

Labour-Managed Firms in Portugal: An Empirical Analysis of Cooperatives' Feasibility

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November, 2024

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Acknowledgements

I am deeply grateful to the unconditional support and acute guidance of Professor Joaquim Ramalho. I deeply thank Professor Arlindo Donário for all the years of shared knowledge. I am also grateful to Professor Mónica Meireles for her singular insights and support. I thank both the support of UAL and ISCTE-IUL. I am grateful to all my ISCTE-IUL fellow colleagues who with me shared this fascinating journey.

Finally, I dedicate this work to my family, especially my wife and daughters who endured my absence.

Resumo

Ao longo deste trabalho procurámos compreender a raridade das cooperativas através do estudo do caso português. As cooperativas parecem ter um desempenho eficiente e altas taxas de sobrevivência. A sua raridade, portanto, pode dever-se às baixas taxas de nascimento. A criação de uma organização cooperativa depende da vontade dos indivíduos e esta vontade baseia-se em incentivos. Para que os indivíduos criem ou se juntem a uma cooperativa, eles precisam de querer e poder fazê-lo. A grande maioria dos indivíduos depende dos seus rendimentos do trabalho e os portugueses não são exceção. Começámos por estudar se as cooperativas consideram tanto o emprego como o rendimento na sua função de bem-estar e descobrimos que sim, sobrepondo os salários. Posteriormente, estudámos se as cooperativas são atraentes do ponto de vista salarial para os indivíduos quando comparadas às empresas capitalísticas e descobrimos que sim. Portanto, o rendimento não é uma fonte de raridade das cooperativas. No entanto, a teoria do ciclo de vida das cooperativas afirma que estas podem degenerar para um comportamento capitalístico. Neste sentido, estudámos se as cooperativas portuguesas degeneram e verificámos que sim, sobretudo devido a jóias incomportáveis. Este processo degenerativo poderia ser ultrapassado através de financiamento externo. Neste sentido, estudámos se as cooperativas têm dificuldade em angariar fundos e descobrimos que sim, nomeadamente porque os credores não reconhecem os seus ativos fixos como garantias sólidas. De um modo geral, verificámos que a degenerescência e a escassez de fundos externos contribuem para a raridade das cooperativas, que poderia ser ultrapassada através da criação de um mercado de títulos e de uma autorização multisectorial para as cooperativas.

Classificação JEL: P12; P13.

Palavras-chave: Raridade das Cooperativas; Bem-estar; Rendimento; Degenerescência; Financiamento.

Abstract

Throughout this work we have tried to understand cooperatives' rarity by studying the Portuguese case. Cooperatives seem to perform efficiently and have high rates of survival. Their rarity thus may be due to low birth rates. The creation of a cooperative organisation depends on individuals' willingness and this will is incentive-based. For individuals to create or join a cooperative they need to want and be able to do so. The vast majority of individuals depend on their labour income and the Portuguese are no exception. We began to study if cooperatives elicit both employment and income in their welfare function and we found that they do, enhancing wages. Subsequently, we studied if cooperatives are income appealing to individuals when compared to capitalistic firms and we found that they are. Thus, income is not a source for cooperatives' rarity. However, cooperatives' life cycle theory asserts that they may degenerate to a capitalistic behaviour. In this sense, we studied if Portuguese cooperatives degenerate and we found that they do, especially due to unbearable membership fees. This degenerative process could be overcome through external funding. In this sense, we studied if cooperatives struggle to raise funds and we found that they do, namely because lenders do not recognize their fixed assets as sound collaterals. Overall, we find that degeneration and external fund shortage contribute to cooperatives' rarity, which could be overcome through the creation of both a membership market and a multi-industry permit for cooperatives.

JEL Classification: P12; P13.

Keywords: Cooperatives' rarity; Welfare; Income; Degeneration; Funding.

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List of abbreviations

Abbreviation	Meaning
AAG	Associations with Altruistic Goals
CASES	Cooperativa António Sérgio for the Social Economy Sector
CLOGLOG	Complementary Log-log Function
CLRI	Collective Labour Regulatory Instruments
EU	European Union
GVA	Gross valued added
HHM	Holy Houses of Mercy
INE	Statistics Portugal
LOGIT	Logistic Unit Function
MA	Mutualist Associations
OLS	Ordinary Least Squares
PC	Producer Cooperatives
PROBIT	Normal Probability Unit Function
QP	Quadros de Pessoal
RESET	Ramsey Regression Equation Specification Error Test
SCIE	Firms' Integrated Accounting System
SE	Social Economy
SESA	Social Economy Satellite Account
SESS	Social Economy Sector Survey
US	United States of America
WMF	Worker Managed Firms

Introduction

Cooperatives have been a reality at least for the past two centuries^{1,2}, but never achieved a prominent place in the economic realm.

Cooperatives differentiate themselves from capitalistic firms³ by having specific characteristics, anchored in the cooperative principles, such as free-adherence, mutual-aid, job-protection and democratic-ruling. These characteristics should be attractive to individuals because they allow them to tendentially receive their full added value and simultaneously cooperatives may induce growth due to the mandatory funds they have to retain, namely for all workers' education. However, cooperatives continue to be rare around the world.

On the second half of the XXth century cooperatives' research gained a different perspective after the works of Ward (1958), Domar (1966) and Vanek (1970). These authors developed what was to be known as the Ward-Domar-Vanek (WDV) hypothesis, which sustains that cooperatives' goal is to maximize income per member. This hypothesis nurtures the belief that cooperatives may behave as capitalistic firms do and thus be only interested in maximizing income.

In developed economies, cooperatives amount for 3-4 percent of total firms (Dow, 2018). The “Quadros de Pessoal” (QP) database organised by Statistics Portugal (INE) has collected information about almost half of the Portuguese cooperatives (SESS, 2019) and has information about cooperatives since 1985. In 1985, Portuguese cooperatives, covered by QP, were around 1 600, while in 2019 were slightly more than 900 firms. This difference indicates a downward trend in the number of cooperatives in Portugal. If we consider the specific period of our work, 2010-2019, the number of Portuguese cooperatives decreased in all years, except in 2011.

On the other hand, Portuguese capitalistic firms seem to have increased. QP database also has information about these firms for the same period. In 1985, capitalistic firms were approximately 55 000 while in 2019 they amounted to almost 157 thousand firms.

The birth rate seems to be in favour of capitalistic firms. However, cooperatives seem to have higher probability of survival than capitalistic firms do (Ben-Ner, 1988; Burdín, 2014), even in Portugal (Monteiro and Stewart, 2015). This may have to do with cooperatives' job-protective nature.

Ireland and Law (1982), Miyazaki and Neary (1983), Stephen (1984), and Bonin and Putterman (1987) found no evidence of employment-sacrifice in cooperatives. Two important works were

¹ See Garteiz-Aurrecoa (2012).

² The cooperative movement is in debt to names such as Plockboy, Bellers, Owen, Walras, Stuart Mill, Fourier, King, Derrion, Buchez, Blanc, Schulze-Delitzsch, Raiffeisen, Wollemborg, Luzzatti, Fabre, Boyve, Marion, Durkheim, Bourgeois, Lavergne, Poisson, and especially Gide and Fauquet, which influenced António Sérgio to develop the foundations of the cooperative movement in Portugal.

³ We are considering capitalistic firms the organisations that pursue profit with the purpose of distributing it among capital owners. We only consider limited-liability companies and share-owned firms because they are the most significant types of firms apart from individually-owned firms.

developed by Craig and Pencavel (1993) and Burdín and Dean (2012). These authors found that cooperatives were effectively considering both employment and income in their welfare function with greater weight on employment. This finding may indicate that cooperatives could be more appealing than capitalistic firms are to individuals by assuring employment. Following this line of reasoning, in our first essay we try to understand if Portuguese cooperatives integrate both employment and income in their goals and what is the relative importance of each. This investigation will allow us to understand if there is a trade-off between employment and income in Portugal. We found that Portuguese cooperatives weigh both employment and income, but with greater importance on wages, which may reflect a capitalistic-like behaviour of Portuguese cooperatives.

Assuring job-protection may be not sufficient to attract individuals to cooperatives. It is important to understand if cooperatives are income-appealing to them. Arando *et al.* (2012), Pérotin (2012), Pencavel (2013) and Delgado and Laliberté (2014) found that companies owned and managed by workers tend to be more efficient than the capitalistic firms whose main objective is to maximize the profit and distribute it among capital owners. Fakhfakh *et al.* (2012) showed that cooperatives are more efficient in France. Mikami (2018) found no evidence that capitalistic firms are more efficient than cooperatives. Monteiro and Straume (2018) found some dubious conclusions about cooperatives efficiency in Portugal but tendentially in agreement with these previous studies. Ting Ren *et al.* (2019) found evidence that Chinese cooperatives outperformed other types of firms. This approach induces the explanation of why cooperatives could be a good solution for the trade-off between efficiency and wealth distribution. Even if cooperatives and capitalistic firms are equal in terms of productivity levels, wages may not be the same in both types of firms. In our second essay, we try to understand if cooperatives are sufficiently income-appealing for individuals for them to choose to work in cooperatives. Using a mincerian-based model, we found that wages are higher in cooperatives when compared to capitalistic firms and other non-profit organisations. We also found that the gender wage gap is lower in cooperatives and the collective labour regulatory instruments have a negative impact on wages, if not mandatory.

Even if individuals are attracted to work in cooperatives due to appealing wages, it is not guaranteed that they are able to become members, namely due to obstacles as the membership fee. Membership was firstly addressed by introducing both the risks of voluntary decision to join a cooperative (Mead, 1972) and the opportunity cost of membership (Steinherr and Thisse, 1979; Brewer and Browning, 1982). These authors paved the way to a better understanding on how cooperatives cope with the free-adherence principle. In fact, cooperatives' life cycle theory sustains that after overcoming the economic uncertainty phase, cooperatives may experience degeneration (Meister, 1984; Rosner, 1984; Cornforth, 1995; Chaves and Sajardo, 2004; Cook, 2018; Bretos *et al.*, 2019). The economic uncertainty phase seems to be overcome due to cooperatives' efficiency track record. Degeneration may impose itself due to the horizon problem cooperatives face. Cooperative members are kin to substitute leaving members by non-member workers, namely because there is no membership market. The lack of this market imposes a

high intertemporal rate of discount to members, which is reflected in preferring wages today against uncertain surplus tomorrow. In this line of reasoning, in our third essay we will try to understand if Portuguese cooperatives endure degeneration, which may cease cooperatives' development. Using fractional response models, we found that Portuguese cooperatives endure degeneration potentiated by high membership fees. We also find that the horizon problem enhances degeneration in Portuguese cooperatives.

The horizon problem cooperatives face arises from the choice between today's wages and uncertain future returns that may not benefit a specific member, especially if those returns become effective when the member is no longer part of the cooperative. This uncertainty regarding the members' length of stay is exacerbated by divergences among them concerning different projects, which leads to reduced investments in cooperatives. Pejovich (1969), Furubotn and Pejovich (1970), Vanek (1970), Furubotn (1971 and 1976), Jensen and Meckling (1979), Drèze (1989) and Podivinsky and Stewart (2007) sustained that the cooperative-type firm would evidence difficulty in gathering funds to invest due to market imperfections. In this sense, we try to understand if cooperatives struggle to raise funds in our fourth essay. Using binary choice and fractional response models we found that Portuguese cooperatives struggle to raise funds. We also found that cooperatives' fixed assets do not mitigate this struggle.

These four axes allow us to further understand why cooperatives are rare. Nonetheless, there have been some other perspectives that tried to understand cooperatives' rarity. One way that may contribute to cooperatives' rarity is the productivity veil. For instance, Alchian and Demsetz (1972) analysed the hardship of monitoring individual productivity thus leading to a workers' shirking-effect on cooperatives. These authors asserted that this could be overcome by the introduction of an impartial spectator, with management responsibilities, who would receive a reward based on profit. This framework would transform cooperatives into a capitalistic firm, explaining why, according to the authors, cooperatives are rare. We did not follow this perspective because rewarding based on profit is not possible under the Portuguese cooperative law and some authors (Eswaran and Kotwal, 1984; Putterman, 1984; MacLeod, 1987 and 1988) sustain that productivity measurement could be more efficient in the hands of a group of members in opposition to Alchian and Demsetz's position.

Another way that has been put forward to explain cooperatives' rarity is the problem that might arise from the lack of members' agreement in the decision process. Hansmann (1990) and Benham and Keefer (1991) discussed that workers have different utilities depending on several dimensions of their life, namely income and employment, while investors may be considered to have a homogeneous behaviour, that is, profit maximization. This entrepreneurs' homogenous behaviour could be a driver for cooperatives because of their efficiency track record. Marglin (1974) and Edwards (1979) sustain that innovation depends on entrepreneur's urge to act and their knowledge. Entrepreneur's urge to act is driven by profit, which encounters several barriers in the Portuguese cooperative law. Probably this is why the recent introduction of the "member-investor" concept in the Portuguese cooperative law has not convinced entrepreneurs. Regarding entrepreneur's knowledge about cooperatives, it may be

affected by asymmetric information problems, namely moral hazard and adverse selection. Nonetheless, MacLeod (1988), Putterman and Skillman (1992), Dong and Dow (1993) and Dow (2000) by using cooperative game theory with repeated interactions, showed that cooperatives' design surpasses possible disagreements among members and thus achieve efficient results at least as optimal as the ones capitalistic firms present. Following this line of thought, the authors predict that cooperatives may be able to achieve higher productivity levels and thus be able to pay higher wages. Once again, here lays the importance of studying wages and leverage capacity in cooperatives as we do in essays 2 and 4.

Another path that was considered was to understand if both capital and labour markets depart from the walrasian competitive equilibria. Bowles and Gintis (1990, 1993a, 1993b, 1993c, 1993d, 1994, 1996a and 1996b) encountered some market imperfections both in the labour and capital markets. In the capital market, the imperfections stem from the fact that lenders' risk cannot be reflected in loan contracts, which may reflect the struggle cooperatives may face to raise funds. Probably, the authors already had the intuition that cooperatives' fixed assets may not be perceived by lenders as sound collaterals. In the labour market, the imperfections may be originated by the fact that workers' real effort cannot be written in a labour contract. The latter could be mitigated by the right incentives, while the former demands a tighter relationship between cooperatives and the financial system. From all the contributes of these authors, probably the most important was their diagnosis for cooperatives' rarity: simply because, on average, workers are poor, thus impeding them to access to capital markets. This strengthens the importance of investigating if cooperatives are income-appealing to workers and if they struggle to raise funds.

Another perspective was to solve the horizon problem. Dow (1986, 2003, 2017 and 2018) shows that if competitive membership markets for cooperatives exist, the horizon problem is no longer an issue due to the ability of a member to capitalize returns at the market price when he wishes to leave the firm, thus creating the environment for eroding the chronological problem amongst members. Once again, as generous this proposal may be, a membership market is forbidden by Portuguese cooperative law and hence we did not follow this path.

The institutional view introduced the organizational design as an economic factor that could explain cooperatives' rarity. For instance, Tabellini (2008a, 2008b and 2010) has shown that history and cultural aspects have a significant impact on economic performance. Cooperatives are on average older and present higher survival rates than capitalistic firms do, which reflects a significant historical and cultural record with highly efficient performances. This seems not to be the cause of cooperatives' rarity, thus we do not endeavour to follow this path. The institutional line of research also tried to understand if the internal organisation design explains cooperatives' rarity. Williamson (1975 and 1985) and Hansmann (1996) argue that a vertical organization diminishes transaction costs in opposition to a horizontal one as cooperatives supposedly present. However, there is no beyond-doubt evidence that this institutionalist perspective is right. For instance, Grossman and Hart (1986) and Hart and Moore (1990) asserted that

vertical integration shifts distortions but do not erode them. This is an interesting perspective but needs some field research that was not possible for us to pursue due to the lack of resources.

To the best of our knowledge, our line of research has never been pursued in Portugal. There are only three works about Portuguese cooperatives of which we know: one investigating cooperative managers' earnings (Barros and Santos, 2003), other researching on cooperatives' survival (Monteiro and Stewart, 2015) and another study on cooperatives' efficiency (Monteiro and Straume, 2018).

Only Barros and Santos (2003) slightly touched our 2nd essay but did not follow our empirical strategy. While those authors used qualitative data directed to managers' earnings, we have used quantitative data oriented to all cooperative workers with more than 3,5 million observations in 2010-2019 period. Furthermore, this is the first study to use collective labour regulatory instruments to explain wages and the first to compare not only with capitalistic firms but also with other non-profit organisations.

In essay 1, we investigate Portuguese cooperatives' welfare maximization function, which has never been done for Portugal. As far as we know, it was only examined for the US (Craig and Pencavel, 1993) and Uruguay (Burdín and Dean, 2012). We also found that wages are an important feature of portuguese cooperatives' welfare, which is in line with our findings in our second essay.

In essay 3 we study Portuguese cooperatives' degeneration process, which is the first work in Portugal and unique in explaining it through the membership fee.

Finally, in essay 4 we explore if cooperatives struggle to raise funds. To do so, we have tried to understand how cooperatives' funding reality match the established financial theories. As far as we know, this is the first time this matching is done.

By pursuing this line of research, we hope to contribute to cooperative's theory consolidation and understand the factors that may cause their rarity and thus pave the way to further understand this puzzling phenomenon.

1. Is cooperatives' welfare based on both employment and income?

Evidence from Portugal.

Executive summary: In this essay we investigate if cooperatives contemplate both employment and wages in their welfare decisions. Using random and fixed effects estimators and data for both Portuguese cooperatives and capitalistic firms in the period 2010-2019, we find that Portuguese cooperatives seem to weigh both jobs and income in their welfare function, though it is given a greater importance to wages. This result reflects a positive marginal rate of substitution between employment and income, suggesting that a reduction in employment is followed by a decrease in wages. This outcome may indicate that Portuguese cooperatives behave pro-cyclically regarding employment and wages, thus being prone to behave in a similar manner as capitalistic firms do.

JEL Classification: C23; J54; P12; P13; P16.

Keywords: Cooperatives; Capitalistic firms; Welfare; Employment; Wages.

1.1. Motivation

Welfare is an important topic for economic and social development⁴. This concept helps understanding how it is possible to satisfy human needs through the consumption of both economic and non-economic goods. Cooperatives are economic agents that pursue welfare (Mazzarol *et al.*, 2013; Tortia, 2018), in contrast to capitalistic firms whose objective is to earn profits.

Welfare can be achieved by maximizing individuals' income, employment or both. The first scholar to dedicate some attention to this subject was Ward (1958). This author asserted that cooperatives were income per member maximizing entities in opposition to the profit maximizing capitalistic firms. This view was highly criticized (Estrin, 1982; Ben-Ner, 1984; Berman and Berman, 1989; Craig and Pencavel, 1992; Dow, 2003; Pencavel *et al.*, 2006; Burdín and Dean, 2009), namely because it would impose some economic counter-intuitive ideas, such as a negative supply curve or even the denial of the replication principle (Dow, 2018), which sustains that cooperatives behave economically as capitalistic firms do.

In clear contrast to Ward (1958), Craig and Pencavel (1992) and Burdín and Dean (2009) found that cooperatives welfare is maximized by trading-off income for employment in the US, Italy and Uruguay, respectively. These results may mirror the inherent job-protective⁵ characteristic cooperatives have while operating. A more conciliatory result was obtained by the same authors in later papers, namely Craig and Pencavel (1993) for the US plywood cooperatives and Burdín and Dean (2012) for

⁴ For instance, the utilitarian versus rawlsian discussion on welfare is a well-known one.

⁵ Even in consumption cooperatives, there is nothing that impedes a member-client to become simultaneously a member-worker. This reality is even more clear in mixed-member cooperatives.

Uruguayan cooperatives. These authors, using a typical welfare maximization function, found that employment and income were both considered in cooperatives' welfare decisions, with greater emphasis on employment.

In this essay, we study whether Portuguese cooperatives weigh both income and employment in their welfare decisions and in what proportion. We also investigate what is the demanded rate of substitution between employment and income to maintain cooperative welfare at the same level. For this purpose, we use the model developed by both Craig and Pencavel (1993) and Burdín and Dean (2012), although with some differences. Like Burdín and Dean (2012), we do not have output-related data to define the production function and therefore we assume a generic quadratic production function. As a result of this restriction, we cannot test different technological specifications and thus our results should be interpreted as less general than the ones obtained by Craig and Pencavel (1993). On the other hand, as in Craig and Pencavel (1993), we have data for working hours, which allows introducing the disutility of work in the welfare function unlike Burdín and Dean (2012).

We fit the model using random and fixed effects estimators and the results are based on a comprehensive panel data set covering the population of Portuguese cooperatives and capitalist firms over the 2010-2019 period. We use a dataset drawn from the "Quadros de Pessoal" (QP) database with more than 1,6 million observations, which comprises diverse information about firms located in Portugal. This database, which is managed by INE-Instituto Nacional de Estatística (Statistics Portugal), also contains information about individuals, allowing us to compare workers' earnings by cooperative and capitalistic firms.

We find that cooperatives weigh both employment and income in their welfare function with more emphasis on the latter. Furthermore, we observe a positive marginal rate of substitution between income and employment suggesting that a reduction in employment is followed by a decrease in wages. This pro-cyclical tendency suggests that Portuguese cooperatives cut down both employment and wages in a downturn period and have the opposite tendency in a recovering period, thus being prone to behave in a similar manner to capitalistic firms.

This essay is organized as follows. Section 1.2 provides a literature review on the debate initiated by Ward. Section 1.3 defines Portuguese cooperatives and compares them to the capitalistic firms. Section 1.4 describes the model. Section 1.5 describes the data. Section 1.6 presents the main results. Finally, section 1.7 concludes and discusses some avenues for further research.

1.2. Related literature

Welfare can be defined as the sum of both consumer and producer surpluses, where the latter arises from profit (Rossini, 2005). The replication principle (Dow, 2018) asserts that cooperatives should behave as capitalistic firms do, thus maximizing profit. Profit strengthens firms' solvency by increasing their reserves. In cooperatives, a part of the reserves is necessarily applied to solvency and social support

funds⁶. The remaining part is tendentially channelled to wages because the absence of a proper membership market (not allowing the cooperative stocks to be traded) increases the uncertainty of the return on equity (the horizon problem) and thus induces members to use cooperatives' reserves to increase their wages. Reserves appliance is influenced by cooperative worker-members because they control information about the organisation, which do not occur in their capitalistic counterparts. This entitlement allows a greater control of the decision process, thus enabling both higher levels of monetary and non-monetary satisfaction either through higher income or job preservation (Tortia, 2018). The possession of this information is even more important to individuals' welfare when we consider risk aversion (Sakai, 2020), which is a state that individuals seek to avoid due to loss aversion (Kahneman and Tversky, 1979).

This cooperative welfare-oriented characteristic contradicts Ward's thesis of income per member maximization. Primarily, besides income, cooperatives also seem to be concerned about employment (Craig and Pencavel, 1993; Burdín and Dean, 2012) and other social benefits that are not originated by members' work (Donário, 2013). Secondly, since Ward did not consider the labour market and its implications on total productivity, his results cannot contribute to fully understand cooperatives' efficiency levels (Domar, 1966) and thus do not reflect a steady state equilibrium (Estrin, 1982). Thirdly, Kahana and Nitzan (1989) argue that employment should be a variable taken into consideration and Ward's approach ignores the impact of employment in workers' welfare (Moene, 1989; Berman and Berman, 1989; Dow, 2003). Other authors even advocate that cooperatives reflect a constant level of employment due to individuals' consciousness of the unemployment threat, especially for lower income and risk-averse workers (Steinherr and Thisse, 1979; Bonin, 1981; Brewer and Browning, 1982). Fourthly, a membership market, where cooperative's stocks can be traded, is a reality that Ward's model also does not consider. This kind of market may induce cooperatives to behave as capitalistic firms do (Sertel, 1982; Dow, 1986 and 1996). Nevertheless, in Portugal such a market is not allowed by the Portuguese cooperative law (articles 86º, 91º and 95º of the Portuguese cooperative legal code). Another fact that the Ward model does not cover is the distinction between members and non-members. Cooperatives can hire non-members as capitalistic firms do. In fact, this raises the degeneration problem that, while enhancing cooperatives' capitalistic behaviour (see essay 3 and Miyazaki, 1984; Ben-Ner, 1984; Dean, 2019), increases the appropriation of reserves through wages due to the horizon problem.

