship between retirement age expectation and age eligibility conditions provided by Social Security provisions align with the results illustrated in previous studies, carried out by Knell et al. (2015), and Baldini et al. (2019) and Bottazzi et al. (2006), first and foremost on the fact that retirement expectations are adjusted in the direction implied by the reforms, even though only partially. All in all, the main findings of this analysis point to a positive and significant relationship between the individual's expectations and the retirement ages set by pension schemes. Yet, there is still an incomplete revision of expectations with respect to new retirement rules, most likely caused by the lack of pension awareness and financial literacy of workers. Therefore, evidence presented support the views according to which specific policies should be addressed to increase the pension awareness of future retirees, particularly in light

of new reforms which assign an increasing importance to the individual's retirement financial planning.

The second part of the thesis was focused on the relationship between expectation on retirement age and the subsequent economic choice undertaken by the individual concerning the exit from the labour market. The sample used for the analysis consists of the employees in the waves 1-5 of SHARE who retire by wave 6. For these individuals, we can compare their expectations concerning retirement age and replacement rates collected when at work with the corresponding realized outcomes (i.e. actual retirement age and actual replacement rate) collected once they retired. In this context, the main results of this analysis were assessed by a linear regression model where the actual retirement age of retired employees is regressed on the expectations about retirement age as well as on a set of individual and household characteristics collected when they were at work. Overall, results suggest the presence of a positive and significant relationship between expected and actual age of retirement, consistent with the main findings of Berheim (1989), Disney and Tanner (1999) and Ho & Raymo (2009), reporting people expectations constitute a reliable predictor of actual retirement events. However, the strong significance of retirement age expectations, holding all the other explanatory factors constant, suggests that expectations data can be seen as a proxy for non-observable individual's characteristics, as the preference for income level, taste for free time or optimal allocation for working and leisure activities, as suggested in the first place by Disney and Tanner (1999).

The last part of the thesis is centered on the relationship between individuals' expectations and realizations of the retirement replacement rate. First and foremost, it is important to recall that almost 30% of the sample interviewed is not able to report any data about the expected Security benefit amount, most likely due to the hardness of the concept these questions focus on. Indeed, in order to come up with an estimation, individuals need to develop expectations concerning the pension benefit computation formula in place when they will retire as well as their labour income and the length of their contribution history at the end of their working career. Nevertheless, in the selected sample of respondents for these questions, we find a significant correlation between expectations and realizations of

replacement rate. Following a regression analysis similar to that implemented to analyze the association between expected and realized retirement age, we find that everything else constant, an increase in the expected replacement rates by 1 percentage points is associated with an increase in the actual replacement rate by 0,4 percentage point for men and 0,3 for women. That is, expectations regarding benefit tend to constitute a valuable factor determining the future amount of benefit perceived, after screening for the effect of other individual's factors that may impact the realized replacement rate. Results from the analysis align with the evidence found by Berheim (1987), who proves consumers, albeit do not consider all the information available, report accurate expectations.

To summarize, this thesis has tried to shed some light on the information contained in retirement expectations of older workers. Firstly, evidence show retirement age expectations of the individuals belonging to the sample constitutes valuable information, because they are significantly related both with institutional rules governing public pension systems, and with the retirement choice eventually taken by individuals. In this sense, findings are encouraging because they prove people take into account pension system rules that should, in fact, contribute to the formation of their expectations. Moreover, findings indicate people's expectations about retirement are consistent with future behaviors and choices actually made by individuals. On the other hand, however, the adjustment of individuals' expectations following a change in retirement age eligibility is only partial, as well as a change in expectations does not imply a change of the same extent of the related realizations. Furthermore, considering expectations on replacement rate, data emphasize only a part of the sample considered is able to formulate an expectation in this regard. Even though the estimation of the future retirement benefit can be considered as a complex task, expectations around replacement rate are still relevant to individuals, for instance, to decide how much private savings to accumulate to finance the years of old age. These difficulties may interfere with an efficient retirement planning process and consequently, they may cause damages to the individual's future pension adequacy. Overall, evidence gathered throughout the analysis supports the view found in previous academic papers regarding the fundamental role attributed to public policy aimed to increase awareness on pension regulations and financial

education, especially among the least financially literate groups of the society, who might be more exposed to the risk of retirement unreadiness.

