

Is degeneration present in the cooperative realm? Evidence from Portugal

*¿Está presente la degeneración en el ámbito cooperativo?
Evidencia de Portugal*

*A degeneração está presente no âmbito cooperativo?
Evidências de Portugal*

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Abstract

Cooperatives may endure degeneration. Degeneration occurs when a cooperative is transformed into a capitalistic firm or behaves like one. In Portugal, only behavioral degeneration is possible, since the transformation of cooperatives into capitalistic firms is forbidden by law. Behaviorally, cooperative degeneration implies the replacement of former cooperative members by non-member employees. In this paper 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 labor-intensive industries.

Keywords: cooperatives; degeneration; membership fee; horizon problem.

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

Resumen

Las cooperativas pueden sufrir un proceso de degeneración. La degeneración se produce cuando una cooperativa se transforma en una empresa capitalista o actúa como tal. En Portugal, solo es posible la degeneración de comportamiento, ya que la transformación de cooperativas en empresas capitalistas está prohibida por ley. En términos de comportamiento, la degeneración cooperativa implica la sustitución de los socios originales por empleados que no son socios. En este trabajo investigamos si las cooperativas portuguesas se enfrentan a un entorno propicio para la degeneración, estudiando la evolución de la proporción de empleados no socios en la cooperativa. Mediante el uso de modelos de respuesta fraccionaria y datos de cooperativas portuguesas correspondientes al periodo 2010-2019, no podemos rechazar la hipótesis de que la degeneración pueda estar presente en dichas cooperativas. Observamos que unas cuotas de afiliación más elevadas y, en cierta medida, un mayor tamaño de la empresa potencia la degeneración, mientras que la experiencia mitiga este proceso. Al restringir el análisis a las cooperativas que cuentan con trabajadores no socios, se constata que unos salarios más altos y una mayor proporción de trabajadoras también potencian la degeneración, mientras que el nivel educativo atenúa dicho proceso. Por otro lado, no encontramos pruebas de que la política de promoción de la cooperativa influya en el proceso de degeneración ni de que esta sea más frecuente en sectores intensivos en mano de obra.

Palabras clave: cooperativas; degeneración; cuota de afiliación; problema del horizonte.

Resumo

Cooperativas podem sofrer um processo de degeneração. A degeneração ocorre quando uma cooperativa se transforma em uma empresa capitalista ou passa a se comportar como tal. Em Portugal, apenas a degeneração comportamental é possível, uma vez que a transformação de cooperativas em empresas capitalistas é proibida por lei. Em termos comportamentais, a degeneração da cooperativa implica a substituição de antigos cooperados por funcionários não cooperados. Neste artigo, investigamos se as cooperativas portuguesas enfrentam um ambiente propício à degeneração, analisando a evolução da proporção de funcionários não cooperados nas cooperativas. Utilizando modelos de resposta fracionária e dados de cooperativas portuguesas

referentes ao período de 2010 a 2019, não rejeitamos a hipótese de que a degeneração possa estar presente nessas organizações. Constatamos que taxas de adesão mais elevadas e, até certo ponto, um maior porte da empresa potencializam a degeneração, enquanto a experiência atenua esse processo. Ao restringirmos a análise às cooperativas que possuem trabalhadores não cooperados, observamos que salários mais altos e uma maior proporção de trabalhadoras também potencializam a degeneração, ao passo que a escolaridade reduz o processo degenerativo. Por outro lado, não encontramos evidências de que a política de promoção da cooperativa afete o processo de degeneração ou de que a degeneração seja mais comum em setores intensivos em mão de obra.

Palavras-chave: cooperativas; degeneração; taxa de adesão; problema do horizonte.

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 entrepreneurs'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 metamorphosis into a capitalistic firm. Degeneration may occur in two ways: legally or behaviorally.

Legal degeneration is when a cooperative firm is transformed into a capitalistic firm. In Portugal, this is forbidden by law. Behavior 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 behavior because members are interested in collecting profit through wages, which is known as the horizon problem. This degenerative behavior is threefold: constitutional, organizational, and cultural.