Along with these theoretical insights, there is some empirical research on this subject. For instance, Jones and Backus (1977), Cable and Fitzroy (1980) and Jones and Sevjnar (1985) compared the observed behavioural patterns on British, German and Italian cooperatives and capitalistic firms, respectively. All these three studies found that workers' participation and ownership of assets has a positive effect on productivity and thus on individuals' prospects of increasing their welfare. Bartlett *et al.* (1992), still for Italy, found that there is no difference between cooperatives and capitalistic firms

⁶ Cooperative social support funds comprehend education, health and other needs individuals may endure.

regarding the pursuit of profit. However, Craig and Pencavel (1992), studying the US plywood industry, found that output price variation has different implications on the two types of firms. While in capitalistic firms the rise of output price increases employment, working hours and output, in cooperatives it induces higher hourly income. Furthermore, Craig and Pencavel (1993) developed an objective function that allows for different employment and income optimization. By studying the US plywood industry, they found that cooperatives maximize both employment and income. Similar conclusions were achieved by Prasnikar *et al.* (1994), Pencavel *et al.* (2006) and Burdín and Dean (2012) for Yugoslavia, Italy and Uruguay, respectively.

The literature, therefore, seems to deviate from Ward's insights, namely, the idea that cooperatives only care about income per member maximization. Most of the research indicates that cooperatives are profit maximization entities (Dow, 2018) and are concerned about both employment and wages, thus increasing workers' wellbeing supported by the fact that they are at least as efficient as capitalistic firms are (Fakhfakh, 2012; Monteiro and Straume, 2018). In our viewpoint, this seems to be the adequate theory to understand cooperative's welfare maximization because foundationally cooperatives are designed to fulfil individuals' economic and non-economic goals instead of profit distribution.

1.3. Portuguese cooperatives and capitalistic firms

The replication principle (Dow, 2018) asserts that cooperatives should be able to employ capitalistic firms' organisational procedures, unless they collide with the cooperative principles. While in an economic perspective, it seems that both types of firms are similar (Bartlett *et al.*, 1992; Fakhfakh *et al.*, 2012; Monteiro and Straume, 2018), the cooperative principles might differentiate them.

In Portugal, cooperatives and capitalistic firms seem to have much in common. For instance, they may have a similar management structure both in the mandatory boards and in the ones established through by-law. Like capitalistic firms, cooperatives pursue profit. Both fiscal and labour framework is similar. Like capitalistic firms, Portuguese cooperatives have no restriction in hiring employees. Both types of firms can have outside investors. Like cooperative firms, capitalistic firms can promote employee stock ownership. Nevertheless, some differences between both types of firms subsist. Regarding management organisation, although the organigram may be similar between both types of firms, the decision rule is based either on capital subscription (capitalistic firms) or "one man one vote" (cooperatives). This difference individually empowers cooperative members in the decision process, irrespective of belonging or not to the board of directors, while in capitalistic firms managers have to abide to capital majority. Another difference is that outside investors are allowed in both types of firms, but in cooperatives their voting weight cannot be decisive. Both capitalistic and cooperatives pursue profit but the latter, unlike the former, have strict rules regarding its distribution. It is, then, clear that the main issue regarding the difference between both types of firms is related with who is in control of the firm.

Theoretically, cooperatives are economic entities where members are in control (Dow, 2003 and 2017), meaning that the decision power of each individual is equal and always the same independently of the capital subscription. In contrast, in capitalistic firms property belongs to capital owners. Thus, the decision power of each individual grows as his/her equity proportion increases. This means that the organisational rules, the structure and the functional procedures of each type of firm are defined by a different set of individuals. While in capitalistic firms the majority of workers do not participate in the definition of the organisational rules, in cooperatives workers can influence the decision process, even if they are not members because, theoretically, they can become members and thus change the incumbent members' *status quo*⁷. Even amongst cooperatives there are some foundational differences. Traditionally, cooperatives are seen as worker managed firms (Moene, 1989; Dow, 2018), but in Portugal cooperatives can also be of the consumption type or even have mixed members. Consumption cooperatives are based on the premise that non-worker individuals join those organisations to enjoy goods more efficiently. Nevertheless, this may mean that consumption cooperatives may relax their employment purpose by hiring non-members workers and/or outsource to fulfil their mission. This legal reality may enhance cooperatives' pro-cyclical behaviour due to the possibility to hire non-members according to the economic cycle.

Regarding mixed cooperatives, the law allows for both workers and clients to be part of the cooperative, which is compatible with the cooperative principles. Typically, mixed cooperatives appear in intangible markets, such as education. This means that Portuguese cooperatives can operate both on the supply and demand sides. This is an important feature because it tendentially allows for a fairer equilibrium. By allowing for both sides of the market to be members, cooperatives enhance the conditions for a balanced transaction and thus potentiate efficiency through repeated interactions (MacLeod, 1988; Putterman and Skillman, 1992; Holmstrom and Milgrom, 1994; Dong and Dow, 1993; Dow, 2000).

Another issue that arises in this framework has to do with the surplus distribution. Tendentially, value-added is created by workers but it is not effective without the market relation, which comes from consumers. When there are only worker-members, the surplus should be distributed proportionally among them. When we are in the presence of a consumption-type cooperative it may happen that there are only consumer-members, and the surplus distribution must follow the same rule because it is only effective when the consumer-members buy the cooperative's product. When there is a mixed cooperative, both workers and non-workers (or clients) are allowed to be members. Therefore, surplus distribution, whenever possible, should follow some fair rule between worker-members and consumer-members that must reflect the origin of the surplus.

The previous concepts are pure legal definitions of the types of cooperatives in Portugal. In practice, cooperatives hire non-members (see essay 3 and Miyazaki, 1984; Ben-Ner, 1984; Sauser, 2009;

⁷ We recall that non-member workers do not have any legal obstacle to adhere to the cooperative.

Kokkinidis, 2012; Cheney *et al.*, 2014; Langmead, 2016; Dean, 2019; Pek, 2019) and may associate themselves with external investors. These investors do not have the incentive to become members because, independently of the injected capital, they cannot have the ruling majority because each member has the same voting capacity. In capitalistic firms, in contrast, the ruling capacity of the member-investor depends on the amount of invested capital. The more capital he invests the more he can control the firm. This explains why cooperatives seem to be in low investment industries (Drèze, 1989; Podivinsky and Stewart, 2007). On the other hand, capitalistic firms can develop some practices that apparently seem to relate to the cooperative style, such as employee stock ownership, but this fact hardly changes control from the incumbent stock owners (Burdín and Dean, 2012).

Portuguese cooperatives are obliged to have a minimum of three members to be legally enforced and to have the organisational framework established, although they are allowed to freely decide some of their associative rules through by-law. For instance, the by-law that approves the management structure is voted on the cooperative general assembly. In the general assembly, as noted previously, each member has one vote independently of the capital subscribed. Employment for worker-members is assured while the firm is operating. The question that remains is if this situation is sustained at wages' expense (Pencavel *et al.*, 2006; Clemente *et al.*, 2012; Burdín, 2016). Workers in cooperatives have the capacity to bargain with the management structure more thoroughly than their counterparts in capitalistic firms (Bonoli, 2003; Dias and Cerdeira, 2011; Campos Lima, 2013; Schulten and Mueller, 2013; Mishel, 2021). This capacity comes from the fact that they have a saying in the decision making through their equal voting power at the general assembly, unless they do it through other channels. This means that, although cooperatives can use collective labour regulatory instruments, such as firms' labour agreements, workers do not seem to need such collective bargaining instruments to negotiate and improve their wages (see essay 2).

1.4. Research hypotheses and the model

Considering all the literature on this subject, it is important to understand, firstly, if cooperatives weigh both employment and income in their welfare decision and, secondly, what is the marginal rate of substitution that assures welfare equilibrium (Craig and Pencavel, 1993; Burdín and Dean, 2012).

Considering that cooperatives are inherently job-protective (Craig and Pencavel, 1992; Burdín and Dean, 2009), are as efficient as capitalistic firms (Bartlett *et al.*, 1992; Fakhfakh *et al.*, 2012; Monteiro and Straume, 2018), pursue profitability (Dow, 2018), and tendentially pay appealing wages to workers (Pencavel *et al.*, 2006; Clemente *et al.*, 2012; Burdín, 2016), we formulate the following two hypotheses:

- **H1: Regarding welfare, Portuguese cooperatives weigh both employment and income**

Moreover, because cooperative workers have higher bargaining power than their capitalistic counterparts (Bonoli, 2003; Dias and Cerdeira, 2011; Campos Lima, 2013; Schulten and Mueller, 2013; Mishel, 2021), we hypothesize that:

- **H2: In Portugal, cooperative workers face a negative marginal rate of substitution between employment and income.**

To test these hypotheses, we apply Craig and Pencavel (1993) model to the Portuguese reality. Craig and Pencavel's model is based on the maximization problem of the traditional neoclassical firm. In this sense, their objective function is the welfare subject to the income-expenditure restriction, which are respectively given by equations (1.1) and (1.2):

$$\Gamma = g(wh/q; h; E; z) \quad (1.1)$$

where w represents the average hourly earnings, h average hours per worker, E employment, z factors beyond cooperatives' control and q consumer price index. It is assumed that cooperatives' welfare is non-decreasing in real wages and employment and non-increasing in working hours.

$$p.X(E; h; M) = G + whE + rM \quad (1.2)$$

where p represents output-price, $X(E; h; M)$ is the level of production, M is the non-labour input, r is the price per unit of non-labour input and G represents fixed costs and income allocated to reserves and capital expenditures.

Craig and Pencavel (1993) implemented this model by considering the following objective function:

$$\Gamma(w; h; E) = [wh/q - \rho \ln(h) - \gamma - \varepsilon]^\theta E \quad (1.3)$$

where z is represented by γ , which is the opportunity cost of alternative activities, and ε stands for factors affecting non-observable cooperatives' goals. The term in square brackets refers to the welfare of a worker. The term $\rho \ln(h)$ reflects individuals' work disutility, where $\ln$ is used since we are assuming that the working hours increase at a decreasing rate. Equation (1.3) is based on the Stone-Geary⁸ function, which has been applied in the workers' organisation context (Craig and Pencavel, 1993; Burdín and Dean, 2012). The parameter θ captures the weight given to wages relative to employment. The higher the θ value, the greater the weight given to wages. The extreme cases, $\theta \rightarrow \infty$ or $\theta = 0$, reflect,

⁸ The Stone-Geary function is an adapted Cobb-Douglas function defined considering an arbitrary origin allowing thus non-homothetic preferences and wage-employment substitution.

respectively, situations where cooperatives only consider maximization of wages or employment. When $\theta = 1$, cooperatives place the same weight on both wages and employment.

If we define cooperative's total rent as $R = [wh/q - \rho \ln(h) - \gamma - \varepsilon]E$, then:

$$\Gamma = R^\theta E^{1-\theta} \quad (1.4)$$

Therefore, the logarithm of the marginal rate of substitution between income and employment, which is defined as $-(\partial \log \Gamma / \partial \log E) / (\partial \log \Gamma / \partial \log R)$, is summarized as follows:

$$(\partial \log R) / (\partial \log E) = -(1 - \theta) / \theta \quad (1.5)$$

The variations of both R and E depend on their exponents and allow capturing the variation in wages to maintain welfare when employment changes. If $0 < \theta < 1$ ($\theta > 1$), the marginal rate of substitution is negative (positive) and wages and employment will evolve in the opposite (same) direction.

The cooperative maximization problem is thus as follows:

$$\begin{aligned} \text{Max } \Gamma(w; h; E) &= [wh/q - \rho \ln(h) - \gamma - \varepsilon]^\theta E, \\ \text{s. t. } p.X(E; h; L) &= G + whE + rM \end{aligned}$$

The Lagrangean function to solve this problem is the following:

$$L = [wh/q - \rho \ln(h) - \gamma - \varepsilon]^\theta E - \lambda [(p.X(E; h; L) - G - whE - rM),$$

which may be simplified to:

$$L = R^\theta E^{1-\theta} - \lambda [(p.X(E; h; L) - G - whE - rM),$$

where λ is the Lagrangean multiplier. The first maximization condition is:

$$\partial L / \partial w = h/q \cdot [(\theta R^{\theta-1} E^{1-\theta}) E] + \lambda hE = 0, \text{ yielding } \lambda = -(\theta/q) R^{\theta-1} E^{1-\theta},$$

and the second is:

$$\partial L / \partial E = (1 - \theta) R^\theta E^{-\theta} + \theta R^\theta E^{1-\theta} E^{-1} + \lambda hw - \lambda p \partial X / \partial E = 0,$$

yielding $\lambda = (R/E)^\theta / (p \partial X / \partial E - wh)$.

Combining both first order conditions, $-(\theta/q).R^{\theta-1}.E^{1-\theta} = ((R/E)^\theta)/(p.\partial X/\partial E - wh)$, and hence $R/E = -(\theta p.\partial X/\partial E)/q) + \theta.(wh)/q$, which is the same as having:

$$(wh/q - \rho \ln(h) - \gamma - \varepsilon).E/E = -(\theta p.\partial X/\partial E)/q) + \theta.wh/q.$$

Solving in order to wh/q delivers the following final expression:

$$wh/q = \gamma/(1 - \theta) + \rho \ln(h)/(1 - \theta) + \varepsilon/(1 - \theta) - [(\theta/(1 - \theta)).((p/q).\partial X/\partial E)] \quad (1.6)$$

which is the real income in cooperatives.

From this result, we see that if $\theta \rightarrow \infty$, then the optimal result is:

$$wh/q = p/q.\partial X/\partial E \quad (1.7)$$

which means that real wages are equal to marginal productivity as in Ward's model, thus representing real income in capitalistic firms.

If $\theta = 0$, then:

$$wh/q = \gamma + \rho \ln(h) + \varepsilon \quad (1.8)$$

which means that cooperative workers would accept a wage equal to the net opportunity cost of work's disutility, and thus cooperatives would be only concerned about employment.

If $\theta = 1$, then $p/q.\partial X/\partial E = \gamma + \rho \ln(h) + \varepsilon$, which reflects a profit maximizing cooperative, meaning that employment will be chosen when real marginal product equals opportunity costs relieved from work's disutility.

Combining (1.6) and (1.7) and assuming $\varepsilon = 0$ (cooperatives are comparable to capitalistic firms), we obtain the expression for both cooperatives and capitalistic firms:

$$(wh/q)_{it} = (\gamma/(1 - \theta) + \rho \ln(h)/(1 - \theta) - [\theta/(1 - \theta).(p/q)_{it}.\partial X/\partial E]_{it}).Coop_i + [(p/q)_{it}.\partial X/\partial E]_{it}.CF_i + u_{it} \quad (1.9)$$

where the subindex it refers to firm i in year t , $Coop$ is a dummy variable that takes the value 1 in case of a cooperative and CF is also a dummy variable taking the value 1 for capitalistic firms. The term u_{it} is the stochastic error term that incorporates the measurement error ζ of non-observable factors.

Due to lack of information about the output level, we assume a quadratic production function, which yields a linear marginal product equal to:

$$\partial X/\partial E = \alpha_0 + \alpha_1 \cdot E \quad (1.10)$$

which means that (1.9) will take the following form:

$$(wh/q)_{it} = [(\gamma/(1-\theta) + (\rho/(1-\theta))\ln(h)_{it} - ((\theta\alpha_0)/(1-\theta)) \cdot (p/q)_{it} - ((\theta\alpha_1)/(1-\theta)) \cdot (p \cdot E/q)_{it}] \cdot Coop_i + [\alpha_0 (p/q)_{it} + \alpha_1 (p \cdot E/q)_{it}] \cdot CF_i + u_{it} \quad (1.11)$$

Defining $\beta_1 = \gamma/(1-\theta)$, $\beta_2 = (\rho/(1-\theta))$, $\beta_3 = ((\theta\alpha_0)/(1-\theta))$ and $\beta_4 = -((\theta\alpha_1)/(1-\theta))$, equation (1.11) can be written as follows:

$$(wh/q)_{it} = [\beta_1 + \beta_2 \cdot \ln(h)_{it} - \beta_3 \cdot (p/q)_{it} - \beta_4 \cdot (p \cdot E/q)_{it}] \cdot Coop_i + [\alpha_0 (p/q)_{it} + \alpha_1 (p \cdot E/q)_{it}] \cdot CF_i + u_{it} \quad (1.12)$$

Estimation of equation (1.12) provides direct estimates for $\beta_1, \beta_2, \beta_3, \beta_4, \alpha_0$ and α_1 . Based on these estimates, two alternative estimates for the main parameter of interest in equation (1.11), θ , may be obtained. The first is based on $\beta_3 = -(\theta_1 \cdot \alpha_0)/(1-\theta_1)$, which implies that $\beta_3 = \theta_1(\beta_3 - \alpha_0)$, and thus:

$$\theta_1 = \beta_3/(\beta_3 - \alpha_0) \quad (1.13)$$

The second starts with $\beta_4 = -(\theta_2 \cdot \alpha_1)/(1-\theta_2)$, which implies that $\beta_4 = \theta_2(\beta_4 - \alpha_1)$, and thus:

$$\theta_2 = \beta_4/(\beta_4 - \alpha_1) \quad (1.14)$$

Parameters γ and ρ are computed straightforwardly after knowing θ , being obtained also two alternative estimates for each one of them.

Knowing θ_1 and θ_2 , we can compute two marginal rates of substitution (MRS_1 and MRS_2) based on equation (1.5):

$$MRS_1 = -(1-\theta_1)/\theta_1 \quad (1.15)$$

$$MRS_2 = -(1-\theta_2)/\theta_2 \quad (1.16)$$

Next, we use this model to understand whether the Portuguese cooperatives consider both employment and income and at what expense is their trade-off to maintain welfare constant.

1.5. Data

1.5.1. Dataset

We use an unbalanced panel built from Quadros de Pessoal (QP) database and information about industry and consumer prices collected from Statistics Portugal (INE), in the timespan 2010-2019. QP has information about employees and firms in two separate sections that we needed to merge. From employees' database we collected, for each worker, information about wages⁹ and working hours and employers' fiscal identification number. Then, for each firm (we considered limited-liability companies, share-owned firms and cooperatives only), we computed the variables present in equation (1.11): the average values of real wages per year, the average working hours (in logs due to its expected decreasing rate; see Craig and Pencavel, 1993), the relative industry output prices (computed by comparing each industry's prices to the general price consumer index (IPC)), the employment value by multiplying the relative price of each industry to the number of employees and two dummy variables that identify both cooperatives and capitalistic firms (the dummies are established directly from the database because it delivers firms' legal status). The formal definitions of the constructed variables are given in Table 1.1. All together, we ended up with a sample of more than 1,6 million observations for the period 2010-2019.

Table 1.1 - Variables' formal definition.

Variable	Definition	Notation in equation (1.12)
Wages	Real average wages by firm and year in euros	wh/q
Work	Logarithm of average working hours by firm and year	$\ln(h)$
Industry prices	Ratio of industry price to consumer price index by firm and year	p/q
Employment value	Relative prices times employment by firm and year	pE/q
Coops	Dummy variable equal to 1 if cooperative and 0 otherwise	$Coop$
CF	Dummy variable equal to 1 if capitalistic firm and 0 otherwise	CF

Source: Statistics Portugal (INE) and QP. Own elaboration.

1.5.2. Descriptive evidence

As reported in Table 1.2, from the more than 286 thousand firms in our dataset, only 1 442 (0,5%) are cooperatives. This suggests that cooperatives are residual in the Portuguese firms' reality.

⁹ For the identified members, our database does not have their wages, and we cannot be sure whether the available wages are from non-members only. In this sense, we could not separate non-members from members. Nevertheless, at least theoretically, non-members are freely allowed to become members, which mitigates this data limitation.

Table 1.2 - Cooperative and capitalistic firms' weight (2010-2019).

	Nr. of firms	%
Cooperatives	1 442	0,005
Capitalistic firms	284 903	0,995
Total	286 345	100

Source: QP. Own elaboration.

Table 1.3 reflects average real wages, employment and average working hours of both types of firms, per month. Cooperatives pay on average higher real salaries than capitalistic firms and the wage disparity is also lower. Cooperative employees work on average a similar number of hours as their capitalistic counterparts, but the standard deviation is wider for the latter. Cooperatives also employ on average a higher number of workers than capitalistic firms, but in the latter the standard deviation is more than 50 times higher.

Table 1.3 - Cooperative and capitalistic firms' real wages (in euros), working hours and number of employees (2010-2019), per month.

		Real wages	Working hours	Employment
Cooperatives	Mean	799,15	152,04	20,25
	Median	759,96	163,00	6,00
	S.D.	307,54	31,91	40,40
	Min	0,00	0,00	1,00
	Max	3 166,34	281,00	516,00
Capitalistic firms	Mean	739,87	152,50	13,15
	Median	655,69	171,67	4,00
	S.D.	482,40	35,87	134,33
	Min	0,00	0,00	1,00
	Max	41 660,75	346,00	27 340,00

Source: QP. Own elaboration.

Table 1.4 shows industry dispersion amongst cooperatives and capitalistic firms. Interestingly, capitalistic firms and cooperatives have approximately the same absolute difference of weight in both labour-intensive (60% against 65%, respectively) and capital-intensive industries (40% versus 35%, respectively), but cooperatives are relatively more present in labour-intensive industries. Considering our dataset, this evidence apparently reflects the replication principle, since the vast majority of cooperatives operate in the same industries where capitalistic firms do.

Table 1.4 - Cooperative and capitalistic firms' relative industry dispersion (2010-2019).

Industry	Cooperatives (%)	Capitalistic firms (%)
Capital-intensive	35,25	40,43
Agriculture industry	8,08	2,85
Food industry	6,09	2,13

Beverage industry	6,72	0,26
Metallic craft industry	0,16	2,44
Building construction	5,31	5,56
Specialized construction activities	0,42	4,02
Other capital-intensive	8,47	23,17
Labour-intensive	64,75	59,57
Vehicle retail	0,26	4,47
Wholesale	12,38	9,41
Retail	10,62	13,71
Transportation	2,64	4,57
Logistics Transportation	2,23	0,58
Catering	0,31	9,03
Radio and television activities	5,81	0,07
Real estate activities	0,30	3,22
Law and Accountant activities	0,10	3,27
Architectural activities	0,39	1,90
Education	9,07	1,42
Human health activities	0,89	5,03
Social support	7,99	0,21
Artistic activities	2,29	0,17
Associative activities	5,39	0,01
Other labour-intensive	4,08	2,50
Total	100,00	100,00

Source: QP. Own elaboration.

Table 1.5 reflects regional dispersion amongst cooperatives and capitalistic firms. We find that Norte, Centro and Lisboa are the areas that have more weight for both types of firms (71% of cooperatives and 85% of capitalistic firms are located here). In Norte, Algarve and Centro the relative presence of cooperatives and capitalistic firms is similar. In relative terms, Alentejo and Açores seem to be more significant for cooperatives than they are for capitalistic firms, while the opposite happens in Lisboa and Madeira. This difference may be due to the fact that Lisboa and Madeira are imminently touristic areas, while a significant number of cooperatives operate in wine and dairy sectors, which are traditionally located in Alentejo and Açores.

Table 1.5 - Cooperative and capitalistic firms' relative regional dispersion (2010-2019).

Nuts II	Cooperatives (%)	Capitalistic firms (%)
Norte	31,46	35,17
Algarve	4,86	4,87
Centro	21,60	22,33
Lisboa	18,29	27,68
Alentejo	16,50	6,20
Açores	6,39	1,39
Madeira	0,89	2,36

Total	100	100
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Source: QP. Own elaboration.