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Appendix

A

The section Employment and pension of the SHARE survey includes several questions about retirement expectations. First of all, respondents are asked whether they believe to be entitled to a future pension by question ep097, reported below:

"Now we are talking about future pension entitlements. Are you entitled to at least one pension listed on this card which you do not receive currently?"
1.Yes
2. No

In case of affirmative response, they need to state which type of pension programs they think to be entitled to (question ep098).

"Which type or types of pension are you entitled to?
1. Public old-age pension
2. Public early retirement or pre-retirement pension
3. Public disability insurance; sickness/invalidity/incapacity pension
4. Private (occupational) old-age pension
5. Private (occupational) early retirement pension
96. None of these"

For each of the pension programs selected, individuals have to answer question ep106 and ep109, respectively on retirement age expectations and replacement rate expectations, which are described in section 3.1.2.

B

TABLE 6: Determinants of retirement age expectations. Ordinary Least Squares regression estimation. (institutional variables erpAGE and opAGE).

| | erpAGE | | opAGE | |
| | MALE | FEMALE | MALE | FEMALE |
VARIABLES	eAGE	eAGE	eAGE	eAGE
Insitutional variable				
erpAGE	0.3821***	0.2973***		
	(0.0529)	(0.0269)		
opAGE			0.0463	0.2546***
			(0.0289)	(0.0207)
Geographical area				
Germany	1.5362***	3.0361***	1.6934***	2.7205***
	(0.1221)	(0.1505)	(0.1190)	(0.1586)
Sweden	2.5482***	3.6890***	2.1118***	3.9711***
	(0.1457)	(0.1386)	(0.1514)	(0.1210)
Spain	2.7876***	3.4913***	1.8139***	2.6323***
	(0.2049)	(0.1702)	(0.1534)	(0.1949)
Italy	3.9299***	4.0915***	0.7060***	2.0821***
	(0.4601)	(0.2021)	(0.1775)	(0.1759)
France	1.4916***	2.5368***	-1.1958***	1.2405***
	(0.4203)	(0.1558)	(0.1829)	(0.1311)
Denmark	2.2060***	3.5826***	3.1394***	4.2508***
	(0.1730)	(0.2140)	(0.1131)	(0.1526)
Switzerland	1.7503***	2.6618***	1.9193***	2.6786***
	(0.1192)	(0.1496)	(0.1164)	(0.1390)
Belgium	1.0591***	2.0544***	0.0851	1.3237***
	(0.1898)	(0.1353)	(0.1329)	(0.1596)
Demographical variables				
age	0.1755***	0.1684***	0.1894***	0.1839***
	(0.0074)	(0.0072)	(0.0075)	(0.0071)
born between 1945-1950	-0.1407	0.1142	-0.0544	0.3760***
	(0.0958)	(0.0997)	(0.0932)	(0.1037)
born between 1950-1955	0.1185	0.3094***	0.2797***	0.6794***
	(0.0911)	(0.0957)	(0.0901)	(0.1004)
born between 1955-1960	0.6262***	0.9008***	0.8466***	1.3273***
	(0.1029)	(0.1086)	(0.1019)	(0.1105)
born after 1960	1.6575***	1.9519***	1.9385***	2.4105***
	(0.1275)	(0.1285)	(0.1268)	(0.1286)
secondary education	0.1527**	0.1762***	0.1552**	0.1708***
	(0.0733)	(0.0630)	(0.0739)	(0.0631)
tertiary education	0.8438***	0.5126***	0.8346***	0.4980***
	(0.0840)	(0.0701)	(0.0845)	(0.0703)
Cognitive abilities variables				
numeracy	0.0352	0.0476**	0.0395	0.0448*
	(0.0269)	(0.0238)	(0.0270)	(0.0237)
fluency	0.0003	0.0047	0.0002	0.0060**