Constitutional degeneration occurs when members create conditions to substitute past fellows with 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 are keen 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 for a membership fee that may not be affordable to them, enforcing the constitutional degeneration.

Organizational degeneration exists when employees are not integrated into the cooperative's decision processes, leaving the decision power to a small group

of individuals, as typically occurs in capitalistic firms. Organizational degeneration is not necessarily a consequence of a constitutional degenerative behavior. 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 "organizational 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 until 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 until 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 whether 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 & Straume, 2018), degeneration may play an important role in cooperatives' rarity. Degeneration tendentially erodes cooperatives' reserves and thus, without the proper financial back-up, disables these firms from establishing themselves and growing according to their efficiency track record. In this sense, in this paper 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, 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 us to investigate whether cooperatives' behavioral degenerative process is also a reflection of institutional and individual characteristics.

This paper is organized as follows. This paper is organized as follows. The first part presents the literature related to cooperative degeneration. The second part discusses our main empirical hypotheses. The third part introduces the dataset, defines the model variables, and performs a preliminary analysis of the data. The fourth part describes the econometric methodology and presents the main results. Finally, the last part concludes and discusses avenues for further research.

Related literature

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 & Straume, 2018), higher survival rates (Ben-Ner, 1988; Burdín, 2014; Monteiro & 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 & Stewart, 2007), which may explain cooperatives' rarity.

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, organizational, and cultural. Constitutional degeneration is when an individual is prevented from joining a cooperative by some means (for instance, an unbearable membership fee). Organizational degeneration occurs when employee involvement in a firm's economic decision process is replaced by a deciding oligarchy¹ (for example, when employees' promotions are not significant). Cultural degeneration is a stage where a cooperative firm trades off social goals for profit (namely, when firms abandon their support for community needs, especially for former employees).

Regarding cultural degeneration, in our viewpoint, the problem is substituting social goals for profit *distribution* through wage '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 paper we will only analyze constitutional and organizational degeneration.

Ben-Ner (1984) and Miyazaki (1984) developed theoretical models for cooperatives' degeneration, stating that this phenomenon is caused by a 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 the firm's economic process, which may induce organizational 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 in his analysis (namely, employees' average wage, age, experience, schooling, and size) to explain its heterogeneity.

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

Hypotheses

In this study, we investigate if degeneration exists in Portuguese cooperatives. We make the following assumptions: there are no restrictions in the labor 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 labor 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 in 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 from becoming 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 to 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 the early stages of cooperatives' birth or development, members are prone to inviting 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 a 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.

According to cooperative life cycle theory, organizational degeneration also happens when workers are not included in the company's financial decision-making processes. As a consequence, cooperatives do not comply with their principle of workers' economic participation. However, when workers are promoted, their responsibility and engagement in the decision process increase, and their motivation is boosted.

Therefore, promotion is expected to increase productivity (Oi & 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 promotions mitigates overall degeneration.

We saw in our second paper 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 with 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 & Pereira, 2004; Devereux & 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 & Idson, 1999). In line with 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 labor supply. Women typically earn less than men (Mishel, 2021) and thus face a greater difficulty in supporting the cooperative membership fee. In line with this reasoning, women will be more prone to maintaining their non-member status, thus increasing degeneration. In this sense, we hypothesize that:

H6: Cooperative degeneration is potentiated as women’s average weight on a firm’s employment increases.

Cooperative firms operate in both capital- and labor-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. Labor is inalienable, thus implying that it can only be acquired as a flow (Dow, 2018). This labor’s inalienable characteristic makes low-skilled employees appealing to members. Simultaneously, low-skilled labor markets

face competitive equilibria enabling the cooperative members to easily replace these workers, *caeteris paribus*. In this respect, we hypothesize that:

H7: Labor-intensive industries tendentially potentiate cooperative degeneration.

Dataset, variables' definition, and descriptive evidence

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 the 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 a merge variable.

Regarding the variable membership fee, we created it using information on the 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 numbers, we were able to merge this new information with the one previously collected from QP.

QP employees' database also has information about workers' labor 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.