1.6. Results

Based on equation (1.12), we estimate the following model:

$$W_{it} = (Coops_{it} \times X_{it})\eta + (CF_{it} \times Y_{it})\partial + \rho_i + \varepsilon_{it} \quad (1.17)$$

where W (average firms' wages) is explained by both the interaction of X (average working hours, industry-prices and employment value) with $Coops$ and the interaction of Y (industry-prices and employment value) with CF and η and ∂ are vectors containing the parameters ($\lambda_1, \lambda_2, \lambda_3$ and λ_4) and (α_0 and α_1), respectively. Based on the estimates obtained for η and ∂ , we may then estimate θ_1 and θ_2 using equations (1.13) and (1.14), and through equations (1.15) and (1.16) compute the marginal rates of substitution.

Since unobservable factors may compromise the consistency of the random effects estimator (Pencavel *et al.*; 2006), Table 1.6 presents the results of both random and fixed effects estimators, with and without industry and region dummies. In our case, it seems that Pencavel *et al.* (2006) were right, since the fixed effects estimator is better suited according to the Hausman test¹⁰.

Table 1.6 - Random and Fixed effects models for firms' average income (2010-2019) with and without industry and region dummies.

Variables	Models			
	RE	FE	RE	FE
Coops	-2178,7*** (166,7)	-2165,1*** (180,6)	-2098,4*** (165,6)	-2153,7*** (181)
Coops*Work	395,9*** (21,3)	396,3*** (21,9)	392*** (20,9)	396,6*** (22,9)
Coops*Industry price	536,3*** (120,4)	525,3*** (123,6)	518,2*** (121,6)	516,1*** (124,1)
Coops*Employment value	0,734** (0,349)	0,008 (0,536)	0,9*** (0,32)	0,0000 (0,536)
CF*Industry price	290,5*** (15,7)	334,1*** (16,3)	343,3*** (16,2)	337,5*** (16,4)
CF*Employment value	0,003 (0,011)	-0,076*** (0,02)	0,001 (0,01)	-0,08*** (0,02)
Industry dummies	No	No	Yes	Yes
Region dummies	No	No	Yes	Yes
θ_1	2,18	2,75	2,96	2,89
θ_2	1,00	0,09	1,00	0,00

¹⁰ The Hausman test's p-value is 0.

MRS_1	0,54	0,64	0,66	0,65
MRS_2	0,00	-10,11	0,00	$-\infty$
Nr. of observations	1 472 350			
Nr. of firms	260 853			

Source: QP. Own elaboration. ***, ** significant at 1% and 5%, respectively. Standard errors (clustered by firm) are in parenthesis.

We find that the interaction between *Coops* and *Employment value* is never significant in both fixed effects models, which weakens θ_2 's significance and thus the marginal rate of substitution based on this parameter. Reflection of this is the incoherence of the values of θ_2 and MRS_2 , which present values of 0 and 1 in the case of the former and of $-\infty$ or zero for the latter. On the other hand, the industry price interaction with both cooperatives and capitalistic firms is significant, allowing to compute robust results for θ_1 and thus the marginal rate of substitution between employment and wages based on this parameter. Thus, from now on, we assume θ_1 as the only estimate for θ .

Either controlling or not for industry and region, we find that cooperatives weigh both employment and wages, since the estimate of θ is finite, which validates hypothesis H1. However, this estimate is higher than unity (ranges from 2,18 to 2,96), meaning that Portuguese cooperatives give more importance to wages when compared to employment. This may show some tendency for cooperatives to behave as capitalistic firms do. When we analyse the marginal rate of substitution between employment and wages, and because it depends on the different values of θ_1 , we observe that it varies between 0,54 and 0,66, meaning that Portuguese cooperatives are pro-cyclical firms, i.e., they reduce wages and employment in recession periods and increase them in growth periods. Therefore, we reject hypothesis H2. These results are in contrast with the ones obtained by Burdín and Dean (2012). Probably, this can be related to the fact that Uruguayan legislation does not allow hiring more than 20% of non-members workers. In Portugal there is no such law, which may induce a typical neoclassical firm behaviour from cooperatives reflected in some degenerative process.

1.7. Concluding remarks

In this work we have tried to understand whether Portuguese cooperatives weigh both employment and wages in their decisions. Using a standard neoclassical welfare function, we found that cooperatives have mixed objectives. We concluded that Portuguese cooperatives weigh both employment and wages, placing more importance to wages. These results imply a positive marginal rate of substitution between employment and wages. Although our results confirm Craig and Pencavel's (for US) and Burdín and Dean's (for Uruguay) findings regarding cooperatives' employment and wage objectives, we found a procyclical behaviour of cooperatives meaning that wages decrease as employment decreases. This result might be related with the Portuguese legal framework. For instance, US law allows for a membership market, which may reduce the horizon problem, thus mitigating cooperatives' members propensity to steer the firm into a capitalistic behaviour. On the other hand, Uruguayan law inhibits

cooperatives to have more than 20% of non-members in their workforce, which also leads to the existence of a higher bargaining power of workers thus mitigating cooperatives' capitalistic behaviour. However, in Portugal, there are no such legal implications, which may justify our results.

The replication principle seems to be present in the cooperative realm, that is, cooperatives behave economically as capitalistic firms do. Indeed, there is scientific evidence that they are as efficient as their capitalistic counterparts (Bartlett *et al.*, (1992); Fakhfakh *et al.*, 2012; Monteiro and Straume, 2018). In this sense, the question is why they are so rare (in our dataset they represent only 0,5% of the total firms). In the following sections we will try to understand the reason behind their short representation among firms. We will analyse whether it is because cooperatives are not income-appealing to workers, or because they struggle to leverage funds, or due to degenerative processes.

2. Are cooperatives income-appealing to workers? Evidence from Portugal

Executive summary: Cooperatives continue to be rare regardless the evidence that they are as efficient and enduring as capitalistic companies. In this essay we investigate if one of the reasons for cooperatives' scarceness is lower wages, since earnings are of the utmost importance for individual job-seeking. Using a mincerian-based model and data for Portuguese cooperatives and capitalistic firms for the period 2010-2019, we reject that hypothesis by showing that workers' income is actually higher in cooperatives than in their capitalistic counterparts. In particular, we found that schooling and firm size have a higher positive impact on wages in cooperatives, that the gender wage gap is reduced when working in a cooperative and that collective bargaining has a negative impact on wages both in cooperatives and capitalistic firms when there is no state intervention. We also found that cooperatives pay higher wages than most of the other companies in the Social Economy sector.

JEL Classification: C23; J54; P12; P13; P16.

Keywords: Cooperatives; Capitalistic firms; Wages; Social Economy.

2.1. Motivation

Cooperatives go back to Rochdale experiments in the XIXth century, and theorists such as Walras, Edgeworth, Marx, Stuart Mill and Marshall have stressed the economic importance of the cooperative organisation. Cooperatives have exquisite characteristics that we do not encounter in any other organisation and have founding and mandatory principles that are based on workers and diverge from other firms' DNA. They pose no barriers to individual's free and voluntary adherence to membership, enabling workers to participate in firm's decisions through capital subscription¹¹. They are democratically managed by their members through the rule "one man one vote"¹², regardless of capital subscription. Cooperative members have the right to receive tendentially their full added value, reflected in their upfront withdrawals¹³ and surplus (when they exist and are legally possible to distribute), independently of their owned capital. Last, but not least, cooperatives are obliged to retain funds for workers' education, regardless of membership. For a comprehensive comparison of cooperative, capitalistic and public firms, see *inter alia* Ward (1958), Domar (1966), Vanek (1970), Bonin, Jones and Putterman (1993), Doucouliagos (1997), Pérotin (2012) and Dow (2017).

¹¹ We are assuming that the membership fee is not hindering an individual's adherence to a cooperative.

¹² The Portuguese cooperative law allows for the plural vote. Nevertheless, it cannot violate the democratic principle of 50 or more percentage of voters to decide.

¹³ Upfront withdrawals are often considered as salaries due to their regularity and lack of ledger definition.

The focus of cooperatives on workers do not seem to harm their economic performance. In fact, since the 80's, there are several empirical studies suggesting that cooperatives are more efficient than their capitalistic counterparts. For example, Defourney *et al.* (1985), Jones and Svejnar (1985) and Estrin *et al.* (1987) found that workers' participation in profits increases firms' value-added and productivity; Ben-Ner (1988), Burdín (2014) and Monteiro and Stewart (2015) found that cooperatives have lower demise rates when compared to capitalistic firms; and Bartlett *et al.* (1992), Fakhfakh *et al.* (2012) and Monteiro and Straume (2018) found that cooperatives are more productive than their capitalistic counterparts.

Given their apparent advantages, both for firms and workers, why are cooperatives much less popular than their capitalistic counterparts? Possible explanations are related to entrepreneurs' (rent appropriation) and workers' (wealth) primary concerns. In the entrepreneur's perspective, the amount of rent they appropriate is not as high as in other firms, because workers/members are also entitled to a part of the firm surplus when it is legally possible to distribute it. Therefore, when interested in a specific cooperative, entrepreneurs often prefer to transform it into another type of firm, namely by buying it (Dow, 2018)¹⁴. On the other hand, workers' wealth is highly dependent on wages. When working at a cooperative, individuals will face the intertemporal dilemma of not knowing if they will still be cooperative members when the cooperative produces surpluses, thus facing a high intertemporal discount rate and tending to prefer present income to future one (Furubotn and Pejovich, 1970). In this sense, most individuals will decide to work in firms that pay higher wages, irrespective of their organisational nature.

Given the importance of earnings for individuals' job choice, in this essay we investigate whether legal firm's organisation has influence in workers' income. In particular, we test whether workers' earnings in cooperatives are lower than in capitalistic firms. If this is the case, then lower wages may be one of the factors explaining cooperatives' scarceness, since individuals will be less prone to work in cooperatives and thus less likely to become cooperative members and create new cooperatives. Previous evidence on how wages compare across cooperatives and other organizations is mixed: Pencavel *et al.* (2006) found that, in Italy, cooperative workers earn 14% less than individuals labouring in capitalistic firms; Clemente *et al.* (2012) found that Spanish cooperatives pay higher wages in some sectors and lower in others; and Burdín (2016) found that workers earn 2,7% to 5,5% more in Uruguayan cooperatives than in their capitalistic counterparts.

To perform our investigation, we use a rich dataset drawn for the period 2010-2019 from the "Quadros de Pessoal" (QP) database, which comprises diverse information about all individuals working in firms located in Portugal, such as wages, other labour-related earnings, schooling, experience, age, tenure and collective bargaining protection. This huge database, which is managed by the Portuguese Ministry of Labour, also contains information about each firm, allowing us to compare workers'

¹⁴ Note that this practice is forbidden in many countries, such as Portugal, Spain, France, Italy, UK and Uruguay. On the contrary, in the USA, with some specificities, capital shares are allowed to be traded.

earnings in cooperatives and capitalistic firms. In Portugal, cooperatives are legally inserted in the Social Economy (SE) sector. In 2016, the SE sector represented 3% of Portuguese gross value-added (GVA), 5,3% of Portuguese employees' earnings and 6,1% of Portuguese employment¹⁵. It accounted for almost 72 thousand firms, from which cooperatives ranked in second place regarding the number of firms (2 343), GVA (12,5%) and employees' earnings (13,2%) and in third in terms of employment (10,4%).

This essay is organized as follows. Section 2.2 presents the theoretical framework and reviews previous empirical research related to cooperatives. Section 2.3 frames the Portuguese cooperative sector in an institutional, historic, and economic perspective. Section 2.4 discusses our research problem and main empirical hypotheses. Section 2.5 presents the dataset and performs a preliminary analysis of the data. Section 2.6 describes the econometric methodology and presents the main results. Finally, Section 2.7 concludes and discusses some avenues for further research.

2.2. Theoretical framework and previous research

In this section we review the literature concerning our research problem. First, we review the cooperatives' horizon problem. Second, we discuss cooperatives' wage policies. Finally, we justify our models' methodology choice sustained by labour economic literature.

2.2.1. The horizon problem

For an individual, the benefits of working in a cooperative are twofold: the wage received in a periodic manner, typically each month; and (a part of) the cooperative's surplus they may receive in the future. This second (potential) return is uncertain, since workers do not know if, and when, the firm is going to produce a surplus. Since only wages are certain, individuals tend to prefer maximizing current income, that is, to get wages as high as possible, and to define a high intertemporal discount rate for their earnings, which leads to the horizon problem in cooperatives.

Pejovich (1969), Furubotn and Pejovich (1970), Furubotn (1971, 1976) and Jensen and Meckling (1979) are some of the first authors to argue that cooperatives face difficulties due to the trade-off between today's wages and uncertain future returns that may or may not benefit a particular member, since they may come when the individual is no longer a member. Bonin *et al.* (1993), Burdín and Dean (2009), Fakhfakh *et al.* (2012) and Burdín (2014) suggest that the horizon problem is important for all individuals. Dow (2018) stresses its significance for the elderly, since they have shorter membership departure dates and thus give a higher importance to the current income. Other factors such as individuals' perception of employment stability and labour-production interaction may enhance the horizon problem, as discussed by Miyazaki and Neary (1983), Navarra (2016) and Tortia (2021). Indeed, if the cooperative does not create conditions for job stability, for a dignified workplace and for workers'

¹⁵ Since 2010, António Sérgio Cooperative for the Social Economy (CASES) and Statistics Portugal (INE) have been reporting in a 3-year time-span information about social economy in the Social Economy Satellite Account (SESA). The last issue of SESA was published in 2019 and regards 2016.

participation in decision-making, the horizon problem may be exponentiated since individuals are not interested in becoming cooperative members and thus will demand a higher wage. On the other hand, the horizon problem, by trading-off firms' reserves for wages, may lead cooperatives to face difficulties regarding capitalization and thus investment. Podivinsky and Stewart (2007) show that this fact leads cooperatives to select labour-intensive industries. See also Mikami (2018), Ellerman (2018), Tortia (2018), Galor and Sofer (2019) for other studies of the horizon problem.

Dow (1986, 2003, 2017) argues that in countries with competitive cooperative membership markets, the horizon problem is not an issue due to the ability of members to capitalize potential returns, at the market price, when they wish to leave the firm. However, such markets are not allowed in most European countries, including Portugal. Moreover, even when cooperative membership markets exist, often membership is underpriced, as found by Craig and Pencavel (1992) for the US plywood industry, and therefore the horizon problem may still be present.

Some approaches have been proposed to overcome the horizon problem. Galor and Sofer (2019) argue that allowing a part of the surplus to be registered in an individual members' account with benefit upon retirement can overcome the horizon problem as seen in the Mondragón case. However, the authors also stress that this solution is hard to replicate due to its dependence on indivisible funds. Tortia (2018) proposes to encompass investment's duration with individual staying horizon. Jossa (2016) stresses the importance of public guarantees to support cooperatives' lack of capacity to invest due to members' unwillingness to give up current higher wages.

The main consequence of the horizon problem is that individuals are more likely to choose to work in firms that offer higher salaries, in spite of the other potential benefits that cooperatives offer. Next, we review previous studies on cooperative's wage policies.

2.2.2. Wage policies in cooperatives

Most of the pioneering scientific studies about cooperatives did not consider their interaction with the labour market (e.g., Ward, 1958; Domar, 1966; and Vanek, 1970). Mead (1972) was the first to introduce in the literature the individuals' voluntary decision of joining or departing cooperatives, which is a basic principle of these firms, developing a model in which individuals choose entering to, or moving to, cooperatives bearing in mind their earnings' opportunities. Steinherr and Thisse (1979) and Brewer and Browning (1982) extended Mead's work by introducing workers' opportunity cost which is linked to workers' wages. They show that cooperative theory rests on the analysis of individual decision-making procedures rather on firm's profit maximization.

Cooperatives are often seen as low-wage paying companies (Ben-Ner, 1984; Craig and Pencavel, 1992; Burdín and Dean, 2009). However, the cooperatives' propensity to job-protectiveness and low-wage policies may collide with cooperative members' willingness to increase wages due to the horizon problem. In cases where all workers (or the vast majority) are cooperative members, the employment effect may overcome the horizon effect and effectively members will accept lower wages to preserve

their jobs. On the other hand, when cooperatives have a significant number of workers that are not members, cooperative members may maintain (or increase) their wages by lowering non-members' wages. This practice may apparently attenuate the horizon problem but introduces another one known as the degeneration problem (Sauser, 2009; Kokkinidis, 2012; Cheney *et al.*, 2014; Langmead, 2016; Dean, 2019; Pek, 2019). This problem arises when members are substituted by non-members and the cooperative loses part of its natural characteristics, being metamorphosed into a capitalistic firm. The degeneration problem allows for the members staying in the cooperative to collect benefits that otherwise they would not be able to, namely through increasing upfront withdrawals¹⁶.

The empirical evidence on cooperatives' wage policies mostly corroborates the above theoretical reasoning. Craig and Pencavel (1992) and Burdín and Dean (2009) found that cooperatives are more prone to adjust wages rather than employment when compared to capitalistic firms. Similarly, Pencavel *et al.* (2006) found more volatility in wages than in employment, concluding that jobs are maintained through decreasing wages. Thomas and Logan (1982) found that in the case of Mondragón Group no difficulties were experienced when imposing limits to earnings and narrowing the wage gap between workers. Ben-Ner (1984), Burdín and Dean (2009) and Alves *et al.* (2014) show that cooperative members maximize their income through the replacement of "expensive" members by low-wage workers.

In contrast, the idea that cooperatives are low-wage paying companies is not unequivocally confirmed by empirical studies. On the one hand, Pencavel *et al.* (2006) found that, in Italy, cooperative workers earn 14% less than individuals labouring in capitalistic firms. On the other hand, Clemente *et al.* (2012) found that Spanish cooperative workers in the agricultural and service sectors earn more than their counterparts in capitalistic firms and Burdín (2016) found that Uruguayan cooperative workers earn 2.7%-5.5% more than those working in capitalistic firms. In the latter study, when only cooperative members are considered, the wage gap between them and workers in capitalistic firms increases to 9%.

2.2.3. Wages in the labour literature

The study of the determinants of wages is one of the most popular research topics in the labour economics literature. This area of research goes back to, at least, the 1950's, when Mincer (1958, 1974) proposed an earnings function that is still used nowadays as basis for many studies. Other seminal papers in this area include Oaxaca (1973), which proposed a methodology for measuring wage gaps between groups of workers finding that the gender wage gap is large especially because women are concentrated in low paying jobs, and Card (1994), which found a positive causal effect of education on labour market earnings using models incorporating individual heterogeneity and estimated by instrumental variables methods, instead of simple OLS models as was practice until then.

¹⁶ Dean (2019) found no evidence of the degeneration problem in Uruguayan cooperatives.

The large number of empirical studies carried out using the Mincer approach show that, regardless of the adopted model, schooling, experience and other individual characteristics are the core explanatory variables of wages. Other variables controlling for region, industry and time effects are also usually added to the model. For the specific case of cooperatives, broadly the same set of explanatory variables has been used to explain wages and in addition a dummy variable identifying the nature of the firm (cooperative or not) has also been included in the models, as in Craig and Pencavel (1992), Pencavel *et al.* (2006), Burdín and Dean (2009), Clemente *et al.* (2012) and Burdín (2016).

There are many papers where earnings functions are estimated using the same Portuguese database “Quadros de Pessoal” that we use in our study. Some examples are Psacharopoulos (1981), Kikker and Santos (1991), Vieira (1999), Hartog *et al.* (2001), Psacharopoulos and Patrinos (2004), Martins and Pereira (2004), Carneiro (2006) and Almeida *et al.* (2021), and all of them concluded that both personal characteristics and firm features are significant in broadly explaining Portuguese wages. Regarding Portuguese cooperatives, the only study that we are aware of is Barros and Santos (2003), which studied managers’ wages, and found similar wage determinants to those mentioned before.

2.3. Portuguese cooperatives’ background information

In this section we describe broadly and specifically the Portuguese cooperative sector. First, we present the Portuguese SE sector, where cooperatives are legally included. Second, we focus on the cooperative sector.

2.3.1. The social economy sector

The most recent official information from António Sérgio Cooperative for the Social Economy (CASES) and Statistics Portugal (INE) shows that the SE sector accounted for almost 72 thousand firms¹⁷ in 2016, reflecting an increase of 17,3% when compared to 2013. In that same year, it presented a 2,7% weight on national output (equalizing 2013) and 3% on national GVA (2,8% in 2013). In absolute terms, the SE sector’s GVA grew in that period 14,6%, whereas national GVA grew 8,3%. In 2016, the SE sector represented 5,3% of both total wages and national employment, which increased 8,8% and 8,5% relative to 2013, surpassing the average national increments of 7,3% and 5,8%, respectively.

The SE sector is composed by different organisations, such as cooperatives, mutualist associations (MA), holy houses of mercy (HHM), Foundations and associations with altruistic goals (AAG)¹⁸. In Table 2.1 we have some indicators about each one of those organisations.

¹⁷ Although financial firms are included in our analysis of the SE sector in this section, we will not take them into account in the econometric models used later in the essay. The reason is twofold: on the one hand, in terms of wages, these firms are positive outliers; on the other hand, they are now in transition to be supervised by the Banco de Portugal, which legally equalizes these firms to traditional banks.

¹⁸ We do not mention community and self-management subsectors due to their marginal contribution to the SE sector.

Table 2.1 - Main indicators by groups of entities in the SE sector (2013 and 2016).

		Units (No.)	Employees (No.)	GVA (10 ⁶ euro)	Wages (10 ⁶ euro)
Cooperatives	2013	2117	24316	489,5	564,4
	2016	2343	24402	604,2	572,2
AAG	2013	57196	140050	2566,3	2472,3
	2016	66761	151779	2896,9	2673,9
MA	2013	111	4896	352,2	216,4
	2016	97	4842	388	212,1
HHM	2013	389	35469	541,2	477,5
	2016	387	39445	596,6	555,3
Foundations	2013	578	10871	250,9	236,3
	2016	619	14113	332,3	304,3

Source: SESA. Own elaboration.

AAG is by far the most significant type of organisation in the SE sector in absolute terms. In 2016, they accounted for almost 93% of total units, representing 60% of GVA, 65% of full-time employees and 62% of employees' wages. Cooperatives rank in second place in number of units, in the contribution for GVA (12,5%) and employees' wages (13,2%) and rank in third place in terms of employment (10,4%). Between 2013 and 2016, all organizations, except MA, improved in all indicators presented in Table 2.1.

2.3.2. The cooperative sector

In Portugal, cooperative firms are spread throughout the most varied economic sectors. Table 2.2 disaggregates, by sector, cooperatives' numbers regarding units, GVA and wages:

Table 2.2 - Number of Cooperatives in Portugal by Economic Sector, GVA and Wages (2016).

	No.	GVA (10 ⁶ Euro)	Wages (10 ⁶ Euro)
Culture, communication, and recreation activities	316	14,6	19,3
Education services	161	107,3	127,7
Human health services	51	5,4	5,2
Social services	161	12,0	63,0
Environmental protection and animal welfare activities	20	2,2	0,9
Community and economic development, and housing activities	335	6,9	6,9
Civic, advocacy, political and international activities	5	0,0	0,0
Business, professional, and labour organisations	25	2,2	6,1
Professional, scientific, and administrative services	104	1,7	2,0
Agriculture, forestry and fishing	219	4,9	7,0
Industry	326	80,0	52,3
Accommodation, restaurants and diverse catering services	18	9,9	5,6
Retail	406	87,3	79,5
Transport and storing services	82	12,8	10,5
Financial and insurance services	92	256,1	185,6

Real estate services	13	0,8	0,4
Other services	9	0,1	0,2
Total	2 343	604,2	572,2

Source: SESA. Own elaboration.

Table 2.2 shows cooperatives' economic diversity. Although the Financial and Insurance sector represents only 4% of total cooperative firms, it is in the first place regarding GVA (42% of total GVA) and wages (32% of total wages). Retail is the first sector in number of units but only represents 14% of both total GVA and total wages. Education is the second most important sector in terms of total GVA (18%) and total wages (22%), although ranking only in sixth, *ex-aequo* with Social Services, in number of units.