VARIABLES	erpAGE		opAGE	
	MALE	FEMALE	MALE	FEMALE
	eAGE	eAGE	eAGE	eAGE
	(0.0034)	(0.0030)	(0.0034)	(0.0030)
short recall	0.0278	0.0116	0.0313*	0.0094
	(0.0173)	(0.0157)	(0.0173)	(0.0158)
long recall	0.0050	0.0161	0.0025	0.0190
	(0.0149)	(0.0130)	(0.0149)	(0.0130)
Health status				
fair health status	-0.2418***	-0.2194***	-0.2478***	-0.2170***
	(0.0444)	(0.0402)	(0.0446)	(0.0400)
poor health status	-1.0425***	-0.4846***	-1.0343***	-0.4881***
	(0.1897)	(0.1599)	(0.1918)	(0.1579)
Employment type				
blue collars	-0.1146**	0.1315***	-0.1227**	0.1484***
	(0.0552)	(0.0484)	(0.0553)	(0.0485)
public sector	-0.5803***	-0.3126***	-0.5536***	-0.3077***
	(0.0597)	(0.0464)	(0.0599)	(0.0461)
Household composition				
partner	-0.0887	-0.3348***	-0.0862	-0.3336***
	(0.0711)	(0.0521)	(0.0715)	(0.0521)
grandchildren	-0.1891***	-0.1383***	-0.1868***	-0.1394***
	(0.0500)	(0.0442)	(0.0500)	(0.0441)
children	-0.0884	0.2590***	-0.1004	0.2533***
	(0.0802)	(0.0749)	(0.0809)	(0.0747)
Economic variables				
low-intermediate income	0.0127	-0.1455***	0.0287	-0.1397***
	(0.0688)	(0.0455)	(0.0692)	(0.0455)
upper-intermediate income	-0.0633	-0.1564***	-0.0595	-0.1495***
	(0.0640)	(0.0521)	(0.0643)	(0.0520)
high income	-0.0098	-0.0123	-0.0059	0.0094
	(0.0652)	(0.0657)	(0.0654)	(0.0653)
low-intermediate wealth	-0.3270***	-0.2563***	-0.3305***	-0.2628***
	(0.0618)	(0.0544)	(0.0620)	(0.0545)
upper-intermediate wealth	-0.3597***	-0.3097***	-0.3615***	-0.3242***
	(0.0638)	(0.0578)	(0.0641)	(0.0578)
high wealth	-0.4096***	-0.3122***	-0.4045***	-0.3225***
	(0.0697)	(0.0603)	(0.0698)	(0.0602)
Constant	28.4381***	32.4224***	48.3462***	33.2614***
	(3.2849)	(1.5661)	(2.0290)	(1.3824)
Observations	12,334	13,438	12,334	13,438
R-squared	0.3916	0.4332	0.3852	0.4353

Notes:

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

Robust standard errors (in parentheses) allows the arbitrary correlation in the error term at the individual level.

(1) erpAGE indicates the minimum age of early retirement pension, accounting the individual's characteristics.

(2) opAGE indicates the minimum age of old-age retirement pension, accounting the individual's characteristics.

TABLE 6: Determinants of retirement age expectations. Ordinary Least Squares regression estimation. (institutional variables earlyAGE and oldAGE).

| | earlyAGE | | oldAGE | |
| | MALE | FEMALE | MALE | FEMALE |
VARIABLES	eAGE	eAGE	eAGE	eAGE
Insitutional variable				
earlyAGE	0.1465***	0.0903***		
	(0.0188)	(0.0151)		
oldAGE			0.0499**	0.2147***
			(0.0220)	(0.0176)
Geographical area				
Germany	1.5446***	3.6529***	1.6958***	2.9335***
	(0.1216)	(0.1382)	(0.1190)	(0.1486)
Sweden	2.1965***	4.2730***	2.1270***	4.0303***
	(0.1248)	(0.1230)	(0.1391)	(0.1201)
Spain	1.4623***	3.4575***	1.8401***	2.9362***
	(0.1666)	(0.2024)	(0.1594)	(0.1950)
Italy	0.9126***	2.4591***	0.7731***	2.1883***
	(0.1786)	(0.1835)	(0.1880)	(0.1840)
France	-0.5009***	1.6841***	-1.2648***	0.8976***
	(0.1826)	(0.1337)	(0.1455)	(0.1398)
Denmark	2.7938***	4.9611***	3.1413***	4.4284***
	(0.1223)	(0.1503)	(0.1131)	(0.1442)
Switzerland	1.8618***	3.3935***	1.9210***	2.8355***
	(0.1170)	(0.1251)	(0.1164)	(0.1330)
Belgium	0.1176	2.1513***	0.0842	1.4900***
	(0.1326)	(0.1431)	(0.1329)	(0.1522)
Demographical variables				
age	0.1799***	0.1780***	0.1865***	0.1710***
	(0.0075)	(0.0073)	(0.0075)	(0.0070)
born between 1945-1950	-0.0287	0.1662*	-0.0116	0.3175***
	(0.0886)	(0.0984)	(0.0930)	(0.1029)
born between 1950-1955	0.2929***	0.4639***	0.3085***	0.5574***
	(0.0835)	(0.0947)	(0.0885)	(0.0992)
born between 1955-1960	0.8338***	1.1722***	0.8584***	1.1745***
	(0.0968)	(0.1062)	(0.1005)	(0.1092)
born after 1960	1.8808***	2.3006***	1.9472***	2.2509***
	(0.1236)	(0.1268)	(0.1262)	(0.1274)
secondary education	0.1101	0.1570**	0.1598**	0.1715***
	(0.0744)	(0.0634)	(0.0747)	(0.0635)
tertiary education	0.7629***	0.4690***	0.8347***	0.4900***
	(0.0850)	(0.0701)	(0.0850)	(0.0705)
Cognitive abilities variables				
numeracy	0.0383	0.0426*	0.0431	0.0430*
	(0.0271)	(0.0238)	(0.0271)	(0.0237)
fluency	0.0013	0.0059*	0.0008	0.0072**
	(0.0034)	(0.0030)	(0.0034)	(0.0030)
short recall	0.0318*	0.0085	0.0312*	0.0024