Other characteristics of cooperatives are provided by the 2019 INE and CASES pioneering Survey for the Social Economy Sector (SESS), with regard to the year 2018. It was found that almost $\frac{3}{4}$ of cooperatives' top managers exercised their functions non-exclusively, accumulating with other functions outside the sector. It was also found that cooperatives had 59,5% of top managers without higher education and the majority (57,3%) had 55 or more years old. This may explain why cooperatives display the poorest gscore¹⁹ performance when compared to other organisations in the SE sector. However, when the analysis is restricted to firms with more than 50 workers, cooperatives become the highest "gscore" companies. One reason that may contribute to this fact is that in medium/large cooperatives the source of management practices is more anchored on external knowledge than it is in small cooperatives (SESS, 2019). It is interesting that in medium/large cooperatives women are in majority with respect to management functions (55,3%).

In 2018, cooperatives paid an average monthly gross wage of 1253 euros, with micro, small and medium/large cooperatives paying an average of, respectively, 823, 1129 and 1338 euros. Cooperatives were the entities in the SE sector that better recognized workers' performance through premia (22,9%). Overall, the average wage of full-time employees in cooperatives is 10% higher than the national average, although SE's average is below it.

According to INE and CASES survey, cooperatives continue to engage significantly in conservative governance strategies (53,1%), rather than in strategies anchored on growth or development, and to adopt already in-use management practices (61,6%). Both the conservative governance strategies and the in-use management practices may contribute to cooperatives' rarity.

2.4. Research problem, assumptions and main hypotheses

As we have stated, there is a vast literature on cooperatives. However, most of this research is concerned with firms' performance. Few studies, with the notable exception of Burdín (2016), are interested in the

¹⁹ USA Bureau of Census methodology for appraising management.

workers' view. In this study, we investigate if cooperatives' rarity is propelled by its wage reality in the sense that cooperative wages may be not as appealing to workers as capitalistic ones are.

Cooperatives, as other firms, are not isolated but integrated instead in a market economy with its inherent characteristics. We assume that market failures do exist, and firms' organisation diversity have different impacts on the mitigation of those failures. This is to emphasise that, as we have discussed, firms are likely to have different goals depending on their legal organisation, namely pursuing growth or employment. Moreover, capital and labour are asymmetric regardless of firms' organisation. While capital's property is tradable, labour's is not, which means that workforce is inalienable. This strengthens the importance of firms' organisation, namely cooperatives. Finally, we assume that, in a way, cooperatives behave as capitalistic firms, which stems from the fact that the non-profit goal from the former does not mean that they are not pursuing profit itself (Donário, 2013). Cooperatives, like capitalistic firms, need revenues to survive and linger.

Workers, by exchanging their workforce for a wage, face different realities. In section 2.2, we have presented arguments for dubious wage policies in cooperatives. Cooperatives tend to preserve employment at wages' expenses. Moreover, wage gap is likely to diminish towards lower bound, which stands for less skilled workers' wage protection. This leads cooperatives to be known as low paying companies. On the other hand, when the proportion of members decreases, there is a tendency for cooperatives to maintain (or rise) members' wages at non-members' expenses. Moreover, due to the horizon problem, present wages are expected to increase at the expense of future ones. Simultaneously, cooperatives are prone to operate in labour-intensive industries, which gives workers a significant bargaining power due to their non-profit nature and tendency for trading off reserves for wages. Balancing both sides of the scale, we think that the latter arguments may have more weight and bearing in mind that we are studying workers regardless of their liaison to the firm, we hypothesize that:

- **H1: Cooperatives pay higher wages to workers than capitalistic firms do.**

Wages can be mandatory or not. It is necessary to distinguish between binding salaries in opposition to fringe benefits that often are perceived as wages but are contingent to firms' needs. These fringe benefits perceived as salaries are unbinding wages. From our standpoint, this difference is of the utmost importance due to their generalization across the Economy. On the one hand, binding wages are due to workers regardless of firms' contingencies. On the other hand, unbinding benefits are at firms' discretion. This difference has impact throughout the workers' lives. It is important to understand if capitalistic firms are more generous than cooperatives, regardless of the distinction between fixed and variable salaries. Capitalistic firms tend to create incentives for increasing workers' productivity, namely through binding and unbinding wages. Cooperatives, by its own nature, legally should do something similar. In a cooperative, if a worker is a member, he has the legal right to both binding and

unbinding wages. Even non-member workers have the legal right to some unbinding benefits, namely education. Thus, we hypothesize that:

- **H2: Cooperatives pay higher binding wages (base salaries) to workers than capitalistic firms do.**

Returns to education have been widely investigated in the economics literature (Grenet, 2013; Devereux and Fan, 2011; Martins and Pereira, 2004) and it is expected to have a positive return. As discussed before, cooperatives face the horizon problem and are prone to operate in labour-intensive industries. These two factors together may give a higher bargaining power to cooperative workers. Education may strengthen even further this bargaining power through increased individual knowledge, which may be reflected in cooperatives' productivity performance (Monteiro and Straume, 2018; Fakhfakh *et al.*, 2012; Bartlett *et al.*, 1992). In this sense, we hypothesize that:

- **H3: Returns to education are higher in cooperatives than in capitalistic firms.**

Typically, larger firms pay higher wages. Josefy *et al.* (2015) state that larger firms are more profitable on average and thus pay higher wages. Magne (2017) finds that the effect of firm size on wages is stronger for cooperatives when firms have 100-plus employees. Due to cooperatives' profit-sharing nature and the propensity to trade-off reserves for wages, individuals may be in advantage if working in a large cooperative rather than in a large capitalistic firm. Oi and Idson (1999) argue that work organisation and employee selection are drivers for wages' increase due to firm size. Cooperatives allow workers to participate in the firms' work organisation and simultaneously individuals tend to identify themselves with the firms' values. These results may induce higher salaries in cooperatives than in capitalistic firms as size increases. Following this line of reasoning, we hypothesize that:

- **H4: The effect of firm size on wages is higher for cooperatives than for capitalistic firms.**

Gender wage gap has been thoroughly analysed in the literature (Mishel, 2021; Magne, 2017; Sousa, 2016; Becchetti et Castriota, 2010; Card *et al.*, 2003; Oaxaca, 1973) and it has been found that women are still disfavoured. On the one hand, women are more susceptible to drop out from employment due to "nonjob-related reasons" (Becchetti et Castriota, 2010), such as personal/familiar ones. On the other hand, unions tend to improve wages, but unionization benefits more the men than the women though this tendency has been declining (Mishel, 2021). However, cooperatives, by its own nature, are bound to treat individuals as equal as possible. Cooperatives are established in industries that are labour and women-intensive and women occupy more executive responsibilities in cooperatives than in capitalistic firms (SESS, 2019; Magne 2017). Considering the inherent protection that cooperatives give to their

workers, the decline of unionization and the presence of women in cooperatives, we thus hypothesize that:

- **H5: The gender wage gap is lower in cooperatives than in capitalistic firms.**

Another issue that is important in western economies, namely in Portugal, is collective bargaining and its implications on wages (Mishel, 2021; Campos Lima, 2013; Schulten and Mueller, 2013; Dias and Cerdeira, 2011; Bonoli, 2003). Collective bargaining, in principle, protects workers' income. Collective bargaining's importance regarding wages depends on unionization (Mishel, 2021), as well as on legal intervention (Campos Lima, 2013; Schulten and Mueller, 2013). Unionization and legal intervention are expected to be more important for capitalistic workers than for cooperative ones due to the expected higher bargaining power of cooperative workers. On the one hand, unionization affects more capitalistic workers than cooperative ones, because the latter have the capabilities to negotiate higher wages independently of their liaison or not to any syndicate. On the other hand, legal intervention on collective labour regulatory instruments (CLRI) enhances capitalistic workers' bargaining power by enforcing negotiation. Capitalistic workers' lower individual bargaining power may reflect a higher dependency on CLRI to improve their wages. In this vein, we hypothesize that:

- **H6: The CLRI effect on wages is lower in cooperatives than in capitalistic firms.**

Although the focus of this essay is on the comparison of wage policies between cooperatives and capitalistic firms, we also perform a small analysis about how those policies differ across the SE sector (cooperatives versus AAG, HHM and Foundations; MA are excluded from our study because most of them are financial institutions). Becchetti *et al.* (2013) state that it is the motivation-productivity hypothesis that dominates the effect on wages rather than the donative-labour hypothesis in the SE sector. Higher motivation induces higher productivity, which in turn induces higher wages. Workers can be employed either through formal (in a public and bureaucratic way) or informal recruitment methods. Mosca and Pastore (2009) found that informal recruitment methods are widely used in the SE sector and are better suited to hire motivated individuals. Motivation is related to the employees' feeling of belonging to a firm, namely regarding autonomy, recognition of individual contributions and their involvement in the firms' decisions. Borzaga and Tortia (2006) found that, in the SE sector, cooperatives are the organisations that motivate the most their workers by involving them in the organisation's economic process. Along with this, cooperatives' levels of productivity are high (Monteiro and Straume, 2018; Fakhfakh *et al.*, 2012; Bartlett *et al.*, 1992) and similar to capitalistic firms, and, at least, no inferior to other SE firms (Ben-Ner *et al.*, 2009; Mosca and Pastore, 2009). Joining together the higher motivation level of cooperative's workers and their high productivity performance, we hypothesize that:

- **H7: In the SE sector, cooperatives pay higher wages than AAG, HHM and Foundations.**

2.5. Dataset and descriptive evidence

We use an unbalanced panel from the QP database, which is managed by the Portuguese Ministry of Labour, in the timespan 2010-2019²⁰. QP has information about employees and firms in two separate sections. By merging that information, we can compare employees' earnings in cooperatives²¹ and capitalistic firms. The QP database covers approximately half of total cooperative companies in the 2010 (1068/2260=47%), 2013 (1025/2117=48%) and 2016 (974/2343=42%) years (SESS, 2019).

In our study, we restricted the analysis to employees in the interval 18-75 years old. We also restricted full-time workers to earn no less than the minimum wage at each year due to portuguese legal imposition. Another important issue is the legal imposition of cooperatives to have no less than 3 members, so we included in our study only companies that have 3 or more employees (both cooperatives and capitalistic firms).

Firm's legal organisation may also contribute to explain wages' disparities. From QP we know that anonymous-owned companies ("Sociedades Anónimas") and known-owned firms ("Sociedades por Quotas") amount for 32% and 42% of employees, respectively. Cooperatives amount for 0,7%. We restricted our analysis to these three types of organizations, which amount for ¾ of total employees' database. The first two, apart from individual enterprises, are the most widespread type of organisation.

Wages also depend on the economic sectors where firms operate. To be able to fully understand cooperatives' impact on workers' retribution, and because in relative terms they are so few, we considered only industries where cooperatives have significant employment. The SESA (2019) report for 2016 states that cooperatives represent almost 1% of total workers in Portugal. The industries considered in our study are the following: agriculture, food, beverage, wholesail, retail, lodging, education and social support with and without lodging, which represent 88% of cooperatives' workers employment and 17% (9 in 54) of the industries where cooperatives are present.

Table 2.3 presents the dispersion of our dataset throughout the aforementioned economic sectors. It is interesting to notice that in these 9 sectors capitalistic firms' observations are concentrated (more than 80%) in 3 sectors: food, wholesail and retail. On the other hand, cooperatives are more spread throughout these 9 sectors than their capitalistic counterparts, being however concentrated (about 70%) in the education, social support and wholesail sectors. Overall, throughout the 2010-2019 timespan, our dataset contains more than 3 and a half million observations.

Table 2.3 - Firms' industry dispersion in 2010-2019.

Industry	Cooperatives	Capitalistic firms
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²⁰ This ten-year period has a complete, coherent, and considerable amount of information regarding workers and firms, reaching almost 30 million observations.

²¹ One drawback that we faced was the fact that QP does not have cooperative members' earnings.

	#	%	#	%
Agriculture and related services	2 615	2,41	119 941	3,40
Food	9 313	8,58	441 780	12,51
Beverage	9 410	8,67	75 878	2,15
Wholesale	19 541	18,01	919 392	26,04
Retail	6 555	6,04	1 531 184	43,37
Lodging	2 592	2,39	250 211	7,09
Education	35 636	32,84	141 487	4,01
Social Support with lodging	4 839	4,46	38 638	1,09
Social Support without lodging	18 017	16,60	11 708	0,33
Total observations	108518	100	3530219	100

Source: QP. Own elaboration.

From QP, we extracted both individual and firm-specific information. Regarding the former, we extracted total and binding hourly wages, schooling, experience and tenure years, gender, employment status (full- or part-time) and information about whether collective bargaining instruments were used or not. Concerning the latter, we extracted firms' size, number of employees, legal nature, industry and geographic location. Table 2.4 provides a formal definition of each variable.

Table 2.4 - Variables' formal definition.

Total income	Logarithm of real hourly base salary plus regular instalments in euros
Binding wages	Logarithm of real hourly base salary in euros
Schooling	Number of years attending school
Experience	Number of working years
Tenure	Number of working years in the same firm
Women	Dummy variable equal to 1 if Woman and 0 otherwise
Employees	Logarithm of firm's number of employees
Sales	Logarithm of firm's sales in euros
Coops	Dummy variable equal to 1 if the individual is working in a cooperative firm and 0 otherwise
CLRI	Dummy variable equal to 1 if the worker is covered by collective labour regulation instrument and 0 otherwise
AAG	Dummy variable equal to 1 if the entity is an association with altruistic goals and 0 otherwise
HHM	Dummy variable equal to 1 if the entity is a holy house of mercy and 0 otherwise
Foundations	Dummy variable equal to 1 if the entity is a foundation and 0 otherwise

Source: QP. Own elaboration.

Table 2.5 shows some descriptive statistics for total and binding individual earnings in cooperatives and capitalistic firms²². In our dataset, on average, cooperative workers earn more than individuals in capitalistic firms. The difference between the two types of firms increases when only base salaries are considered. On the other hand, capitalistic firms have a greater disparity of earnings than cooperatives.

²² Note that inflation was not significant in the timespan considered.

Table 2.5 - Descriptive statistics for monthly earnings in 2010-2019 (nominal euros).

		Total income	Base salary
Cooperatives	Mean	1 109,29	961,40
	Median	870,00	720,00
	S.D.	734,41	654,82
	Min	7,11	5,55
	Max	14 731,72	14 591,64
Capitalistic firms	Mean	1 018,12	864,69
	Median	785,82	639,00
	S.D.	866,94	798,87
	Min	3,30	3,00
	Max	60 891,91	44 583,34

Source: QP. Own elaboration.

Table 2.6 reports the same descriptive statistics for individuals' and firms' main characteristics. Cooperative workers have, on average, one additional year of schooling than capitalistic workers, having also more experience and tenure years. Women are the majority in both types of organisations, with cooperatives employing a higher proportion of female workers. Regarding sales and number of employees, capitalistic firms exceed by far, on average, cooperatives. In both types of organisations, the use of collective labour instruments (CLRI) is very relevant, covering about 95% of workers in capitalistic firms and 78% in cooperatives. The higher proportion of workers covered by CLRI in capitalistic firms seems to be in line with hypothesis 6. Almost 90% of employees work full-time in both types of companies.

Table 2.6 - Workers and Firms' Characteristics in 2010-2019.

		Schooling (#)	Experience (#)	Tenure (#)	Women (%)	Sales (Million €)	Employees (#)	CLRI (%)	Full- time (%)
Cooperatives	Mean	11,22	27,34	13,80	0,59	170	111,31	0,78	0,89
	Median	12,00	27,00	12,00	1,00	2,40	71,00	1,00	1,00
	S.D.	4,66	12,45	9,84	0,50	40,70	107,44	0,41	0,31
	Min	0,00	0,00	0,00	0,00	0	3,00	0,00	0,00
	Max	20,00	61,00	54,00	1,00	321	502,00	1,00	1,00
Capitalistic firms	Mean	10,01	23,99	9,68	0,54	454	2789,23	0,95	0,88
	Median	9,00	23,00	8,00	1,00	7,41	56,00	1,00	1,00
	S.D.	3,71	12,85	8,64	0,50	1090	6900,52	0,21	0,32
	Min	0,00	0,00	0,00	0,00	0	3,00	0,00	0,00
	Max	2,00	61,00	54,00	1,00	4280	25612,00	1,00	1,00

Source: QP. Own elaboration.

2.6. Empirical results

2.6.1. The overall effect of cooperatives on wages

Our base model is a well-established mincerian function as follows:

$$W_{it} = X_{it}\alpha + Coops_{it}\delta + \rho_i + \varepsilon_{it} \quad (2.1)$$

where W represents either *Total income* or *Binding wages* for each individual, X comprises individual observed characteristics such as *Schooling*, *Experience* (and squared *Experience*), *Women*, *Tenure* (and squared *Tenure*) and *CLRI*, as well as *Firm size*, ρ represents individual unobserved factors and ε is the usual error term. The key parameter is δ , which captures the sign and wage differential among cooperatives and capitalistic firms.

Table 2.7 displays the results for two distinct random effects model²³ that use workers' *Total income* as dependent variable. Model (1) does not include any dummy for years, industry and region, while model (2) adds them. We find that in both models all coefficients are statistically significant and have the expected signs, with the exception of *CLRI*. *Schooling* has a positive contribution to *Total income*, with an additional year of education increasing income in 4,9%-6,2%. *Experience* and *Tenure* affect positively *Total income* for most of the time, at decreasing rates. The effect of *Firm size* ranges from 2% to 2,2%, which shows that larger firms pay higher wages²⁴. *Women* earn 14,2% to 14,8% less income than men do. Overall, the results for these five variables are in line with related research (Oaxaca, 1973; Psacharopoulos, 1981; Kiker and Santos, 1991; Vieira, 1999; Hartog *et al.*, 2001; Psacharopoulos and Patrinos, 2004; Martins and Pereira, 2004; Carneiro, 2006; Sá *et al.*, 2014; Almeida *et al.*, 2021).

Table 2.7 - Random effects models for workers' *Total income* (2010-2019).

Independent variables	Models	
	(1)	(2)
Schooling	0,062*** (0,0002)	0,049*** (0,0002)
Experience	0,024*** (0,0001)	0,019*** (0,0001)
Experience²	-0,0002*** (0,0000)	-0,0002*** (0,0000)
Firm size	0,022*** (0,0002)	0,020*** (0,0002)

²³ We have chosen random effects models because fixed effects type-models would not allow us to estimate the relationship of our explanatory variables with wages because most of them were constant in time, namely, our main explanatory variable *Coops*.

²⁴ Using the log of sales instead of the log of employees as proxy for firm size produces very similar results.

Women	-0,148*** (0,001)	-0,142*** (0,001)
Tenure	0,012*** (0,0001)	0,010*** (0,0001)
Tenure²	-0,0001*** (0,0000)	-0,0001*** (0,0000)
Coops	0,042*** (0,004)	0,044*** (0,004)
CLRI	-0,028*** (0,003)	-0,005*** (0,001)
Year dummies	No	Yes
Industry dummies	No	Yes
Region dummies	No	Yes
Nr. of observations	3 638 640	
Nr. of workers	853 601	

Source: QP. Own elaboration. *** significant at 1%.

Standard errors (clustered by worker) in parenthesis.

Regarding *CLRI*, its impact on *Total income* is negative, ranging from -0,5% to -2,8%, pulling wages downward regardless of firm's organisation. This evidence is in contradiction with the literature (Grahl and Teague, 1991; Ebbinghaus, 1998; Bonoli, 2003; Dias and Cerdeira, 2011). Both Troika's intervention, in Portugal, on workers' CLRI coverage spectre (Schulten and Mueller, 2013; Naumann, 2013), and the de-unionization phenomenon (Mishel 2021) may explain CLRI's negative sign presented in our results, which are in line with Martins' (2014) findings for Portugal²⁵.

The effect estimated for *Coops* is also the expected, since according to both models cooperatives pay 4,2% to 4,4% more than capitalistic firms do. Therefore, our first hypothesis conjecturing that cooperative organisations pay higher total wages than capitalistic firms do is validated. One possible explanation for this result is based on the horizon problem. If the cooperative workers have a negative perception of job stability and labour-production engagement, then they may compute a high intertemporal discount rate and thus demand a higher wage. Another possible explanation lies on the sectors we are considering. The sectors in analysis are labour-intensive and cooperatives, through the horizon problem and their non-profit nature, tend to trade-off reserves for wages, which may impose them difficulties in enhancing capitalization and thus investment. This reality may impede cooperatives to engage in capital-intensive sectors, which may give a higher bargaining power to workers.

Table 2.8 replicates the above analysis, but now considering *Binding wages* as dependent variable. As for *Total income*, in models (3) and (4) all coefficients are statistically significant and have the expected signs, again with the exception of CLRI. Now, the wage differential between cooperatives and capitalistic firms is even more pronounced, with the former paying 5,5%-9,7% higher wages. Therefore, our second hypothesis is also validated. CLRI also evidence a negative impact on binding wages.

²⁵ Mishel (2021) also found a similar result for the US.

Table 2.8 - Random effects models for workers' *Binding wages* (2010-2019).

Independent variables	Models	
	(3)	(4)
Schooling	0,048*** (0,0002)	0,037*** (0,0002)
Experience	0,026*** (0,0001)	0,020*** (0,0001)
Experience²	-0,0002*** (0,0000)	-0,0002*** (0,0000)
Firm size	0,008*** (0,0002)	0,008*** (0,0002)
Women	-0,100*** (0,001)	-0,103*** (0,001)
Tenure	0,009*** (0,0001)	0,008*** (0,0001)
Tenure²	-0,0001*** (0,0000)	-0,0001*** (0,0000)
Coops	0,097*** (0,006)	0,055*** (0,006)
CLRI	-0,024*** (0,003)	-0,009*** (0,001)
Year dummies	No	Yes
Industry dummies	No	Yes
Region dummies	No	Yes
Nr. of observations	3 638 640	
Nr. of workers	853 601	

Source: QP. Own elaboration. *** significant at 1%.

Standard errors (clustered by worker) in parenthesis.

2.6.2. Specific effects of cooperatives on wages

In order to investigate specific differences between cooperatives and capitalistic firms in explaining *Total income* and *Binding wages*, we added to our base model interactions between *Coops* and all the other explanatory variables:

$$W_{it} = X_{it}\alpha + Coops_{it}\partial + (Coops_{it} * X_{it})\gamma + \rho_i + \varepsilon_{it} \quad (2.2)$$

The results are reported in Table 2.9.

Table 2.9 - Random effects models with interaction variables for workers' *Total income* (model 5) and *Binding wages* (model 6) (2010-2019).

Independent variables	Models	
	(5)	(6)
Schooling	0,048*** (0,0002)	0,037*** (0,0002)
Experience	0,019*** (0,0001)	0,021*** (0,0001)
Experience²	-0,0002*** (0,0000)	-0,0002*** (0,0000)
Firm size	0,019*** (0,0002)	0,008*** (0,0002)
Women	-0,142*** (0,001)	-0,103*** (0,001)
Tenure	0,010*** (0,0001)	0,010*** (0,0001)
Tenure²	-0,0001*** (0,0000)	-0,0001*** (0,0000)
Coops	-0,222*** (0,022)	-0,121*** (0,025)
CLRI	-0,004*** (0,001)	-0,009*** (0,001)
Coops*Schooing	0,017*** (0,001)	0,015*** (0,001)
Coops*Experience	-0,012*** (0,001)	-0,015*** (0,001)
Coops*Experience²	0,0002*** (0,0000)	0,0002*** (0,0000)
Coops*Firm size	0,050*** (0,003)	0,044*** (0,003)
Coops*Women	0,022*** (0,008)	0,024** (0,011)
Coops*Tenure	0,003*** (0,001)	0,002*** (0,001)
Coops*Tenure²	-0,0001*** (0,0000)	0,0000*** (0,0000)
Coops*CLRI	0,017*** (0,006)	0,021*** (0,005)
Year dummies	Yes	Yes
Industry dummies	Yes	Yes
Region dummies	Yes	Yes
Nr. of observations	3 638 640	
Nr. of workers	853 601	

Source: QP. Own elaboration. ***, ** significant at 1% and 5%, respectively. Standard errors (clustered by worker) in parenthesis.