	earlyAGE		oldAGE	
	MALE	FEMALE	MALE	FEMALE
VARIABLES	eAGE	eAGE	eAGE	eAGE
	(0.0173)	(0.0158)	(0.0174)	(0.0158)
long recall	0.0022	0.0184	0.0003	0.0175
	(0.0149)	(0.0131)	(0.0150)	(0.0131)
Health status				
fair health status	-0.2498***	-0.2241***	-0.2444***	-0.2150***
	(0.0444)	(0.0403)	(0.0448)	(0.0400)
poor health status	-1.0113***	-0.4665***	-1.0353***	-0.4980***
	(0.1929)	(0.1645)	(0.1918)	(0.1600)
Employment type				
blue collars	-0.1070*	0.1409***	-0.1258**	0.1393***
	(0.0556)	(0.0488)	(0.0557)	(0.0486)
public sector	-0.6533***	-0.3532***	-0.5448***	-0.2157***
	(0.0598)	(0.0466)	(0.0603)	(0.0468)
Household composition				
partner	-0.1003	-0.3275***	-0.0917	-0.3413***
	(0.0713)	(0.0524)	(0.0713)	(0.0524)
grandchildren	-0.1843***	-0.1208***	-0.2025***	-0.1439***
	(0.0499)	(0.0445)	(0.0503)	(0.0442)
children	-0.0722	0.2512***	-0.0948	0.2517***
	(0.0810)	(0.0757)	(0.0817)	(0.0753)
Economic variables				
low-intermediate income	0.0391	-0.1434***	0.0399	-0.1440***
	(0.0692)	(0.0460)	(0.0697)	(0.0456)
upper-intermediate income	-0.0541	-0.1463***	-0.0574	-0.1372***
	(0.0644)	(0.0526)	(0.0648)	(0.0521)
high income	0.0034	-0.0019	0.0009	0.0105
	(0.0653)	(0.0660)	(0.0658)	(0.0654)
low-intermediate wealth	-0.3134***	-0.2605***	-0.3233***	-0.2877***
	(0.0623)	(0.0548)	(0.0625)	(0.0547)
upper-intermediate wealth	-0.3569***	-0.3236***	-0.3569***	-0.3347***
	(0.0645)	(0.0581)	(0.0646)	(0.0581)
high wealth	-0.3821***	-0.3053***	-0.3918***	-0.3248***
	(0.0700)	(0.0604)	(0.0702)	(0.0604)
Constant	42.7308***	43.7855***	48.2246***	36.5498***
	(1.2311)	(0.9398)	(1.5402)	(1.1754)
Observations	12,190	13,284	12,166	13,273
R-squared	0.3951	0.4331	0.3884	0.4382

Notes:

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

Robust standard errors (in parentheses) allows the arbitrary correlation in the error term at the individual level.

(3) earlyAGE indicates the minimum age of early retirement pension, accounting the individual's characteristics and contribution history.

(4) oldAGE indicates the minimum age of old-age retirement pension, accounting the individual's characteristics and contribution history.

TABLE 8: Determinants of retirement age expectations. Ordinary Least Squares regression estimation. (institutional variable mixAGE).

	mixAGE	
	MALE	FEMALE
VARIABLES	eAGE	eAGE
Insitutional variable		
mixAGE	0.0785***	0.0759***
	(0.0118)	(0.0103)
Geographical area		
Germany	1.5870***	3.6545***
	(0.1211)	(0.1298)
Sweden	2.0398***	4.2807***
	(0.1213)	(0.1204)
Spain	1.6474***	3.5699***
	(0.1619)	(0.1872)
Italy	0.7828***	2.5094***
	(0.1747)	(0.1740)
France	-1.2325***	1.3428***
	(0.1394)	(0.1322)
Denmark	2.9627***	5.0688***
	(0.1172)	(0.1303)
Switzerland	1.8997***	3.4620***
	(0.1168)	(0.1179)
Belgium	0.1052	2.2254***
	(0.1329)	(0.1342)
Demographical variables		
age	0.1693***	0.1642***
	(0.0079)	(0.0077)
born between 1945-1950	-0.0487	0.2102**
	(0.0896)	(0.0974)
born between 1950-1955	0.2499***	0.4714***
	(0.0845)	(0.0936)
born between 1955-1960	0.7804***	1.1630***
	(0.0978)	(0.1052)
born after 1960	1.8230***	2.2676***
	(0.1246)	(0.1260)
secondary education	0.1408*	0.1665***
	(0.0741)	(0.0633)
Tertiary education	0.8138***	0.4879***
	(0.0847)	(0.0702)
Cognitive abilities variables		
numeracy	0.0392	0.0469**
	(0.0270)	(0.0237)
fluency	0.0012	0.0059*
	(0.0034)	(0.0030)
short recall	0.0318*	0.0063
	(0.0174)	(0.0157)
long recall	-0.0004	0.0165