For each additional year of schooling cooperatives pay 1,5% (model 6) to 1,7% (model 5) more than capitalistic firms. These results sustain hypothesis H3, suggesting that the increase in individuals' education level strengthens even further the capability of cooperative workers to experience higher wages when compared to their capitalistic counterparts. Indeed, the expected higher bargaining power of cooperative workers is enhanced as their schooling, and hence their perception of the firm's reality, increases.

The effect of *Firm size* is higher for cooperatives in 4,4% (model 6) to 5% (model 5), which supports hypothesis H4. Individuals are in advantage when working in large cooperatives rather than in large capitalistic firms. The explanation for these results is twofold. Firstly, since larger firms are on average more profitable (Josefy *et al.*, 2015), these results may reflect cooperatives' non-profit goal and their proneness to trade-off reserves for wages. Secondly, cooperative workers are legally stimulated to participate in firm's economic organisation and thus cooperatives tendentially have a horizontal structure. This horizontal structure gives workers the capabilities to strengthen their position in the decision process due to their growing significance in firm's output as firm size increases and hence to experience higher salaries.

The gender wage gap is reduced through cooperative organisation in 2,2% (model 5) to 2,4% (model 6). This sustains hypothesis H5. A possible explanation may lay in cooperatives' non-discriminatory nature and on the fact that women represent about 60% of workers in cooperatives, which may increase their bargaining power.

The effect of CLRI is positive for cooperatives and negative for capitalistic firms. This result contradicts hypothesis H6. The positive effect of CLRI in cooperatives may reflect the capability of cooperative workers to take advantage of both their increased bargaining power and their participation in cooperative's economic organisation. The negative effect of CLRI for capitalistic firms is more intriguing. The explanation for this fact may lay on both the de-unionization phenomenon and the legal intervention's characteristic. On the one hand, the de-unionization phenomenon has more impact on capitalistic workers when compared to cooperative workers due to their lower bargaining power. On the other hand, legal intervention enforces negotiation but if this negotiation legally leaves capitalistic firms and their workers alone in the negotiation process, the latter may be disadvantaged due to their lower bargaining power produced by de-unionization.

When compared to the first models, the cooperatives' overall effect on wages has changed, becoming negative, which suggests that cooperative firms pay higher wages due to higher effects that the other explanatory variables in the regression models have on cooperatives. However, because the effect found for CLRI is also unexpected, we suspect that the education sector may be biasing the results, namely because it is a skilled-intensive sector, has a significant expression in cooperatives and the State legally intervenes on wages. To check if this is the case, we re-estimated the previous models excluding the education sector. The results are reported in Table 2.10.

Table 2.10 - Random effects models with interaction variables for workers' *Total income* (model 7) and *Binding wages* (model 8) without the Education sector (2010-2019).

Independent variables	Models	
	(7)	(8)
Schooling	0,046*** (0,0002)	0,034*** (0,0002)
Experience	0,019*** (0,0001)	0,021*** (0,0001)
Experience²	-0,0002*** (0,0000)	-0,0002*** (0,0000)
Firm size	0,018*** (0,0002)	0,006*** (0,0002)
Women	-0,141*** (0,001)	-0,103*** (0,001)
Tenure	0,010*** (0,0001)	0,008*** (0,0001)
Tenure²	-0,0001*** (0,0000)	-0,0001*** (0,0000)
Coops	0,037 (0,023)	0,045* (0,026)
CLRI	-0,008*** (0,001)	-0,013*** (0,001)
Coops*Schooing	0,005*** (0,001)	0,007*** (0,002)
Coops*Experience	-0,011*** (0,001)	-0,012*** (0,001)
Coops*Experience²	0,0002*** (0,0000)	0,0002*** (0,0000)
Coops*Firm size	0,014*** (0,003)	0,007* (0,003)
Coops*Women	0,053*** (0,008)	0,049*** (0,011)
Coops*Tenure	0,001 (0,007)	0,0000 (0,007)
Coops*Tenure²	0,0000 (0,0000)	0,0000 (0,0000)
Coops*CLRI	-0,020*** (0,004)	0,005 (0,005)
Year dummies	Yes	Yes
Industry dummies	Yes	Yes
Region dummies	Yes	Yes
Nr. of observations	3 461 517	
Nr. of workers	813 880	

Source: QP. Own elaboration. ***, **, * significant at 1%, 5% and 10%, respectively. Standard errors (clustered by worker) in parenthesis.

In general, most of the previous conclusions are valid. However, as we suspected, the education sector was indeed biasing the results of the CLRI variable. Now, the CLRI effect is more in line with hypothesis H6, being significantly lower for cooperatives in model 7 and similar for both organizations in model 8.

There are two other differences that are worthwhile to comment on. First, the reduction of the gender wage gap in cooperatives is now even more pronounced. Considering binding wages (total income), while capitalistic firms pay 10,3% (14,1%) less to women, cooperatives pay less 5,4% (8,9%). Second, the effect of *Coops* is now positive again, but statistically insignificant (model 7) or only marginally significant (model 8). This suggests that our models capture well why wages are higher in cooperatives: it is because of the higher effects that the other explanatory variables have on wages in the case of cooperatives.

2.6.3. Cooperatives' effects on wages in the SE sector

In order to compare cooperatives' effect on both *Total income* and *Binding wages* with the other main SE organisations, we reformulated our base model by withdrawing the dummy variable *Coops* and introducing a dummy variable for each organisation, maintaining all the other explanatory variables:

$$W_{it} = X_{it}\alpha + AAG_{it}\theta_1 + HHM_{it}\theta_2 + Foundations_{it}\theta_3 + \rho_i + \varepsilon_{it} \quad (2.3)$$

The results are reported in Table 2.11.

Table 2.11 - Random effects models in SE sector for workers' *Total income* (model 9) and *Binding wages* (model 10) (2010-2019).

Independent variables	Models	
	(9)	(10)
Schooling	0,052*** (0,0003)	0,038*** (0,0003)
Experience	0,002*** (0,0002)	0,002*** (0,0002)
Experience²	0,0000*** (0,0000)	0,0000*** (0,0000)
Firm size	0,045*** (0,0008)	0,036*** (0,001)
Women	-0,162*** (0,002)	-0,123*** (0,003)
Tenure	0,016*** (0,0002)	0,012*** (0,0002)
Tenure²	-0,0002*** (0,0000)	-0,0002*** (0,0000)
AAG	-0,051***	-0,04***

	(0,006)	(0,008)
HHM	-0,047*** (0,006)	-0,03*** (0,008)
Foundations	-0,024*** (0,006)	-0,017** (0,008)
CLRI	-0,003 (0,002)	0,003** (0,002)
Year dummies	Yes	Yes
Industry dummies	Yes	Yes
Region dummies	Yes	Yes
Nr. of observations	1 485 825	
Nr. of workers	279 299	

Source: QP. Own elaboration. ***, ** significant at 1% and 5%, respectively. Standard errors (clustered by worker) in parenthesis.

We find that in both models all coefficients are statistically significant. The effect estimated for *AAG*, *HHM* and *Foundations* is the conjectured in hypothesis H7, since according to both models all these organisations pay less to their workers than cooperatives do. This result reinforces our suspicion that cooperative workers are more motivated and thus deliver higher productivity levels than their SE counterparts.

2.7. Concluding remarks

Since Economics emerged as an independent science, the cooperative organization has been examined and assessed. With its democratic grounds and foundations, the question that remains is: Why cooperatives are rare? By studying cooperative workers' income retribution within a market economy, we show that cooperatives rarity does not arise from the fact that they are income unappealing. In fact, we found that cooperatives pay higher both total and binding wages than capitalistic firms do, being this effect even more pronounced regarding the latter. The returns to education are higher in cooperatives when compared to capitalistic firms, as well as the effect of firms' size on wages. Considering the gender wage gap, we found that in cooperatives this difference is lower for both total and base wages when compared to capitalistic firms. *CLRI*'s effect on wages is lower in cooperatives than it is in capitalistic firms, except in the sectors where there is State's intervention, namely in the education sector. Finally, we found that cooperatives pay higher wages when compared to the other players in the SE sector.

3. Is degeneration present in the cooperative realm? Evidence from Portugal

Executive summary: Cooperatives may endure degeneration. Degeneration occurs when a cooperative is transformed into a capitalistic firm or behaves like one. In Portugal, only behavioural degeneration is possible, since the transformation of cooperatives on capitalistic firms is forbidden by law. Behaviourally, cooperative degeneration implies the replacement of former cooperative members by non-member employees. In this essay we investigate if Portuguese cooperatives face a degenerative environment by studying the evolution of the proportion of non-member employees in a cooperative. Using fractional response models and data for Portuguese cooperatives, for the period 2010-2019, we cannot reject the hypothesis that degeneration may be present in Portuguese cooperatives. We find that higher membership fees and, to a certain extent, a larger firm size potentiate degeneration, while experience mitigates the degenerative process. When we restrict the analysis to cooperatives that have non-member workers, higher wages and a higher proportion of female workers are also found to potentiate degeneration, while schooling lowers the degenerative process. On the other hand, we could not find evidence that the cooperative's promotion policy affects the degenerative process and that cooperative degeneration is more common in labour-intensive industries.

JEL Classification: C23; J54; P12; P13; P16.

Keywords: Cooperatives; Degeneration; Membership fee; Horizon problem.

3.1. Motivation

Most firms evolve in a market economy environment. Cooperative firms are no exception, although their nature is markedly different from capitalistic firms. One of the aspects that distinguishes them is entrepreneur's rent appropriation. In capitalistic firms there are no limits to profit appropriation irrespective of its source. On the contrary, cooperatives' surplus can only be distributed if it is originated by members. This may lead to the degeneration phenomenon, which reflects the cooperative metamorphose into a capitalistic firm. Degeneration may occur in two ways: legally or behaviourally.

Legal degeneration is when a cooperative firm is transformed into a capitalistic firm. In Portugal, this is forbidden by law. Behaviour degeneration occurs when a cooperative firm, while maintaining its legal cooperative status, behaves as a capitalistic firm. Cooperative's life cycle theory asserts that, after passing through economic consolidation, cooperatives may face this degenerative behaviour because members are interested in collecting profit through wages, which is known as the horizon problem. This degenerative behaviour is threefold: constitutional, organisational and cultural.

Constitutional degeneration occurs when members create conditions to substitute past fellows by non-member employees. By doing so, the remaining members will concentrate the decision power on

themselves and thus may increase their wages by using the cooperative's capital reserves. Although individuals that want to join a cooperative firm are allowed to do so by cooperative principles, Portuguese law permits cooperatives to settle a membership fee, which is not clearly defined. This means that, to maintain their decision power, cooperatives may ask candidates a membership fee that may not be affordable to them, enforcing the constitutional degeneration.

Organisational degeneration exists when employees are not integrated in the cooperative's decision processes, leaving the decision power to a small group of individuals, as typically occurs in capitalistic firms. Organisational degeneration is not necessarily a consequence of a constitutional degenerative behaviour. Even if constitutional degeneration occurs, cooperative firms may operate as if they were worker-managed firms (WMF) by giving employees the freedom to integrate and decide over the economic processes. This is what the cooperatives' life cycle theory denominates organisational regeneration.

Cultural degeneration occurs when a cooperative trades-off its compromise towards society for profit. This degenerative process is linked to constitutional degeneration due to the horizon problem. In this sense, it is expected that constitutional degeneration will enhance the cultural one.

Previous evidence on degeneration is overall non-degenerative. Estrin and Jones (1992), by studying French cooperatives' hired ratio (in the 1970-79 period), did not find strong evidence of cooperative degeneration. Burdín and Dean (2009), focusing on wages and employment of Uruguayan cooperatives (from 1996 till 2005), performed a degeneration test using the hired ratio and did not find evidence of cooperative degeneration. Dean (2019), concentrating only on Uruguayan cooperatives' degeneration (from 1996 till 2013), concludes that "WMFs hire an increasing share of employees" although in his view this does not reflect a degeneration process because "the share of employees that the Producer Cooperative (PC) chose to hire does not seem to have been affected by variations in the level of success of PCs". Note that the hired ratio illustrates the share of non-member employees in a cooperative, which in turn may elucidate if there is a degenerative process or not.

Because cooperatives' economic performance seems to be at least as good as that of capitalistic firms (Bartlett et al., 1992; Fakhfakh et al., 2012; Monteiro and Straume, 2018), degeneration may play an important role on cooperatives' rarity. Degeneration tendentially erodes cooperatives' reserves and thus, without the proper financial backup, disables these firms to establish themselves and grow according to their efficiency track record. In this sense, in this essay we investigate if degeneration is a reality that may explain why cooperatives continue to be rare. To do so, we will perform an econometric analysis of Portuguese cooperatives' hired ratio for the period 2010-2019, in order to investigate if they have experienced degeneration. We use data from two rich Portuguese databases, "Quadros de Pessoal" (QP) and "Sistema de Contas Integradas das Empresas" (SCIE), both from Statistics Portugal (INE). Our sample gathers cooperative corporate and employee information, allowing to investigate whether cooperatives' behavioural degenerative process is also a reflection of institutional and individuals' characteristics.

This essay is organized as follows. Section 3.2 presents related literature to cooperative degeneration. Section 3.3 discusses our main empirical hypotheses. Section 3.4 presents the dataset, defines the model variables, and performs a preliminary analysis of the data. Section 3.5 describes the econometric methodology and presents the main results. Finally, Section 3.6 concludes and discusses some avenues for further research.

3.2. Related literature

3.2.1. Cooperatives' life cycle theory, degeneration and the horizon problem

Cooperatives' life cycle theory asserts that cooperative firms experience two different stages: economic consolidation and degeneration (Meister, 1984; Rosner, 1984; Cornforth, 1995; Chaves and Sajardo, 2004; Cook, 2018; Bretos et al., 2019). Both stages may influence cooperatives' rarity. Economic consolidation seems not to be the cause for cooperatives' rarity, namely because of their better productivity performance (Bartlett et al., 1992; Fakhfakh et al., 2012; Monteiro and Straume, 2018), higher survival rates (Ben-Ner, 1988; Burdín, 2014; Monteiro and Stewart, 2015) and higher wages when compared to capitalistic firms (Clemente et al., 2012; Burdín, 2016).

Degeneration occurs when a cooperative is either transformed into a capitalistic firm or, even maintaining its legal status, behaves as a capitalistic firm through the gradual substitution of members by non-members. By Portuguese law, it is illegal to transform a cooperative into a capitalistic firm, which means that degeneration can only occur through the replacement of members by non-members. Members have a high intertemporal discount rate regarding future earnings, which is potentiated by the decrease in the number of members. In this sense, cooperative degeneration enhances the horizon problem leading to capitalization shortage and thus investment difficulties (Podivinsky and Stewart, 2007), which may explain cooperatives' rarity.

3.2.2. Degeneration in the literature

Webb and Webb (1921) introduced the degeneration thesis by asserting that cooperatives would inevitably end up being capitalistic firms. The 1980s saw a deeper exploration of the degeneration thesis (Ben-Ner, 1984; Meister, 1984; Miyazaki, 1984; Russell, 1984). Cornforth et al. (1988) produced a conceptualization of degeneration within the cooperative legal framework, dividing degeneration into three types: constitutional, organisational and cultural. Constitutional degeneration is when an individual is prevented from joining a cooperative by some mean (for instance, an unbearable membership fee). Organisational degeneration occurs when an employee involvement in firm's economic decision process is replaced by a deciding oligarchy²⁶ (for example, when employees' promotions are not significant).

²⁶ Which resembles to Michels' (1915) iron law of oligarchy.

Cultural degeneration is a stage where a cooperative firm trades-off social goals for profit (namely, when firms abandon their support to community needs, especially to former employees).

Regarding cultural degeneration, in our viewpoint, the problem is substituting social goals for profit *distribution* through wages' increases. The horizon problem boosts constitutional degeneration by trading-off profits for wages, which in turn enhances cultural degeneration and thus deviation from social goals. In this sense, cultural degeneration is a consequence of cooperative constitutional diversion, which may arise from an unbearable membership fee. Therefore, in this essay we will only analyse constitutional and organisational degeneration.

Ben-Ner (1984) and Miyazaki (1984) developed theoretical models for cooperatives' degeneration, stating that this phenomenon is caused by firm's success. In those models, firm's success is defined as members' earnings being higher than the wages they would receive as employees in capitalistic firms. This criterion may reflect the degeneration scenario due to the horizon problem.

Kalmi (2004) found that collective decisions negatively affect membership expansion, although it may be better for members to let non-members in if asymmetric information increases monitoring costs (Bowles, 2004). Employee's promotion decentralizes firms' decisions, enhancing employees' participation in firm's economic process, which may induce organisational regeneration.

Degeneration can also occur due to personal characteristics and institutional differences. Hansmann (1996) states that capitalistic firms are more homogeneous than cooperatives. Heterogeneity is also significant due to cooperatives' principle of individual free and voluntary adherence. Dean (2019), in explaining cooperatives' hired ratio, considered both personal and institutional characteristics into his analysis (namely, employees' average wage, age, experience, schooling and size) to explain its heterogeneity.

3.3. Hypotheses

In this study, we investigate if degeneration exists in Portuguese cooperatives. We make the following assumptions: there are no restrictions in the labour market and thus individuals can be employed in a cooperative firm; cooperatives are profit-seekers despite their non-profit distribution goal; cooperatives elicit both growth and employment; capital and labour are asymmetric, with the former being alienable and the latter not; and the lower the number of members, the higher their income at non-members' expenses, due to the horizon problem.

Degeneration in Portugal is only possible through the substitution of members by non-members. As Ben-ner (1984), Myiazaki (1984) and Dean (2019) suggest, cooperative firms' success may induce this type of degeneration. Firms' success may be measured by their economic and financial robustness, which in turn is reflected on their balance sheet's accumulated reserves. Meira (2017) states that these reserves should be the basis to calculate cooperative membership fees. High membership fees may

impede a candidate to become a member of a cooperative firm, which is known as constitutional degeneration (Bretos et al., 2019). In this sense, we hypothesize that:

- **H1: Constitutional degeneration is positively related with the cooperative membership fee.**

A firm's small size is found not to lead to cooperative degeneration (Rothschild-Whitt, 1976; Varman and Chakrabarti, 2004; Schneiberg et al., 2008) because in early stages of cooperatives' birth and/or development, members are prone to invite other individuals to join the firm. After consolidation, an increase in size, in general, implies that hiring employees has a positive correlation with the total value of firm's assets (Simons and Ingram, 1997; Dean, 2019). This may enhance the horizon problem (Bretos et al., 2019), which promotes the degeneration process. Thus, as firm size increases, it is expectable that members will hire more non-members. Nevertheless, as firms grow, increasing the hired ratio beyond a certain point may become costly (Bradley, 1980; Kalmi, 2004) due to employees' increasing information and knowledge, thus creating an incentive for mitigating degeneration. In this context, we hypothesize that:

- **H2: As cooperative firm size increases, degeneration initially increases and then decreases.**

Cooperatives' life cycle theory prescribes that when firms' employees are not integrated into the economic decision processes of the firm, degeneration also occurs in an organisational fashion. As a consequence, cooperatives do not comply with their own principle of workers' economic participation. However, when workers are promoted, their responsibility and engagement in the decision process increases and their motivation is boosted. Therefore, promotion is expected to increase productivity (Oi and Idson, 1999) through the narrowing of "corporate goals and employees' intrinsic motivations" (Bechetti *et al.*, 2013). Higher productivity lowers firms' need to hire additional employees. In this sense, we hypothesize that:

- **H3: A higher proportion of employee's promotions mitigates overall degeneration.**

We saw in our second essay that cooperatives tendentially pay higher average wages to employees than capitalistic firms do. These higher average wages may reflect members' willingness to support the opportunity cost of maintaining their *status quo* in the firm. This tends to incentivize individuals to seek employment in cooperatives, which may generate the individuals' acceptance of their non-member status. Simultaneously, as members leave the cooperative, there is a tendency to substitute them by non-members due to the horizon problem. In this regard, we thus hypothesize that:

- **H4: Higher average wages in cooperatives increase degeneration.**

The importance of Workers' education for firms' efficient performance is well established in the literature (Card, 1994; Martins and Pereira, 2004; Devereux and Fan, 2011; Grenet, 2013). Higher levels of education increase workers' productivity and thus potentially decrease the need for new employees. Similar to education, experience also induces firms' efficiency and may even strengthen it (Oi and Idson, 1999). In line of this thought, we hypothesize that:

- **H5: Both higher average schooling and experience decrease the degeneration level of cooperatives.**

Women represent a significant part of cooperative employment (SESS, 2019; Magne, 2017) and there is no shortage of their labour supply. Women typically earn less than men (Mishel, 2021) and thus face a greater difficulty to support the cooperative membership fee. In line of this reasoning, women will be more prone to maintain their non-member status, thus increasing degeneration. In this sense, we hypothesize that:

- **H6: Cooperative degeneration is potentiated as women's average weight on firm's employment increases.**

Cooperative firms operate in both capital and labour-intensive industries but tendentially are more present in the latter (Podivinsky and Stewart, 2007), which are usually low investment sectors (Drèze, 1989). Low investment industries tendentially employ low-skilled workers. Labour is inalienable thus implying that it can only be acquired as a flow (Dow, 2018). This labour's inalienable characteristic makes low-skilled employees appealing to members. Simultaneously, low-skilled labour markets face competitive equilibria enabling the cooperative members to easily replace these workers, *caeteris paribus*. In this respect, we hypothesize that:

- **H7: Labour-intensive industries tendentially potentiate cooperative degeneration.**

3.4. Dataset, variables' definition and descriptive evidence

3.4.1. Dataset

We use an unbalanced panel built from the QP and SCIE databases, both of which are collected and managed by the INE, in the timespan 2010-2019. QP has information about employees and firms in two separate sections that we needed to merge. From employees' database we collected for each worker information about wages, schooling, experience, gender, if he/she was promoted or not, and his/her

employer' fiscal identification number. Then, for each firm, we computed by year the average values of wages, schooling and experience, the proportion of male and female workers and the total number of promotions. To this information we added the total number of employees by firm and year, which was collected from QP's section on firms using their fiscal identification number as merge variable.

Regarding the variable membership fee, we created it using information on firm's reserves, which was extracted from SCIE, a database that contains accounting information not available at QP. Because SCIE also contains firms' fiscal identification number, we were able to merge this new information with the one previously collected from QP.

QP employees' database also has information about worker's labour status, allowing the identification of employees that are members of a cooperative firm in a given year and the calculation of the hired ratio by firm. Unfortunately, such information is not available for all firms, so our sample contains only 192 cooperatives and a total of 905 observations for the period 2010-2019.

3.4.2. Variables' definition

Table 3.1 presents the variables' definitions. The *hired ratio* is an established variable to understand cooperatives' degeneration (Estrin and Jones, 1992; Burdín and Dean, 2009; Dean, 2019). The *hired ratio* reflects the weight non-member workers have on total employees. If the *hired ratio* of a cooperative increases, it means that the proportion of non-member workers also increases, thus promoting degeneration.

Table 3.1 – Variables' formal definition

Hired ratio	Ratio of non-member employees to total workers in each cooperative in each year
Membership fee	Logarithm of the ratio of cooperative reserves to total workers in euros in each year
Size	Total workers in each cooperative in each year
Size2	Square of Size
Promotions	Proportion of workers that are promoted by firm/year
Wages	Average wages in each cooperative in each year
Experience	Average number of working years in each cooperative in each year
Schooling	Average number of years attending school in each cooperative in each year
Women	Women proportion in each cooperative in each year
Labour industries	Dummy variable equal to 1 if a cooperative firm is in labour-intensive industry and 0 otherwise

Source: QP and SCIE. Own elaboration.

We expect the *membership fee* to be a significant explanatory variable of degeneration, namely constitutional degeneration, although, as far as we know, its effect has not been studied yet. The *membership fee* is the amount a cooperative may demand to a candidate to join in. This amount is not clearly defined in the Portuguese law but should reflect each individual contribution to cooperatives' reserves at the moment of the candidate's appliance. If this membership fee is too high, candidates will step down from their appliance and thus the hired ratio may increase, reflecting constitutional

degeneration. As explained before, from SCIE we collected firm's reserves and divided it by the number of workers, obtaining a proxy for the *membership fee* value required to allow for individual membership. Its logarithmic representation tries to capture the potential non-linearity effect of the *membership fee* on the hired ratio.