	mixAGE	
	MALE	FEMALE
VARIABLES	eAGE	eAGE
	(0.0149)	(0.0131)
Health status		
fair health status	-0.2514***	-0.2259***
	(0.0446)	(0.0402)
poor health status	-1.0180***	-0.4773***
	(0.1922)	(0.1655)
Employment type		
blue collars	-0.1105**	0.1436***
	(0.0555)	(0.0487)
public sector	-0.6007***	-0.3308***
	(0.0596)	(0.0466)
Household composition		
partner	-0.0881	-0.3255***
	(0.0713)	(0.0525)
grandchildren	-0.1849***	-0.1214***
	(0.0498)	(0.0444)
children	-0.0924	0.2469***
	(0.0809)	(0.0754)
Economic variables		
low-intermediate income	0.0407	-0.1383***
	(0.0692)	(0.0459)
upper-intermediate income	-0.0451	-0.1553***
	(0.0642)	(0.0525)
high income	0.0048	-0.0087
	(0.0652)	(0.0660)
low-intermediate wealth		
	-0.3282***	-0.2590***
upper-intermediate wealth	(0.0623)	(0.0548)
	-0.3643***	-0.3216***
high wealth	(0.0644)	(0.0581)
	-0.4069***	-0.3088***
Constant	(0.0701)	(0.0605)
	47.6054***	45.3741***
	(0.7720)	(0.6500)
Observations	12,263	13,337
R-squared	0.3898	0.4328

Notes:

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

Robust standard errors (in parentheses) allows the arbitrary correlation in the error term at the individual level.

(5) mixAGE indicates the individual's minimum age of retirement (either old-age or early retirement pension)

*T*ABLE 10: Determinants of retirement age realization. Ordinary Least Squares regression estimation.

	rAGE	
	MALE	FEMALE
VARIABLES	rAGE	rAGE
Expectation variable		
Expected Age	0.3140***	0.3219***
	(0.0227)	(0.0252)
Geographical area		
Germany	0.8298***	0.6937***
	(0.2153)	(0.2309)
Sweden	1.3193***	1.4314***
	(0.2097)	(0.2223)
Spain	0.8464***	1.1940***
	(0.2888)	(0.3932)
Italy	0.1061	-0.0026
	(0.2614)	(0.2652)
France	0.5623***	0.8028***
	(0.1929)	(0.1914)
Denmark	0.3783*	0.1949
	(0.2240)	(0.2312)
Switzerland	0.8574***	0.9252***
	(0.2042)	(0.2449)
Belgium	0.2145	0.7408***
	(0.1952)	(0.1974)
Demographical variables		
age	0.2936***	0.2488***
	(0.0145)	(0.0167)
born between 1945-1950	-0.2380**	-0.1300
	(0.1165)	(0.1520)
born between 1950-1955	-1.3475***	-1.3713***
	(0.1350)	(0.1651)
born after 1955	-3.5672***	-3.1409***
	(0.2413)	(0.2813)
secondary education	-0.1240	0.0616
	(0.1234)	(0.1261)
tertiary education	-0.0310	0.0391
	(0.1380)	(0.1487)
Cognitive abilities variables		
numeracy	0.0766	-0.0150
	(0.0468)	(0.0457)
fluency	0.0011	-0.0034
	(0.0064)	(0.0075)
short recall	0.0071	0.0169
	(0.0325)	(0.0319)
long recall	-0.0257	0.0034