We think that degeneration is better explained by the *membership fee* rather than the indicators of firm's success considered by Dean (2019), which measure members' opportunity cost of belonging to a cooperative firm instead of a capitalistic one²⁷. Indeed, Dean's (2019) measures of firm's success do not consider the horizon problem, which reflects an internal decision that trades-off reserves for wages, the main characteristic of a degeneration process. In contrast, cooperative law endorses the received membership fees to reserves. The higher the membership fee, *caeteris paribus*, the higher the members' propensity to trade-off reserves for wages due to the horizon problem. Moreover, Dean (2019) advances that legal complexity may produce either cooperatives' degeneration or regeneration, depending on their incentives on monitoring and compliance of both workers and members. In the Portuguese case, the unclear legal definition of the *membership fee* may incentivise cooperatives' degeneration due to both cooperatives' legal freedom to define it and the consideration of the horizon problem. By substituting Dean (2019)'s cooperatives' success definition by the membership fee rationale, we can more suitably clarify Portuguese degeneration's roots.

Another firm's characteristic that may explain cooperative's degeneration is *size*. We used the number of employees as a proxy for cooperative's *size* in each year to understand the impact of this variable on the *Hired ratio*'s evolution. We also introduced the square of size to capture the possible non-linear behaviour of this variable.

Degeneration may also be of the organisational type. Promotions embed workers in the economic process of cooperatives, thus mitigating overall degeneration (Oi an Idson, 1999; Bechetti et al., 2013). The proportion of workers that are promoted by firm/year allow us to understand if there is organisational degeneration or not.

The variables measuring individual employee's characteristics, *wages*, *schooling*, *experience* and *Women*, are computed in average terms by firm and year to capture their expected influence on the degeneration process through the impact the horizon problem has on wages, the productivity scores of schooling and experience (Card, 1994; Oi an Idson, 1999; Martins and Pereira, 2004; Devereux and Fan, 2011; Grenet, 2013) and women's vulnerability and professional instability (Bechetti and Castriota, 2010; Magne 2017; Mishel, 2021). *Labour industries* is a dummy variable to capture the influence of labour-intensive industries on cooperative degeneration.

²⁷ Dean (2019) defines firm's success as "firms in which members earn more than what they would earn as employees in a Capitalistic Firm"; Because we have no information on members' earnings, we do not consider this approach in our work.

3.4.3. Descriptive evidence

As reported in Table 3.2, from the 192 cooperatives in our dataset, only 56 (29%) never had non-member workers. This suggests that the usage of non-member labour force occurs in Portuguese cooperatives, which may be a sign of degeneration.

Table 3.2 – The hired ratio in the dataset’s cooperatives.

	Value	%
Cooperatives with only members	56	29
Cooperatives with employees	136	71
Total cooperatives	192	100

Source: QP and SCIE. Own elaboration.

To have a first picture of the differences between cooperatives where all workers are members and cooperatives that have a mix of members and non-members (from now on designated by ‘cooperatives with employees’), Table 3.3 reports total sales, own capital and total workers for each group. Cooperatives that only have members are on average smaller than those that also have employees, having less sales, capital and workers. This suggests that cooperatives with a bigger dimension may be more susceptible to degeneration.

Table 3.3 – Cooperatives’ average total sales, own capital and total workers in 2010-2019 (nominal euros).

		Total sales (€)	Own capital (€)	Total workers
Cooperatives with only members	Mean	660 700,50	490 033,30	11,57
	Median	111 513	45 874	6
	S.D.	2 680 274	1 671 160	16,23
	Min	0	-383 949	1
	Max	16 900 000	10 800 000	111
Cooperatives with employees	Mean	2 644 138	1 890 780	29,64
	Median	587 086	377 111,50	13
	S.D.	4 669 361	3 725 319	48,19
	Min	0	-5 012 687	2
	Max	29 300 000	22 500 000	334

Source: QP and SCIE. Own elaboration.

Table 3.4 presents some descriptive statistics for the *hired ratio* in cooperatives with employees. The proportion of non-members in these cooperatives ranges from 2% to 99%, with a high median value of 75%, which suggests that there is an apparent tendency for cooperatives to degenerate.

Table 3.4 – Descriptive statistics for the hired ratio in 2010-2019.

		Hired ratio
Cooperatives with employees	Mean	0,66
	Median	0,75

S.D.	0,267
Min	0,02
Max	0,99

Source: QP and SCIE. Own elaboration.

The *Hired ratio* may be a reflection of both constitutional and organisational degeneration. Table 3.5 presents some descriptive information about the membership fee and the promotions' ratio both for cooperatives with only members and with employees.

Table 3.5 – Descriptive statistics for the membership fee (in nominal euros) and the promotions' ratio in cooperatives with and without employees in 2010-2019.

		Membership fee	Promotions ratio
Cooperatives with only members	Mean	34 861,46	0,10
	Median	7 090,33	0
	S.D.	64 694,87	0,27
	Min	0	0
	Max	414 574,90	1
Cooperatives with employees	Mean	51 251,63	0,21
	Median	23 502,38	0
	S.D.	86 969,69	0,32
	Min	0	0
	Max	697 668,30	1

Source: QP and SCIE. Own elaboration.

The average *membership fee* in cooperatives that employ non-members is higher than in the cooperatives with only members, which reflects a higher barrier for non-members to concretize their membership. The higher *promotions ratio* in cooperatives with employees may be attributed to two distinct factors that benefit both cooperative's members and non-members. On the one hand, non-member workers benefit from a higher integration on firm's economic process and better wages. On the other hand, because higher promotion levels usually lead to higher productivity levels, members benefit from higher earnings through increased reserves. Simultaneously, cooperatives tend to diminish the hiring pace, which balance the degeneration process.

The *hired ratio* is also influenced by individual characteristics such as *wages*, *schooling*, *experience* and *gender*. Table 3.6 presents some descriptive information about those variables for both groups of cooperatives. Note that we cannot compare wages in both type of cooperatives because members' wages are not available.

Table 3.6 – Descriptive statistics for individuals' wages (in nominal euros), schooling and experience (in years) and women in cooperatives with employees and with only members in 2010-2019.

		Wages	Schooling	Experience	Women
	Mean	NA	8,81	31,29	0,52
	Median	NA	8	30,33	0,50

Cooperatives with members only	S.D.	NA	3,87	9,91	0,41
	Min	NA	3,20	6,50	0
	Max	NA	19	54	1
Cooperatives with employees	Mean	818,33	10,13	29,50	0,40
	Median	778,04	9,19	29,13	0,40
	S.D.	351,77	3,29	7,89	0,29
	Min	14	4	7,13	0
	Max	2 172,64	19	51,63	1

Source: QP and SCIE. Own elaboration.

In cooperatives that employ non-members, the annual average wage is four and half times lower than the average expected *membership fee* reported in Table 3.5, which makes the *membership fee* difficult to bear and thus apparently there is a tendency for constitutional degeneration to exist. *Schooling* is on average higher in cooperatives that have non-members. *Experience* shows that there is a high degree of employment stability in cooperatives, with minor differences between both types of cooperatives. Men seem to have more weight in cooperatives with employees and be equally predominant in cooperatives with only members.

Table 3.7 shows cooperatives' industry dispersion in our dataset. As we can observe, cooperatives with only members are mainly established in more capital-intensive industries (58,9%), whilst cooperatives with employees are predominantly present in more labour-intensive industries (64,97%).

Table 3.7 – Relative industry dispersion of cooperatives with and without employees in 2010-2019.

	Capital-intensive industries	Labour-intensive industries
Coops with only members (%)	58,90	41,10
Coops with employees (%)	35,03	64,97
Total	100,00	100,00

Source: QP and SCIE. Own elaboration.

Table 3.8 shows that degeneration is dominant in all regions except for Madeira where we find an equal presence of both types of cooperatives (only two cooperatives in our dataset). The most significant degenerative processes are in Açores and Algarve where there is not a single cooperative with only members. On the one hand, Algarve, a touristic area, may endure this full degenerative process due to a labour seasonality effect. On the other hand, Açores, an agricultural area, may suffer from degeneration due to excessive labour supply. Norte, Centro and Lisboa also present significant degenerative processes, which may be a reflection of the high concentration of individuals in working age in those areas. Interestingly, Alentejo shows almost an even distribution of the two types of cooperatives. Alentejo is an agricultural area with large estates, where the cooperative organisation has tradition, and is now competing both in internal and external markets, especially in the wine industry. This reality may have propelled capital investment, which may have substituted labour force, thus mitigating degeneration.

Table 3.8 – Regional dispersion of cooperatives with and without employees in 2010-2019.

NUTS II	ACORES	LISBOA	ALENTEJO	ALGARVE	CENTRO	MADEIRA	NORTE
COOPS WITH ONLY MEMBERS (%)	0,0	27,7	45,5	0,0	17,5	50,0	35,7
COOPS WITH EMPLOYEES (%)	100,0	72,3	54,5	100,0	82,5	50,0	64,3
TOTAL (%)	100,0	100,0	100,0	100,0	100,0	100,0	100,0

Source: QP and SCIE. Own elaboration

3.5. Empirical results

To understand what influences degeneration in the Portuguese cooperative realm, we use an econometric model to explain the variable *Hired ratio*, which is a proportion defined between 0 and 1. This means that our dependent variable is continuously bounded and thus linear models cannot appropriately describe it. To deal with our variable of interest, which is of the fractional response type, we assume a functional form for *Hired ratio* that imposes constraints on its conditional mean²⁸:

$$E(Hired Ratio_{it} | X_{it}; Membership Fee_{it}; Promotions_{it}) = G(X_{it}\alpha + Membership Fee_{it}\partial + Promotions_{it}\theta) \quad (3.1)$$

where $G(.)$ is a non-linear link function that only produces values between 0 and 1 and X comprises *Wages*, *Schooling*, *Experience*, *Women*, *Size*, *Size2* and *Labour industries*. The key parameters are ∂ and θ , which capture the effects of the *Membership fee* and *Promotions* variables, and, hence, reflect the existence, or not, of constitutional and organisational degeneration, respectively.

To understand *Hired ratio*'s dynamics, we have estimated different fractional response models, which produce different results depending on their link function. The Logit and Probit link functions are the most commonly used in this framework and the Cloglog link function was also considered due to its asymmetric characteristics.

Table 3.9 shows the results of the three mentioned fractional response models for all cooperatives in our dataset. Following Papke and Wooldridge (1996) and Ramalho et al. (2011), we computed the RESET test (based on the addition of the square of the predicted argument of the $G(.)$ function) to assess the suitability of the link functions and a R^2 measure (calculated as the square of the correlation between the actual and predicted values of *Hired ratio*) to get an idea of the explanatory power of each model. Due to the fact that we do not have members' wages in our database, this first set of models does not allow us to test hypothesis H4.

²⁸ This approach was first proposed by Papke and Wooldridge (1996). See Ramalho *et al.* (2011) for a survey.

Table 3.9 – Hired ratio fractional response's Logit, Probit and Cloglog models for all cooperatives (2010-2019).

		Fractional response models		
		All Coops		
Hired ratio's Models		Logit	Probit	Cloglog
Regressors	Membership fee	0,344*** (0,09)	0,203*** (0,051)	0,257*** (0,065)
	Size	0,032** (0,015)	0,018** (0,008)	0,018** (0,008)
	Size ²	-0,0002** (0,0001)	-0,0001*** (0,0000)	-0,0001** (0,0000)
	Promotions	0,457 (0,472)	0,281 (0,277)	0,344 (0,314)
	Wages	NA	NA	NA
	Experience	-0,04* (0,022)	-0,025* (0,013)	-0,031** (0,015)
	Schooling	-0,004 (0,065)	-0,004 (0,039)	-0,009 (0,045)
	Women	-0,420 (0,42)	-0,268 (0,252)	-0,244 (0,305)
	Labour industries	-0,363 (0,406)	-0,225 (0,24)	-0,215 (0,272)
	Year dummies	Yes	Yes	Yes
	Region dummies	Yes	Yes	Yes
	R ²	0,381	0,376	0,367
RESET Test		0,635	0,601	0,046**
Nr. of observations		769		

Source: QP. Own elaboration. ***, ** and * significant at 1%, 5% and 10%, respectively. Standard errors (clustered by firm) in parenthesis.

The RESET test suggests that, unlike the Logit and Probit cases, the Cloglog model is not well specified. Nevertheless, our results are robust to the choice of the link function, with no differences in the sign and significance of the parameters across models.

The results show that the higher the membership fee, the higher the hired ratio. This suggests that membership fee is, as conjectured in hypothesis H1, an obstacle to individuals' membership, probably due to its gap in relation to workers' income. Thus, our first hypothesis is validated, indicating a tendency for constitutional degeneration of Portuguese cooperatives.

Regarding cooperatives' size, we find that this variable has a quadratic effect on the *Hired ratio*. *Size* positively affects the *Hired ratio*, though at decreasing rates, until a cooperative reaches 100 workers – both in Logit and Probit models. Only 9 cooperatives have more than 100 workers in the

entire period, which means that these thresholds are far away from cooperatives' average number of workers and thus it is most likely that *size* enhances degeneration. Nevertheless, the explanation for *size*'s behaviour may be twofold. First, as firms grow, it is both expected that they need more workers and that profits are on average higher, thus enhancing the horizon problem. Second, members will have the tendency to use their power to impede non-members from joining in up to a certain point. Beyond that point, cooperatives may fall into an "employee-trap" reflected on their dependency on workers' information and knowledge, which may induce regeneration. The results seem to support our conjecture that degeneration increases as cooperatives' size increases, but only while members are in control. Hence, hypothesis H2 is validated.

Hypothesis H3 conjectures that organisational degeneration decreases as employees' promotions increase. This conjecture seems not to be supported by the models, since the coefficient of *Promotions ratio* is not statistically significant. In this sense, we cannot validate hypothesis H3.

In hypothesis H5, we have assumed that both average experience and schooling decrease cooperatives' degeneration. While *Experience* presents the expected sign and is statistically significant, *Schooling* is not statistically significant. These results indicate that *Experience* seems to mitigate cooperatives' degeneration, while *Schooling* does not influence it. This evidence allows us to partially support hypothesis H5.

We have hypothesized in H6 that as the women's weight in cooperatives increase, degeneration will also increase. Because *Women* is not statistically significant, we cannot validate this hypothesis. A similar situation occurred with hypothesis H7, which we could not validate due to its statistical insignificance.

To test hypothesis H4, we estimated similar models to the ones in Table 3.9, but restricted the sample to cooperatives that have non-member employees for whom the database has information about their wages. Table 3.10 shows the results of the Logit, Probit and Cloglog fractional response models. The RESET test and R^2 were computed as previously. Now the RESET test indicates that we cannot reject any of the functional forms of the models and the R^2 increased in all three models.

Table 3.10 – Hired ratio fractional response's Logit, Probit and Cloglog models for cooperatives with non-members (2010-2019).

Fractional response models				
Coops with workers				
Hired ratio's Models		Logit	Probit	Cloglog
Regressors	Membership fee	0,2*** (0,057)	0,121*** (0,033)	0,122*** (0,034)
	Size	0,014 (0,008)	0,008* (0,005)	0,011** (0,004)
	Size ²	-0,0001** (0,0000)	-0,0001** (0,0000)	-0,0001*** (0,0000)
	Promotions	-0,231	-0,139	-0,173

	(0,322)	(0,192)	(0,188)
Wages	0,001*** (0,0005)	0,001*** (0,0002)	0,001*** (0,0002)
Experience	-0,077*** (0,016)	-0,046*** (0,009)	-0,046*** (0,009)
Schooling	-0,195*** (0,051)	-0,119*** (0,03)	-0,121*** (0,03)
Women	1,176*** (0,379)	0,698*** (0,224)	0,644*** (0,222)
Labour industries	-0,091 (0,246)	-0,059 (0,15)	-0,114 (0,145)
Year dummies	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes
R²	0,477	0,472	0,470
RESET Test	0,263	0,261	0,654
Nr. of observations	482		

Source: QP. Own elaboration. ***, ** and * significant at 1%, 5% and 10%, respectively. Standard errors (clustered by firm) in parenthesis.

For *Membership fee*, *Size*, *Promotions*, *Experience* and *Labour industries* the results are similar to the ones previously obtained, thus confirming H1, H2 and H5 and rejecting again both H3 and H7. In contrast, the variables *Schooling* and *Women* are now significant. Regarding the former variable, this result strengthens the validity of hypothesis H5, which before was only partially supported by the result of *Experience*. Regarding the latter, the new results reveal that as women's weight in cooperatives increase, the degeneration level also increases, which provides support to hypothesis H6. This effect may be explained by the fact that women may anticipate better working conditions in cooperatives than in capitalistic firms, thus increasing their labour supply for the former type of organisations. This reality creates an incentive for cooperative members to hire more women as non-members.

In hypothesis H4, we conjectured that higher average wages potentiate cooperative degeneration. *Wages'* coefficients are positive and statistically significant in all models, which validates hypothesis H4. The reason behind this may lay on the fact that higher wages attract more workers, which may be satisfied with their non-member status and thus potentiating degeneration.

3.6. Concluding remarks

Hiring employees seems to be common in Portuguese cooperatives. This degenerative process is apparently enhanced by the high membership fee requested and firm's size.

In all models, the membership fee has a positive and significant relationship with the hired ratio. This indicates that constitutional degeneration is tendentially present in Portuguese cooperatives and the membership fee is a key factor. If the membership fee was fairly and clearly defined in the Portuguese

law, more individuals would likely become members, thus increasing cooperative's reserves and enabling capital shortage reduction. For instance, if for the membership fee's calculation, firm's reality, candidate's capacity and the cooperative principles were taken into account, more individuals would be able to join in. This would allow cooperatives to robust their capacity to invest and thus increase their weight in the economy.

Similarly, an increase in firm's size puts a pressure on the degenerative process, although only until a certain point. Beyond that point, cooperative size induces cooperative regeneration, thus tending to diminish capital shortage. Nevertheless, only a few cooperatives have reached the point where size induces regeneration.

Another factor that may induce degeneration is the average wage, at least in cooperatives with employees. However, we cannot fully confirm this result because available data do not disclosure members' income. In future research, we would like to collect members' wages in order to fully understand if increases in income indeed propels degeneration.

Individual experience seems to mitigate degeneration, affecting in a negative, significant way the proportion of non-members workers in all models. Regarding individual education and the proportion of women, the evidence is mixed since only in some models we found a significant effect. While individual education mitigates degeneration in cooperatives with non-members, the proportion of women seems to increase it. The promotions' proportion and labour-intensive industries were never significant.

The reversion of the degenerative process conduces to capital shortage reduction but does not automatically imply an increase in investment. This investment capacity can be halted by the horizon problem. This leads us to think that the creation of an adequate membership market that complies with the cooperative principles would mitigate the horizon problem effect on investment. This is another avenue for further research on cooperatives' rarity.

4. Do cooperatives struggle to leverage funds? Evidence from Portugal

Executive summary: Cooperatives may struggle to raise funds despite their efficient track record and significant survival levels. In this essay we investigate if this is the case for Portuguese cooperatives by studying their probability of raising debt, as well as the proportion of debt cooperatives are able to raise. Using binary choice and fractional response models and data for the period 2010-2019, we cannot reject the hypothesis that Portuguese cooperatives may struggle to raise funds. Overall, we found that cooperatives face obstacles to raise debt when compared to capitalistic firms. Cooperatives seem to face difficulties in presenting sound collaterals to lenders due to their fixed assets' special nature. Liquidity presents a negative effect on both the probability and proportion of debt regarding all firms with a more pronounced effect for cooperatives. We also found that profitability increases the likelihood of firms raising debt, with this effect being more evident for cooperatives. Finally, we found similar effects for cooperatives and capitalistic firms in what concerns their dimension and location. Smaller firms are less prone to raise debt, but, when they do, they use it in a higher proportion. In contrast, firms located in rural areas have a higher probability of raising debt, but they use it in a lower proportion.

JEL Classification: C23; J54; P12; P13; P16.

Keywords: Cooperatives; Capitalistic firms; Debt; Firms' tangibility; Firms' profitability; Firms' liquidity.

4.1. Motivation

At least since the 70's of the past century, cooperatives have been viewed as capital-raising struggling firms²⁹. Vanek (1977) sustained that cooperatives would have difficulties in raising funds due to their collective capital structure nature. Drèze (1989) asserted that cooperatives would rely on self-financing and thus be on low-investment industries. Podivinsky and Stewart (2007) found empirically that cooperatives in the UK, indeed, struggle to raise funds. Moreover, although cooperatives are high performance firms (Bartlett *et al.*, 1992; Fakhfakh *et al.*, 2012; Monteiro and Straume, 2018), seem to endure (Ben-Ner, 1988; Burdín, 2014; Monteiro and Stewart, 2015) and have contributed to independent producers and consumers to have access to competing markets in the US and Western Europe in the past three decades, they struggle to avoid bankruptcies, leading scholars to question their financial viability (Kalogeras *et al.*, 2010).

²⁹ The most notable exception to this scenario is the Spanish multi-industry cooperative Mondragón, which has a financial tool called "Caja Laboral" (Thomas and Logan, 1982). In Portugal, cooperatives may not be allowed to become multi-industry.

Thus, cooperatives seem to be subject to a financial constraint (Vitaliano, 1983; Cook, 1995; Kalogeras, *et al.* 2005; Li *et al.*, 2015), having difficulties in raising debt, among other funding sources. Debt raising has been widely studied in the financial literature. The three major theories that explain firm's capital structure are: the Pecking Order theory (Myers, 1984; Myers and Majluf, 1984), the Agency Cost theory (Jensen and Meckling, 1976) and the Trade-Off theory (Modigliani and Miller, 1958). The Pecking Order theory asserts that, to finance their activity, firms prefer to use internal funding first, then external funding and only as a last resort outside equity. The Agency Cost theory sustains that firms choose their debt level both to balance the interaction between stockholders and managers and the financial engagement between stockholders and lenders. The Trade-Off theory states that firm's debt level is set to maximize tax advantages while avoiding financial distress or even bankruptcy.

These capital structure theories were developed with a focus on large companies regardless of firms' ownership. However, the incorporation of different firm's organisation forms may bring some new insights into this subject. For instance, Ramalho *et al.* (2018) found that family ownership influences positively the probability of firms using external debt. Chua *et al.* (1999) define a family-owned firm as "a business governed and/or managed with the intention to shape and pursue the vision of the business held by a dominant coalition controlled by members of the same family or by a small number of families in a manner that is potentially sustainable across generations of the family or families.". This "...coalition controlled by members... of a small number of families..." applies broadly to many cooperatives, especially when they face a degenerative process (see our third essay), and thus approximate them to family-owned firms' organisation. Also, Chua *et al.* (1999), Chrisman *et al.* (2003) and Habbershon *et al.* (2003) suggest that family-owned firms are based on both economic and noneconomic values enhanced by the combination of unity and business. This is much alike cooperative principles and objectives, which include mutual-aid and welfare achievement.

In this essay we adapt the capital structure theories developed for family-owned firms to study both the probability of a cooperative raising debt and, conditional on using it, the proportion of debt it holds in its capital structure. To this end, we use binary and fractional regression models. To the best of our knowledge, this is the first study of cooperative's capital structure applying this methodology and focusing on Portugal. In fact, several authors studied cooperatives' funding phenomenon (Berman and Berman, 1989; Doucouliagos, 1990; Bowles and Gintis, 1996c; Hardesty and Salgia, 2004; Kalogeras *et al.*, 2010; Kalogeras *et al.*, 2011; Martí and Andrés, 2015; Royer, 2015; Li *et al.*, 2015; Royer, 2019; Royer and McKee, 2020), but none, as far as we know, has used our methodology. Moreover, none considered the Portuguese context.

This essay is organised as follows. Section 4.2 describes cooperatives' financial context and reviews the main capital structure theories. Section 4.3 discusses our research problem and main empirical hypotheses. Section 4.4 presents the dataset, performs a preliminary analysis of the data and describes

the econometric methodology. Section 4.5 presents the main results. Finally, Section 4.6 concludes and discusses some avenues for further research.

4.2. Theoretical framework and previous research

In this section we first discuss cooperatives' funding context. Then, we review the main capital structure theories and discuss how they may apply to cooperatives.

4.2.1. The financial context of cooperatives

Theoretical and legally, cooperatives are economic entities with variable and unlimited equity (1st principle of the international cooperative alliance reflected in the Portuguese cooperative law). As in family-owned firms, either due to lack of interest or barriers to adherence, cooperative subscribed capital remains in the hands of small groups, which may be potentiated by cooperatives' degenerative process, as discussed in our third essay. It is worth noting that subscribed capital shares in cooperatives, although unavailable to be sold, can be endorsed to anyone the departing member chooses.

Portuguese cooperatives are legally obliged to apply cashflows into, at least, two funds: the backup and the education funds. These two funds are fed by the membership fee, and eventually by other sources (profits). The backup fund is initially endowed until it reaches the total amount of subscribed equity, while the education fund is freely decided by the general assembly. Only after guaranteeing these two funds, cooperatives can use the unrestricted reserves to increase wages. Nevertheless, this process leaves a significant margin to trade-off the remaining reserves for wages. Thus, cooperatives tendentially diminish reserves and, therefore, potentiate the need for funding.

Funding can be raised through internal or external sources. Regarding internal funding, there is evidence that cooperatives are, at least, as efficient as capitalistic firms (Bartlett *et al.*, 1992, Fakhfakh *et al.*, 2012; Monteiro and Straume, 2018) and have significant survival rates (Ben-Ner, 1988; Burdín, 2014; Monteiro and Stewart, 2015). This apparently indicates that cooperatives should not have difficulties in raising internal funds. Nevertheless, these funds may not be applied into investment, namely because of the horizon problem cooperatives face.

External funding comes from public and private sources. Public funding is recognized to have been a driving force of cooperative growth in the western world at the end of the XXth century (Estrin, 1985; Estrin and Pérotin, 1987; Provan and Kenis, 2007), but its importance has been declining since then, namely in Spain (García *et al.*, 2020) and Portugal (Leite, 2011). For instance, as far as we know, in Portugal the most recent data shows that there are only around 30 cooperatives publicly funded, including the regulatory agency “Cooperativa António Sérgio para a Economia Social” (CASES), in a universe of around 2 thousand cooperatives (Leite, 2011). On the other hand, private funding in cooperatives has always been scarce, because investors cannot control decisions (Dow, 2018), the costs of borrowing are more expensive than in capitalistic firms (Bowles and Gintis, 1996c; Alessandrini and

Messori, 2016) or due to financial discrimination (Doucouliagos, 1990). Nevertheless, Royer (2019) showed, for US cooperatives, that equity is more expensive than borrowed capital and Royer and McKee (2020) found that financial leverage may improve members' income flows as prescribed by Brown and Volkin (1977).

4.2.2. Capital structure theories

Traditional theories, such as Pecking Order theory, Agency Cost theory and Trade-off theory, were developed for large, listed firms, but may be adapted to family-owned firms (Agrawal and Nagarajan, 1990; Anderson and Reeb, 2003; King and Santor, 2008; Schmid, 2013; Ramalho *et al.*, 2018). Moreover, cooperatives may be included in the family-owned firms' set (Chua *et al.*, 1999; Chrisman *et al.*, 2003; Habbershon *et al.*, 2003). Next, we review the three theories and explain how they can be adapted to the cooperative context.

Pecking Order theory asserts that firms first use their internal resources and only in the if-need basis choose external debt, being outside equity a last resort. The main reason for this behaviour is that there is asymmetrical knowledge between firms' managers and outside lenders and investors, which limits firms' access to external funds. In the case of cooperatives and family firms, managers are also frequently owners, which suggests that they are able to channel funds to themselves (Knoeber and Baumer, 1985; Barton, 1989; Ramalho and Silva, 2009; Roger and Schatt, 2016; Galor and Sofer, 2019) and thus they will try to minimize external interference (Koropp *et al.*, 2014) and preserve firm's controlling *status quo* (Blanco-Mazagatos *et al.*, 2007; Brenes *et al.*, 2011). Therefore, they prefer internal funding, as predicted by the pecking-order theory. Moreover, cooperatives seem to endure high financial costs regarding debt (Doucouliagos, 1990; Bowles and Gintis, 1996c; Alessandrini and Messori, 2016), which is another factor for cooperatives favouring internal funding.

Agency Costs theory sustains that firm's capital structure should mitigate conflicts between stockholders and managers or debtholders. To attenuate the first conflict, firms should use more debt, because it allows stockholders to better (legally) control managers' usage of freed cash flows (Jensen 1986). Regarding the second conflict, firms may be forced to issue less debt because high leverage levels may be an incentive to refuse value-augmenting projects and induce riskier ones, thus increasing agency costs between these agents (Myers, 1977). In the case of cooperatives, as in family-owned firms, the conflict between stockholders and managers is expected to be neglectable because in most cases they are the same individuals. This means that using debt to deal with the principal-agent problem is of residual need in these firms. However, there may be a conflict between stockholders and debtholders due to the probability of the former using lenders' funds for other riskier purposes than the ones agreed. Cooperatives are also often perceived by lenders as risky firms due to insufficient levels of equity to guarantee the projects when compared to their capitalistic counterparts (Bowles and Gintis, 1996c), weakly signalling their capability to comply with debt payments (Mikami and Tanaka, 2010), and thus debtholders may demand them higher lending costs. This may induce us to think that cooperatives are

prone/forced to avoid debt. However, Royer (2019) found that for cooperatives the cost of borrowing is lower than the cost of equity. Probably this may have to do with the dynamic renewal these firms have pursued since the beginning of the present century by focusing more on strategic rather than on organisational factors, thus mitigating lenders' risk perception (Kalogeras *et al.*, 2009; Chaddad and Cook, 2004; Benos *et al.*, 2009). Therefore, the agency cost theory is not clear about whether cooperatives tend to use more debt or not.

Trade-off theory relates capital structure to the tax advantages of using debt while preventing financial distress. Firms must choose between obtaining fiscal benefits through more debt or avoiding financial problems by decreasing the level of external lending. Both cooperatives and family-owned firms seem to have an efficient usage of their resources (Bartlett *et al.*, 1992; Lee, 2006; Maury, 2006; Fakhfakh *et al.*, 2012; Monteiro and Straume, 2018). This may induce to believe that these firms aim at reducing the tax burden. But cooperatives do not seem to benefit from tax advantages like their capitalistic counterparts do, namely because cooperatives have more restrictions regarding profit distribution than capitalistic firms (García *et al.*, 2020). Simultaneously, financial distress is a concern for both family-owned and cooperative firms, namely due to the loss of self-employment (Craig and Pencavel, 1992; Blanco-Mazagatos *et al.*, 2007; Burdín and Dean, 2009). Overall, Trade-off theory does not clarify if cooperatives will engage in more debt or not.

4.2.3. Classical determinants of debt

All the three classical theories consider that firm's size, profitability, tangibility, liquidity, growth and age are the principal explanatory variables that explain the capital structure of capitalistic firms (Modigliani and Miller, 1958; Jensen and Meckling, 1976; Myers and Majluf, 1984). These theories only predict the same type of effects for size and tangibility, which are expected to be positive. As firms' dimension increases, informational asymmetries are smaller and thus debt markets are more available to lend them funds. Regarding tangibility, because fixed assets tend to preserve their value, firms with higher levels of these assets are more suitable candidates to raise debt.

The same capital structure theories predict conflicting effects for the other four variables. Profitability is expected to have a positive effect by both the trade-off (higher tax advantages by engaging in debt) and the agency costs (more debt is needed to reduce the higher free cashflows at the disposal of the management) theories, whereas according to pecking order theory it is expected to have a negative influence (more profits imply more internal resources and thus less need of debt). Liquidity is expected to have a positive influence according to the trade-off theory (firms with higher liquid assets have lower risk of defaulting payments, which decreases the borrowing costs and thus may increase the attractiveness of external debt) and a negative effect predicted by the pecking-order theory (higher free cashflows allow more internal resources usage). Growth is expected to be positively related to debt by the pecking-order theory (the higher the growth the higher the need to invest, which may lead to the exhaustion of internal funds and thus engage in more debt) and negatively related to debt by both the

trade-off (the higher the growth the higher the reluctance of falling into bankruptcy through increasing debt) and the agency costs (the higher the prospects of growth the lower is the need to resort to debt) theories. Age is expected to have a positive influence by the agency costs theory (age increases reputational credibility, which induces firms to select low-risk projects and thus debtholders tend to demand lower costs to these firms due to their credibility) and a negative effect predicted by the pecking order theory (aging allows firms to retain higher reserves and thus the lesser the need to rely on debt).

In the next section, we will describe our research problem, assumptions and hypotheses.

4.3. Research problem, assumptions and main hypotheses

In this study, we aim at understanding if cooperatives are rare due to their struggle to raise funds. Because cooperatives operate in the market as capitalistic firms do, we also aim at knowing if cooperatives struggle more than their capitalistic counterparts to raise debt. To understand cooperatives' funding phenomenon, we follow both the classical literature on capital structure as well as the one focusing on family firms. These two branches consider as explanatory variables for firms' debt levels the variables described in the previous section and defined in Table 4.1 of the next section. In our analysis, we consider them as control variables with the exception of firms' tangibility, profitability and liquidity. The first two variables have a particular nature in cooperatives, while liquidity may influence cooperatives differently due to their reserves' endowment obligation. Next, we formulate the main research hypotheses of our study.

Although there are similarities between cooperatives and family-owned capitalistic firms, their distinct forms of organisation may influence their demand and access to debt differently. Cooperatives are perceived by lenders as non-pursuing profit firms, which may induce difficulties to raise external funds (Bowles and Gintis, 1996c; Alessandrini and Messori, 2016) and thus endure financial discrimination when compared to capitalistic firms (Doucouliagos, 1990). Furthermore, cooperatives are legally obliged to retain funds and members are prone to avoid external interference to preserve cooperative's control (Blanco-Mazagatos *et al.*, 2007; Brenes *et al.*, 2011). Krahnen and Schmidt (1995) argue that increased liquidity will remain in cooperative's reserves, namely due to their oriented purposes, such as the backup fund, reducing the need for external funding. Moreover, cooperative members do not own firms' assets as capitalistic owners do, which may create difficulties in presenting risk-mitigating guarantees. Capitalistic firms do not face the horizon problem that cooperatives do and that induces them to avoid external interference, namely from lenders. Thus, we hypothesize that:

- **H1: Portuguese cooperatives are less prone to raise debt and, conditional on raising it, use a lower proportion of debt than capitalistic firms.**

In general, firms' tangibility is expected to have a positive effect on debt because fixed assets are not likely to lose their value, thus increasing the firms' capacity to raise external funds by giving them greater access to the financial market. However, in cooperatives, equity is on the hands of members and the firm itself (3rd cooperative principle). Like for capitalistic firms, Portuguese cooperative law imposes that members' responsibility is limited by their capital subscription but, typically, cooperative members subscribe less shares than capitalists do.³⁰ This cooperative members' lower level of responsibility may increase lenders' risk-perception and thus they may be more reluctant to accept fixed assets as collaterals for credit. Moreover, members may also choose to dissolve the firm, but unlike capitalistic firms, in cooperatives the value obtained from the liquidation of fixed assets is firstly used to pay wages and other debts to cooperative's workers. This framework may increase even further the lenders' risk-perception of the cooperative and thus they may not consider fixed assets as sound collaterals. In this line of reasoning, we hypothesize that:

- **H2: The positive effect of tangibility on the probability of firms using debt and, conditional on using it, the proportion of debt raised is lower for Portuguese cooperatives than it is for capitalistic firms.**

Unlike capitalistic firms, cooperatives are non-profit oriented organisations. Therefore, lenders find cooperatives' profit more unpredictable compared to those of capitalistic firms. Thus, when lenders perceive that cooperatives are profitable, the impact of this event on the probability of firms raising debt may be higher than it is for capitalistic firms. On the other hand, accumulated profits enhance firms' economic and financial autonomy, implying that they may need fewer external funds (Myers, 1984). In the case of cooperatives, because they face the horizon problem, their tendency to avoid external interference is higher than in capitalistic firms. Therefore, the negative impact of profitability on debt demand is expected to be higher (in absolute terms) for cooperatives. Thus, we hypothesize that:

- **H3a: The positive effect of profitability on the probability of firms using debt is higher for Portuguese cooperatives than it is for capitalistic firms.**
- **H3b: The negative effect of profitability on, conditional on using it, the proportion of debt raised is higher (in absolute terms) for Portuguese cooperatives than it is for capitalistic firms.**

³⁰ In our database, cooperatives' average equity is around 250 thousand euro, and the average employees are 24. Members by law must subscribe 1500 euro in shares, which, on average, amounts to 36 thousand euro in capital that is in the hands of members and capital's remaining part is subscribed by the cooperative itself. This means that members only have 14,4% of cooperatives' capital.

Overall, firm's liquidity is expected to have a negative effect on both the probability and the proportion of debt. Cooperatives seem to be efficient firms (Bartlett *et al.*, 1992, Fakhfakh *et al.*, 2012; Monteiro and Straume, 2018) and thus generate positive cashflows like capitalistic firms do. However, the law imposes significant obstacles to cooperatives regarding the distribution of freed cashflows among members, which do not exist in capitalistic firms. This legal constraint enhances cooperatives' internal funding capacity. In this sense, we hypothesize that:

- **H4: The negative effect of liquidity on the probability of firms using debt and, conditional on using it, the proportion of debt raised, is higher (in absolute terms) in cooperatives than it is for capitalistic firms.**

Small firms are the vast majority in Portugal (in our database, 99% of the observations are relative to small firms), including cooperatives. These types of firms apparently face more difficulties in raising external debt from lenders than large firms (Cowling *et al.*, 2012) due to higher funding costs (Kurshev and Strebulaev, 2007; Ramalho and Silva, 2009; Strebulaev and Yang, 2013). As discussed before, cooperatives also seem to face more financial constraints than capitalistic firms due to financiers' unfamiliarity with the cooperative organisation, which generates a higher risk-perception to them (Doucouliagos, 1990). This financial constraint is even more significant for smaller cooperatives because they may not have made economic proof of their resilience yet (Pokharel *et al.*, 2018; Bretos *et al.*, 2019). Thus, we hypothesize that:

- **H5: Small firms are less prone to raise debt and, conditional on raising it, use a lower proportion of debt than large firms, being this effect more accentuated in the case of cooperatives.**

Cooperatives, by their own nature, have more members than capitalistic firms do, and those members are usually integrated in their community. In rural areas, this fact may decrease information asymmetries concerning financiers-cooperative relationship, either through higher proximity or personal knowledge regarding lenders, thus increasing cooperatives' ability to obtain more external funding. In this manner, we hypothesize that:

- **H6: In the case of cooperatives, their probability of using debt and, conditional on using it, their proportion of debt raised increases when they are located in rural areas.**

4.4. Data and methodology

In this section we present the dataset and the variables used in our study. We also provide some descriptive statistics for the variables and present the econometric methodology used in their analysis.

4.4.1. Dataset and variables

We use an unbalanced panel built from the QP and SCIE databases, both of which are collected and managed by INE, in the timespan 2010-2019. QP and SCIE have different information about firms that we needed to merge. From QP firms' database we collected information about organisations' age, sales, legal framework and location. From SCIE we collected information about firms' earnings, assets, liabilities and liquidity. To join the information from the two databases we used firms' fiscal identification number. After these procedures, we ended up with a dataset with almost 800 thousand observations and 182 thousand firms for the 2010-2019 period, from which 1097 are cooperatives.

Table 4.1 describes the variables used in our study. Because we are interested in explaining both firms' probability and proportion of debt usage (Ramalho and Silva, 2009; Ramalho *et al.*, 2018), the econometric models used in this study are based on two distinct dependent variables: *Leverage* and *Debt ratio*. *Leverage* is a dummy variable indicating if a firm has long-term debt or not, while *Debt ratio* is the ratio of long-term debt to long-term capital assets. We focus on long-term debt (Cook *et al.*, 2008; Ramalho and Silva, 2009; Ramalho *et al.*, 2018) because they reflect strategic capital structure choices rather than possible random short-term factors.

Regarding the explanatory variables, to test the empirical hypotheses H1-H6 formulated in the previous section we consider the variables *Cooperative*, *Tangibility*, *Profitability*, *Liquidity*, *Small* and *Rural*, respectively. We defined *Tangibility*, *Profitability* and *Liquidity* in a similar way as other studies in the capital structure literature (Frank and Goyal, 2008; Ramalho and Silva, 2009; Ramalho *et al.* 2018.). *Cooperative* is a dummy variable that allows the comparison between cooperatives and capitalistic firms. *Small* is a binary variable that captures the difference between large and small firms and is based on the European Commission criteria (Recommendation 2003/361/EC) that define a small firm as having up to 10 million euros of revenue and total balance sheet up to 50 employees. *Rural* is also a dummy variable, which is defined by separating Lisboa and Porto urban areas from the rest of the country.³¹

Finally, *Size*, *Growth*, *Age* and *Troika* are control variables that are assumed to influence both cooperative and capitalistic firms in a similar way. We decide to include the last variable in our model, because, following the sub-prime crisis, Portugal endured the troika intervention, period which is expected to have affected negatively all firms as it did internationally (Cowling *et al.*, 2012; Vermoesen *et al.*, 2013; Dang *et al.*, 2014; Van Hoang *et al.*, 2017).

Table 4.1 - Variables' formal definition.

Dependent variables

³¹ Ideally, other urban areas should have been considered jointly with the metropolitan areas of Lisboa and Porto. However, such information was not available for other urban areas such as Braga, Coimbra and Setúbal, which is a limitation in our analysis.

Debt ratio	Ratio of long-term debt to long-term capital assets
Leverage	Dummy variable equal to 1 if a firm is levered
Explanatory variables	
Cooperative	Dummy variable equal to 1 if it is a cooperative firm
Tangibility	Proportion of fixed assets in total assets
Profitability	Ratio between earnings before interest and taxes and total assets
Liquidity	Sum of cash and marketable securities, divided by total assets
Small	Dummy variable equal to 1 if a firm has a turnover/balance sheet below or equal to 10 million euros and up to 50 employees
Rural	Dummy variable equal to 1 if a firm is not located either in Lisboa or Porto areas
Control variables	
Size	Logarithm of assets
Growth	Yearly percentage change in total sales
Age	Number of years since the foundation of the firm
Troika	Dummy variable equal to 1 if a firm exists between 2011 and 2014

Source: QP and SCIE. Own elaboration.

4.4.2. Descriptive evidence

Table 4.2 shows that more than half of the sample firms have long-term debt, namely 60% of cooperatives and 55% of capitalistic firms. Moreover, on average, cooperatives have 23% of long-term debt in their capital structure while capitalistic firms have 25%. Although statistically different, these averages are close in absolute terms, suggesting that in Portugal cooperatives and capitalistic firms may follow similar financial policies or face the same difficulties in obtaining credit.

Table 4.2 - Firms' debt ratio and leverage in Portugal (2010-2019).

		Debt ratio	Leverage
Cooperatives	Mean	0,23	0,60
	Median	0,07	1,00
	S.D.	0,280	0,490
	Min	0	0
	Max	1	1
Capitalistic firms	Mean	0,25	0,55
	Median	0,06	1,00
	S.D.	0,313	0,498
	Min	0	0
	Max	1	1
Means t-test		7,424***	-8,657***

Source: QP and SCIE. Own elaboration. The t-tests were performed assuming unequal variances. The stars indicate that the differences are statistically significant at 1%, 5% and 10% levels.

Table 4.3 presents summary statistics for the continuous explanatory variables. The *t*-tests indicate that cooperatives present significantly higher mean values than capitalistic firms for *Size*, *Tangibility* and *Age* and lower for *Profitability* and *Liquidity*. Regarding *Growth*, due to the huge standard deviations, it is less relevant to compare both groups of firms in terms of means. Looking at the median values, it seems that cooperatives and capitalistic firms display similar growth rates.

Table 4.3 - Summary statistics for continuous explanatory and control variables.

		Tangibility	Profitability	Liquidity	Size	Growth	Age
Cooperatives	Mean	0,39	0,02	0,16	13,41	0,13	33,50
	Median	0,36	0,04	0,10	13,34	-0,001	33,00
	S.D.	0,25	0,72	0,19	1,86	20,48	17,75
	Min	0	-39,82	-0,21	6,40	-100	1
	Max	1,49	9,93	2,33	19,32	495,85	118
Capitalistic firms	Mean	0,32	0,04	0,17	12,68	0,73	17,90
	Median	0,25	0,07	0,09	12,58	0,01	15,00
	S.D.	0,37	4	1,48	1,67	20,96	13,44
	Min	0	-2 694,06	-854,8	2,20	-110,4	0
	Max	196,43	35,22	4,73	22,92	499,74	262
Means t-test		-22,054***	1,984**	2,775***	-31,056***	-0,974	-70,844***

Source: QP and SCIE. Own elaboration. The t-tests were performed assuming unequal variances. The stars indicate that the differences are statistically significant at 1%, 5% and 10% levels.

Table 4.4 presents the discrete explanatory variables, apart from Cooperative and Troika. The tests for the differences between proportions show that the percentage of small cooperatives is significantly lower than the corresponding figure for capitalistic firms. In contrast, the proportion of cooperatives located outside the metropolitan areas of Lisboa and Porto is significantly higher than what happens in the capitalistic case.

Table 4.4 - Summary statistics for discrete explanatory variables.

		Small	Rural
Cooperatives	Mean	0,934	0,537
	Median	1,00	1,00
	S.D.	0,248	0,499
	Min	0,00	0,00
	Max	1,00	1,00
Capitalistic firms	Mean	0,971	0,387

	Median	1,00	0,00
	S.D.	0,167	0,487
	Min	0,00	0,00
	Max	1,00	1,00
Proportion test		17,764***	-24,785***

Source: QP and SCIE. Own elaboration. The stars on the proportion tests indicate that the differences are statistically different at 1%, 5% and 10% levels.

4.4.3. Methodology

To investigate what might explain Portuguese cooperatives' capacity to raise debt, we use both binary choice and fractional response models. The former model helps explaining the probability of raising debt. The latter allows explaining the proportion of debt raised by levered firms.

First, we assume the following functional form for the binary choice models for the probability of observing a levered firm:

$$Pr (Leverage_{it} = 1 | X_{it}, \beta) = G(X_{it}\beta), \quad (4.1)$$

where $G(.)$ is a distribution function, X_{it} is the vector of the explanatory variables, observed for firm i in year t , and β is the vector of the parameters of interest. These models are estimated by maximum likelihood using the whole sample.

Second, we assume the following functional form for the fractional response models for the proportion of debt conditional on debt usage:

$$E(Debt\ ratio_{it} | X_{it}) = \Gamma(X_{it}\theta), \quad (4.2)$$

where $\Gamma(.)$ is a non-linear link function that only produces values between 0 and 1, X_{it} comprises the same variables used in the binary choice models, and θ is the vector of the parameters of interest. These models are estimated by quasi-maximum likelihood using the subsample of levered firms.

In order to test the empirical hypotheses formulated in Section 3, vector X_{it} comprises not only the variables *Size*, *Profitability*, *Tangibility*, *Liquidity*, *Growth*, *Age*, *Micro*, *Small*, *Rural*, *Troika* and *Cooperative* discussed before, but also interactions between *Cooperative* and the variables that are relevant for hypotheses H2-H6.

In our main models we assume for both the G and Γ functions a logit specification and use pooled estimation. Later, for robustness, we also consider the probit and cloglog functional forms and, whenever possible, fixed and random effects models.

4.5. Empirical results

4.5.1. Main results

Table 4.5 presents the results of our main models. Models 1 and 2 are binary choice models and models 3 and 4 are fractional response models. In models 1 and 3, the key parameter is the coefficient of *Cooperative*, which gives us the possibility to compare these firms with their capitalistic counterparts. In models 2 and 4 we added the interactions between cooperatives and the other explanatory variables (apart from the control ones), which allows testing some differences among those firms. As Table 4.5 shows, despite the low values obtained for the R^2 measure³², our models are able to reveal some of the determinants of firms' capital structure decisions, since in all models the independent variables are jointly significant and most of them is also individually significant.