	rAGE	
	MALE	FEMALE
VARIABLES	rAGE	rAGE
	(0.0259)	(0.0266)
Health status		
fair health status	-0.1267	-0.1264
	(0.0811)	(0.0860)
poor health status	-0.9115*	-0.8859***
	(0.4954)	(0.2966)
Employment type		
blue collars	-0.0936	0.1224
	(0.1057)	(0.1158)
public sector	-0.1727	-0.1139
	(0.1072)	(0.1136)
Household composition		
partner	-0.0849	-0.2037*
	(0.1112)	(0.1128)
grandchildren	-0.0872	-0.2456**
	(0.0929)	(0.1018)
children	-0.0689	0.3727**
	(0.1392)	(0.1753)
Economic variables		
low-intermediate income	0.0308	0.1004
	(0.1278)	(0.1034)
upper-intermediate income	0.0126	0.2073*
	(0.1108)	(0.1102)
high income	0.0612	0.3618***
	(0.1119)	(0.1383)
low-intermediate wealth	-0.1546	-0.0746
	(0.1164)	(0.1168)
upper-intermediate wealth	-0.0507	0.0265
	(0.1201)	(0.1176)
high wealth	-0.0979	0.0431
	(0.1283)	(0.1254)
Constant	25.2587***	26.8635***
	(1.3641)	(1.4503)
Observations	2,669	2,621
R-squared	0.6687	0.5932

Notes:

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

Robust standard errors (in parentheses) allows the arbitrary correlation in the error term at the individual level.

(1) *rAGE*, the realized age of retirement, is the dependent variable.

TABLE 16: Determinants of retirement replacement rate realizations. Ordinary Least Squares regression estimation..

VARIABLES	rRR	
	MALE	FEMALE
	rRR	rRR
Expectation variable		
expected RR	0.4192***	0.3035***
	(0.0503)	(0.0542)
Geographical area		
Central EU	2.6881	11.4960***
	(2.4936)	(2.7843)
Southern EU	5.3247	10.7018***
	(3.4499)	(3.8823)
Demographical variables		
age	-1.7595***	-1.9396***
	(0.3121)	(0.3410)
born between 1945-1950	-6.8202***	-9.2066***
	(2.4949)	(2.7182)
born between 1950-1955	-13.2685***	-14.8598***
	(3.4243)	(3.5048)
born after 1955	-17.8830***	-7.7807
	(5.6883)	(5.0870)
secondary education	-0.1346	-5.4266*
	(2.9736)	(3.1212)
tertiary education	4.7435	-4.4252
	(3.4761)	(3.2610)
Cognitive abilities variables		
numeracy	0.3536	-0.8083
	(1.1563)	(1.2214)
fluency	-0.0503	0.2589
	(0.1539)	(0.1576)
short recall	1.1312	0.0061
	(0.7940)	(0.7444)
long recall	-0.1038	-0.2035
	(0.6917)	(0.6156)
Health status		
fair health status	1.3376	2.4650
	(1.9664)	(2.0622)
poor health status	-1.1841	6.2128
	(8.7227)	(5.9430)
Employment type		
blue collars	2.1655	-8.9423***
	(2.7608)	(2.7572)
public sector	1.7534	-1.5499
	(2.6534)	(2.3174)
Household composition		
partner	-4.7778	-3.8574

VARIABLES	rRR	
	MALE	FEMALE
	rRR	rRR
	(3.1103)	(2.8730)
grandchildren	0.5616	1.0982
	(2.1284)	(2.4656)
children	1.9168	1.7288
	(3.7214)	(4.0488)
Economic variables		
low-intermediate income	-12.8926***	-11.2378***
	(4.0373)	(2.9957)
upper-intermediate income	-21.2936***	-14.6597***
	(3.9484)	(3.0743)
high income	-26.6692***	-20.9040***
	(3.8702)	(3.6178)
low-intermediate wealth	-2.4293	4.9059
	(2.7804)	(3.0349)
upper-intermediate wealth	-0.9640	4.0856
	(2.7651)	(2.9085)
high wealth	2.7564	2.1075
	(3.0549)	(3.2443)
Constant	158.6596***	175.7749***
	(19.9861)	(21.5897)
Observations	1,014	886
R-squared	0.2229	0.2248

Notes:

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

Robust standard errors (in parentheses) allows the arbitrary correlation in the error term at the individual level.

(1) *rRR*, the retirement realized replacement rate, is the dependent variable.