Table 4.5 - Pooled binary and fractional Logit models.

Debt	Binary		Fractional	
	All		All	
	(1)	(2)	(3)	(4)
Cooperative	-0,249*** (0,074)	-0,519* (0,310)	-0,195*** (0,041)	0,364** (0,169)
Tangibility	3,163*** (0,026)	3,168*** (0,026)	0,068*** (0,014)	0,073*** (0,014)
Cooperative*Tangibility		-0,624** (0,311)		-0,732*** (0,181)
Profitability	0,068*** (0,024)	0,054** (0,024)	0,016 (0,011)	0,021* (0,011)
Cooperative*Profitability		1,444*** (0,459)		-0,032* (0,018)
Liquidity	-0,347*** (0,024)	-0,340*** (0,024)	-0,543*** (0,021)	-0,539*** (0,021)
Cooperative*Liquidity		-0,977*** (0,365)		-0,785*** (0,272)
Small	-0,433*** (0,039)	-0,433*** (0,039)	0,161*** (0,019)	0,165*** (0,019)
Cooperative*Small		0,541* (0,278)		-0,096 (0,145)
Rural	0,181*** (0,011)	0,180*** (0,011)	-0,026*** (0,006)	-0,026*** (0,006)
Cooperative*Rural		0,023 (0,140)		-0,085 (0,078)
Size	0,286*** (0,004)	0,286*** (0,004)	-0,027*** (0,002)	-0,027*** (0,002)
Growth	-0,001***	-0,001***	0,0004***	0,0004***

³² In all models the R^2 measure was calculated as the square of the correlation between the actual and predicted values of the dependent variable.

	(0,0001)	(0,0001)	(0,0001)	(0,0001)
Age	-0,001** (0,0004)	-0,001** (0,0004)	-0,009*** (0,0003)	-0,009*** (0,0003)
Troika	-0,108*** (0,006)	-0,108*** (0,006)	-0,013*** (0,004)	-0,012*** (0,004)
Industry dummies	Yes	Yes	Yes	Yes
Wald test for the joint significance	26739,87***	26786,43***	3155,67***	3212,18***
R²	0,1781	0,1782	0,0962	0,0965
Nr. of observations	795279	795279	434510	434510

Source: QP and SCIE. Own elaboration. ***, **, * significant at 1%, 5% and 10%, respectively.

Standard errors (clustered by firm) in parenthesis.

Another sign of the statistical reliability of our models is that the effects of the control variables on the dependent variables are in agreement with previous empirical studies, although in some cases they do not conform with the classical theories. Moreover, the fact that many variables have opposite effects on the probability of using debt and on the conditional proportion of debt raised justifies our option for the chosen econometric methodology.

Size has a positive effect on the probability of a firm raising debt and a negative impact on the proportion of debt, which agrees with both the trade-off theory (on the probability of raising debt) and the pecking order theory (on the proportion of debt). This mixed effect may be explained by the fact that as firms' dimension increases, their businesses become more diversified, which, on the one hand, lowers the probability of bankruptcy and thus decreases their debt issuance costs, implying an increase in the probability of raising debt, and, on the other hand, allows them to have more frequent rebalancing compared to smaller firms due to lower (in relative terms) fixed financial costs, thus decreasing their proportion of debt (Kurshev and Strebulaev, 2007; Strebulaev and Yang, 2013). *Growth* presents a similar behaviour to *Size*, which is in line with the findings of Ramalho et. al. (2018). Firms' probability of raising debt decreases as their growth increases, namely due to financial distress concerns (trade-off theory), whereas levered firms increase their proportion of debt due to exhaustion of internal funds (pecking order theory), especially when considering the horizon problem cooperatives face. *Age* influences negatively both the probability and the proportion of debt (Ramalho et al., 2018), which seems to be in line with the pecking order theory sustaining that older firms retain more internal funds. *Troika* also influences negatively both the probability and the proportion of debt, which confirms that Portuguese firms also endured the financial hardship that occurred in western economies (Cowling et al., 2012).

Considering now the main variables of our models, i.e. those related to the empirical hypothesis formulated in Section III, model 1 indicates that cooperatives are less prone to raise debt than capitalistic firms, while model 3 reveals that cooperatives raise a lower proportion of debt when compared to capitalistic firms. In model 1, the results may reflect that cooperatives' non-pursuing-profit nature creates financial obstacles for these firms to raise debt, while model 3 shows that cooperatives prefer to

keep a lower proportion of debt in order to maintain internal control of the firm by the members. Therefore, our results confirm hypothesis H1.

For the other hypotheses, we need to focus on models 2 and 4. In these models, *Tangibility* is statistically significant and positive, which indicates a positive effect on both the probability and the proportion of debt raised by capitalistic firms. However, for cooperatives the effect is significantly different: it is lower, although still positive, for the probability of raising debt, as conjectured in hypothesis H2; and it is negative for the proportion of debt held by levered cooperatives, unlike predicted by that same hypothesis H2.³³ The negative effect on cooperatives' proportion of debt may reflect the fact that financial institutions heavily weight cooperatives' specific legal nature when scoring the risk. Indeed, besides members' low level of legal responsibility, members are allowed to dissolve the firm without placing fixed assets as first guarantees to fulfil a lending contract, thus leaving lenders without solid guarantees, which highly increases cooperatives' risk level. Therefore, overall, our H2 is only partially confirmed.

In model 2, the specific effect of cooperatives' *Profitability* for the probability of raising debt is positive and higher than it is for capitalistic firms. This may be related with the fact that, because cooperatives face degeneration, they need higher levels of debt to control non-member managers' behaviour. This result confirms hypothesis H3a). Regarding the proportion of debt, in model 4 the specific effect of profitability is positive for capitalistic firms and negative for cooperatives. This may reflect members' willingness to preserve cooperative *status quo*. In this sense, we confirm hypothesis H3b) in which concerns cooperatives' behaviour.

The effect of *Liquidity* is negative and significant for both capitalistic firms and cooperatives and for both capital structure decisions. Moreover, this negative effect is higher (in absolute terms) for cooperatives. This may reflect the fact that cooperatives' obligation of endowing their reserves decreases more intensively their need for external funding. Thus, H4 is fully confirmed.

Regarding the case of small firms, in both models 2 and 4 there is no relevant difference between the probabilities of large and small cooperatives raising debt, since the sum of the coefficients of *Small* and *Cooperative*Small* is not statistically significant, unlike what happens with capitalistic firms. Indeed, comparing with their larger counterparts, smaller capitalistic firms display a lower probability of raising debt, but, when levered, hold a higher proportion of debt. Overall, hypothesis H5 is rejected, since only the behaviour inferred for the probability of small capitalistic firms raising debt was confirmed.

When considering the effect of firm geographical location, it seems that there are no differences between cooperatives and capitalistic firms, both for the probability and the proportion of debt. Model 2 shows that the probability to raise debt is higher in non-urban areas for both types of firms. Thus, it

³³ The specific effect of cooperatives' tangibility is computed by summing up the coefficients of *Tangibility* and its interaction with *Cooperative*. The same applies to the other cases where interaction variables were included in the model.

seems that our conjecture in the first part of hypothesis H6 is also valid for capitalistic firms. In model 4, the results show that firms' proportion of debt, conditional on using it, decreases in non-urban areas. This result may reflect the fact that possibly the financial decision-makers are not so established in these areas as they are in urban areas and, therefore, the expected proximity of managers with local agents may not be sufficient enough to increase their proportion of debt. Therefore, hypothesis H6 is rejected.

4.5.2. Robustness tests

In this section we test the robustness of our previous results by considering different estimation methods and model specifications. First, we consider the binary regression models and then the fractional response models.

4.5.2.1. Robustness for binary models

The results reported in Table 4.6 consider pooled estimation of binary regression models, as previously, but instead of a logit functional form, the probit and cloglog specifications are assumed. The sign and significance of the model parameters is the same in all cases, with the exception of the variable *Cooperative*, which is not significant in the full model both for the probit and cloglog specifications. In the base logit model, this variable was only significant at the 10% level, which, together with the new results, suggests that the differences between cooperatives and capitalistic firms are being fully captured by the other variables. All the other conclusions taken in the previous section are confirmed by the new results.

Table 4.6 – Binary Probit and Cloglog models.

Debt	Binary			
	Probit		Cloglog	
	(5)	(6)	(7)	(8)
Cooperative	-0,150*** (0,044)	-0,297 (0,184)	-0,171*** (0,045)	-0,246 (0,172)
Tangibility	1,858*** (0,015)	1,861*** (0,015)	1,731*** (0,015)	1,734*** (0,015)
Cooperative*Tangibility		-0,375** (0,177)		-0,362** (0,165)
Profitability	0,049*** (0,015)	0,042*** (0,015)	0,064*** (0,014)	0,058*** (0,014)
Cooperative*Profitability		0,751*** (0,234)		0,607*** (0,161)
Liquidity	-0,220*** (0,015)	-0,215*** (0,015)	-0,342*** (0,018)	-0,337*** (0,018)
Cooperative*Liquidity		-0,577*** (0,213)		-0,674*** (0,26)
Small	-0,262*** (0,023)	-0,267*** (0,023)	-0,212*** (0,021)	-0,217*** (0,021)

Cooperative*Small		0,329** (0,164)		0,296** (0,15)
Rural	0,111*** (0,007)	0,111*** (0,007)	0,121*** (0,007)	0,121*** (0,007)
Cooperative*Rural		0,006 (0,083)		0,007 (0,087)
Size	0,173*** (0,002)	0,174*** (0,002)	0,182*** (0,003)	0,183*** (0,003)
Growth	-0,001*** (0,0001)	-0,001*** (0,0001)	-0,001*** (0,0001)	-0,001*** (0,0001)
Age	-0,001** (0,0003)	-0,001** (0,0003)	-0,001** (0,0003)	-0,001** (0,0003)
Troika	-0,065*** (0,004)	-0,065*** (0,004)	-0,072*** (0,004)	-0,072*** (0,004)
Industry dummies	Yes	Yes	Yes	Yes
Wald test for the joint significance	29384,04***	29425,69***	28151,4***	28158,3***
R²	0,1767	0,1768	0,1698	0,1699
Nr. of observations	795279	795279	795279	795279

Source: QP and SCIE. Own elaboration. ***, **, * significant at 1%, 5% and 10%, respectively. Standard errors (clustered by firm) in parenthesis.

In Table 4.7 we return to a binary logit functional form, but we now consider random and fixed effects estimation, instead of a pooled estimation. The sign and significance of the parameters in the random effects models are similar to the previous results, with the exception of *Age*, which is not a crucial variable for our empirical hypotheses. Now, the results of *Age* reveal a positive effect on the probability of raising debt, which reflects a behaviour in line with the agency costs theory. As in the previous robustness tests, the variable *Cooperative* is once again statistically insignificant in the full random effects model, which reinforces our previous conclusion that the differences between cooperatives and capitalistic firms are being fully captured by the other variables.

In the fixed effects models the time-constant variables (*Cooperative*, *Rural* and the interaction between them) are omitted from the model. For the remaining relevant variables to test our empirical hypothesis the only difference is related with the interaction between *Cooperative* and *Profitability*, which is no longer statistically significant.

Table 4.7 – Random and fixed effects binary Logit models.

Debt	Binary Logit			
	Random effects		Fixed effects	
	(9)	(10)	(11)	(12)
Cooperative	-0,505*** (0,122)	-0,297 (0,487)		
Tangibility	5,304*** (0,043)	5,318*** (0,043)	3,467*** (0,041)	3,483*** (0,041)

Cooperative*Tangibility		-2,129** (0,573)		-2,272*** (0,468)
Profitability	0,155*** (0,039)	0,146*** (0,039)	0,150*** (0,019)	0,150*** (0,019)
Cooperative*Profitability		1,068** (0,464)		-0,048 (0,322)
Liquidity	-0,309*** (0,038)	-0,300*** (0,038)	-0,447*** (0,037)	-0,441*** (0,037)
Cooperative*Liquidity		-1,574*** (0,575)		-1,095** (0,537)
Small	-0,495*** (0,061)	-0,504*** (0,062)	0,013 (0,071)	0,046 (0,077)
Cooperative*Small		0,828** (0,405)		0,151 (0,679)
Rural	0,378*** (0,019)	0,378*** (0,019)		
Cooperative*Rural		-0,125 (0,239)		
Size	0,636*** (0,007)	0,636*** (0,007)	0,771*** (0,013)	0,771*** (0,013)
Growth	-0,002*** (0,0002)	-0,002*** (0,0002)	-0,0004* (0,0002)	-0,0004* (0,0002)
Age	0,007*** (0,0007)	0,007*** (0,0007)	0,065*** (0,002)	0,066*** (0,002)
Troika	-0,067*** (0,011)	-0,067*** (0,011)	0,190*** (0,010)	0,190*** (0,010)
Industry dummies	Yes	Yes	Yes	Yes
Wald test for the joint significance	25050,64***	25185,72***	16293,87***	16316,24***
R²	0,1603	0,1604	0,0817	0,0820
Nr. of observations	795279	795279	269850	269850

Source: QP and SCIE. Own elaboration. ***, **, * significant at 1%, 5% and 10%, respectively. Standard errors (clustered by firm) in parenthesis.

4.5.2.2. Robustness for fractional models

The results reported in Table 4.8 consider pooled estimation for probit and cloglog models. The sign and significance of the model parameters are in line with what was found for models (3) and (4), with the exception of *Profitability* in the cloglog models, which is now negative for capitalistic firms and positive for cooperatives. This outcome raises some doubts about the validity of hypothesis H3b and suggests that, while cooperatives may follow both the trade-off and agency costs theories, capitalistic firms' behaviour is better explained by the pecking order theory. Regarding the other variables, all previously expressed conclusions are confirmed by these results.

Table 4.8 – Fractional Probit and Cloglog models.

Debt	Fractional
------	------------

	Probit		Cloglog	
	(13)	(14)	(15)	(16)
Cooperative	-0,122*** (0,025)	0,230** (0,105)	-0,129*** (0,033)	0,257* (0,138)
Tangibility	0,047*** (0,009)	0,050*** (0,009)	0,021** (0,011)	0,025** (0,011)
Cooperative*Tangibility		-0,463*** (0,112)		-0,574*** (0,149)
Profitability	0,013* (0,008)	0,016** (0,008)	-0,363*** (0,018)	-0,380*** (0,018)
Cooperative*Profitability		-0,023** (0,012)		0,533*** (0,062)
Liquidity	-0,297*** (0,030)	-0,295*** (0,030)	-0,437*** (0,014)	-0,431*** (0,014)
Cooperative*Liquidity		-0,521*** (0,168)		-0,749*** (0,229)
Small	0,101*** (0,012)	0,103*** (0,012)	0,083*** (0,015)	0,084*** (0,015)
Cooperative*Small		-0,057 (0,090)		-0,072 (0,117)
Rural	-0,016*** (0,004)	-0,016*** (0,004)	-0,024*** (0,005)	-0,024*** (0,005)
Cooperative*Rural		-0,053 (0,048)		-0,052 (0,064)
Size	-0,016*** (0,002)	-0,016*** (0,002)	-0,033*** (0,002)	-0,033*** (0,002)
Growth	0,0003*** (0,0001)	0,0003*** (0,0001)	0,0003*** (0,0001)	0,0004*** (0,0001)
Age	-0,005*** (0,0002)	-0,005*** (0,0002)	-0,007*** (0,0002)	-0,007*** (0,0002)
Troika	-0,007** (0,003)	-0,007** (0,003)	-0,017*** (0,003)	-0,017*** (0,003)
Industry dummies	Yes	Yes	Yes	Yes
Wald test for the joint significance	1758,53***	1817,78***	3345,3***	3423,94***
R²	0,0329	0,0333	0,0332	0,0336
Nr. of observations	434510	434510	434510	434510

Source: QP and SCIE. Own elaboration. ***, **, * significant at 1%, 5% and 10%, respectively. Standard errors (clustered by firm) in parenthesis.

Random and fixed effects estimation of fractional response models is not straightforward. Since only the firms that use debt are considered, and *Debt_ratio* equal to 1 is neglectable in our dataset (40 observations), we opted for linearizing the models using the logit transformation and considering the linearized versions of the standard random and fixed effects commonly used in linear settings to test the robustness of the pooled fractional logit models estimated before. Table 4.9 reveals that the effect of *Tangibility* is now negative for capitalistic firms, as well, but this effect is even more pronounced for

cooperatives. As for the fractional cloglog model, the effect of *Profitability* on the proportion of debt held by levered firms is again negative. Furthermore, similar to the main models, this effect is negative for cooperatives, but, unlike what assumed in hypothesis H3b, it is lower (in absolute terms) than the one estimated for capitalistic firms. The remaining results are similar to those found for the main models.

Table 4.9 – Fractional Logit random and fixed effects models.

Debt	Fractional logit			
	Random effects		Fixed effects	
	(17)	(18)	(19)	(20)
Cooperative	-0,312*** (0,066)	0,446* (0,259)		
Tangibility	-0,208*** (0,023)	-0,198*** (0,023)	-0,608*** (0,069)	-0,598*** (0,067)
Cooperative*Tangibility		-1,603*** (0,283)		-2,049*** (0,508)
Profitability	-0,112*** (0,017)	-0,125*** (0,018)	-0,336*** (0,038)	-0,381*** (0,036)
Cooperative*Profitability		0,123*** (0,021)		0,369*** (0,038)
Liquidity	-0,339*** (0,040)	-0,329*** (0,040)	-0,136*** (0,048)	-0,124*** (0,047)
Cooperative*Liquidity		-1,052*** (0,360)		-0,262 (0,483)
Small	0,282*** (0,028)	0,282*** (0,028)	0,166*** (0,038)	0,160*** (0,038)
Cooperative*Small		0,144 (0,145)		0,385 (0,315)
Rural	-0,044*** (0,010)	-0,043*** (0,010)		
Cooperative*Rural		-0,130 (0,126)		
Size	0,018*** (0,004)	0,018*** (0,004)	0,352*** (0,014)	0,355*** (0,013)
Growth	0,0005*** (0,0001)	0,0005*** (0,0001)	0,0005*** (0,0002)	0,0005*** (0,0002)
Age	-0,018*** (0,0005)	-0,018*** (0,0005)	-0,056*** (0,002)	-0,057*** (0,002)
Troika	0,039*** (0,006)	0,039*** (0,006)	-0,010 (0,007)	-0,011 (0,007)
Industry dummies	Yes	Yes	Yes	Yes
Wald test for the joint significance	2861,72***	2914,92***	186,88***	131,88***
R²	0,0187	0,0189	0,0022	0,0024
Nr. of observations	434470	434470	434470	434470

Source: QP and SCIE. Own elaboration. ***, **, * significant at 1%, 5% and 10%, respectively. Standard errors (clustered by firm) in parenthesis.

4.6. Concluding remarks

Overall, the results of all models seem to indicate that Portuguese firms' capital structure is not simply explained by only one of the traditional financial theories, in particular for cooperative firms. The explanatory variables have mixed effects, with the exception of *Liquidity*, which has a negative effect on both the probability and the proportion of debt raised by firms, as predicted by the pecking order theory. This effect is valid for both cooperatives and capitalistic firms, but it seems to be particularly important for the former, possibly because these firms are more prone to prefer internal funds rather external ones due to the horizon and degeneration problems they face.

Cooperatives seem to experience some obstacles to raise funds when compared to capitalistic firms, both in terms of the probability of raising debt and the proportion of debt used. As the more flexible models show, these barriers are related to the different evaluation that lenders make of the characteristics of cooperative and capitalistic firms in their credit decisions. Particularly, cooperatives' tangibility seems to be a source of this struggle, not because cooperatives do not possess sufficient fixed assets (as described in section IV), but because financial institutions do not perceive them as sound collaterals as they do for capitalistic firms. On the other hand, profitability increases the probability of all types of firms raising debt, with this effect being more pronounced, as hypothesized, for cooperatives. Regarding the proportion of debt, the results were not clear about the impact of profitability. Simultaneously, our results show that the effect of firms' dimension and geographical location is the same for both types of firms. Smaller firms seem to have a lower probability of raising debt but, when already using it, they hold a higher proportion than larger firms. Firms in non-urban areas have a higher probability of raising debt but, when levered, they have a lower proportion of debt than their urban-located counterparts.

This financial constraint that cooperatives seem to face has been dealt outside Portugal. Cooperatives in the US and EU have been changing their traditional collective ownership to a more individualized one, for instance, by allowing non-member parties to partially fund their activities (Cook and Chaddad, 2004; Bijman and van Bekkum, 2005; Kalogeras, *et al.* 2007; Benos *et al.*, 2009; Kalogeras, *et al.* 2009). This change allows cooperatives to be more flexible and dynamic (Kalogeras *et al.* 2009) and more innovative (Chaddad and Cook, 2004) and thus create higher levels of added-value through market-oriented strategies (Benos *et al.* 2009). In Portugal this was reflected in the last amendment of the cooperative law by allowing outside investors to become members. Nevertheless, we suspect that the improvements from this strategy may be limited, namely, because, by law, member-investors cannot fully control their investments.

This study has some limitations. First, by using a binary variable to distinguish cooperatives from capitalistic firms, we considered cooperatives as homogeneous entities. However, cooperatives are of different types, namely, of production, of consumption and both. Thus, it would be interesting to investigate whether our results would still hold if the specificities of different types of cooperatives were

considered. Another line of research would be to integrate personal characteristics of cooperative members such as age, gender and level of education, because cooperatives are managed by members and these personal characteristics influence firm's goals. Unfortunately, such data are usually not available. Another limitation is that we focussed on long-term debt. For instance, it would be interesting to analyse other financing sources, namely if short-term debt or other financing sources would have different results from the ones we have obtained. It would also be interesting to study if the creation of a membership market would mitigate this problem and/or legally increase the liaison among social economy financial institutions and cooperatives or even if a legal permit for cooperatives to be able to own a financial institution would change our results. Finally, we assumed that both the decisions of using debt and the quantity of this usage are independent, which may not be the case due to unobserved factors that may influence these two decision types. In future research, these issues should be taken into account to further understand this phenomenon.

Conclusions

Our motivation for this study was to contribute to the answer for cooperatives' rarity by studying the Portuguese case. Cooperatives seem to perform efficiently and have high rates of survival. Their rarity thus may be due to low birth rates. The creation of a cooperative organisation depends on individuals' willingness and this will is incentive-based. For individuals to create or join a cooperative they need to want and be able to do so. Most individuals depend on their labour income and Portuguese people are no exception. We began to study if cooperatives elicit both employment and income in their welfare function and we found that they do, but enhancing wages. Subsequently, we studied if cooperatives are income appealing to individuals when compared to capitalistic firms and we found that they are. Thus, workers' income is not a source for cooperatives' rarity. However, cooperatives' life cycle theory asserts that they may degenerate to a capitalistic behaviour. In this sense, we studied if Portuguese cooperatives degenerate and we found that they do, especially due to unbearable membership fees. This degenerative process could be overcome through external funding. In this context, we studied if cooperatives struggle to raise funds and we found that they do, namely because lenders do not recognize their fixed assets as sound collaterals.

Overall, we found that Portuguese cooperatives tend to behave as capitalistic firms do. This feature may produce the perception that the cooperative principles are ignored and thus here may lay one explanation for cooperatives' rarity. It seems that this capitalistic behaviour of cooperatives is driven by a degenerative process enhanced by the horizon problem and high membership fees, which could be mitigated by cooperatives' access to capital markets. However, cooperatives seem to face a fierce struggle to raise funds. To deal with all these issues, we recommend the creation of both a membership market and a multi-industry permit for cooperatives, which may create the conditions for cooperatives to thrive as cooperatives.

This study faced some limitations. First, our data did not allow examining members' wages, which prevented us from confirming if the results from essay 2 would hold with this information. Second, along with the absence of members' income, we could not collect the member status for all cooperatives in the database, which substantially reduced the dataset for the degeneration analysis. Finally, our database did not allow distinguishing between different types of cooperatives and did not contain any information about cooperative members' personal characteristics, which would enrich our studies.

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