Variables' definition

Table 1 presents the variables' definitions. The *hired ratio* is an established variable to understand cooperatives' degeneration (Estrin & Jones, 1992; Burdín & Dean, 2009; Dean, 2019). The *hired ratio* reflects the weight nonmember 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 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
Labor industries	Dummy variable equal to 1 if a cooperative firm is in labor-intensive industry and 0 otherwise

Source: Own elaboration based on QP and SCIE.

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 from 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 application. 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 the 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 a firm's success considered by Dean (2019), which measure members' opportunity cost of belonging to a cooperative firm instead of a capitalistic one.² Indeed, Dean's (2019) measures of a 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 for

2 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.

monitoring and compliance of both workers and members. In the Portuguese case, the unclear legal definition of the *membership fee* may incentivize cooperatives' degeneration due to both cooperatives' legal freedom to define it and the consideration of the horizon problem. By substituting Dean's (2019) cooperatives' success definition with the membership fee rationale, we can more suitably clarify Portuguese degeneration's roots.

Another firm's characteristic that may explain a cooperative's degeneration is size. We used the number of employees as a proxy for the 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 behavior of this variable.

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

The variables measuring individual employees' 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 & Idson, 1999; Martins & Pereira, 2004; Devereux & Fan, 2011; Grenet, 2013); and women's vulnerability and professional instability (Becchetti & Castriota, 2010; Magne, 2017; Mishel, 2021). *Labor industries* are a dummy variable to capture the influence of labor-intensive industries on cooperative degeneration.

Descriptive evidence

As reported in Table 2, from the 192 cooperatives in our dataset, only 56 (29%) never had non-member workers. This suggests that the usage of a non-member labor force occurs in Portuguese cooperatives, which may be a sign of degeneration.

Table 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: Own elaboration based on QP and SCIE.

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 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 fewer sales, capital, and workers. This suggests that cooperatives with a bigger dimension may be more susceptible to degeneration.

Table 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: Own elaboration based on QP and SCIE.

Table 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 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: Own elaboration based on QP and SCIE.

The hired ratio may be a reflection of both constitutional and organizational degeneration. Table 5 presents some descriptive information about the membership fee and the promotions' ratio, both for cooperatives with only members and with employees.

Table 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: Own elaboration based on QP and SCIE.

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 the cooperative's members and non-members. On the one hand, non-member workers benefit from a higher integration in the 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 balances the degeneration process.

The hired ratio is also influenced by individual characteristics such as wages, schooling, experience, and gender. Table 6 presents some descriptive information about those variables for both groups of cooperatives. Note that we cannot compare wages in both types of cooperatives because members' wages are not available.

Table 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
Cooperatives with members only	Mean	NA	8,81	31,29	0,52
	Median	NA	8	30,33	0,50
	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: Own elaboration based on QP and SCIE.

In cooperatives that employ non-members, the annual average wage is four and a half times lower than the average expected membership fee reported in Table 1.5, 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 appear to have more weight in cooperatives with employees and be equally predominant in cooperatives with only members.

Table 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%), while cooperatives with employees are predominantly present in more labor-intensive industries (64.97%).

Table 7. Relative industry dispersion of cooperatives with and without employees in 2010-2019.

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

Source: Own elaboration based on QP and SCIE.

Table 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 labor seasonality effect. On the other hand, Açores, an agricultural area, may suffer from degeneration due to excessive labor 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 organization 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 labor force, thus mitigating degeneration.

Table 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

Own elaboration based on QP and SCIE.

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 mean³:

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

$$E(\text{Hired Ratio}_{it} | X_{it}; \text{Membership Fee}_{it}; \text{Promotions}_{it}) = G(X_{it}\alpha + \text{Membership Fee}_{it}\vartheta + \text{Promotions}_{it}\theta) \quad (1.1)$$

where $G(\cdot)$ is a non-linear link function that only produces values between 0 and 1, and X comprises wages, schooling, experience, women, size, size², and labor industries. The key parameters are ϑ and θ , which capture the effects of the membership fee and promotions variables and, hence, reflect the existence, or not, of constitutional and organizational degeneration, respectively.

To understand hired ratio 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 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 $G(\cdot)$ 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 the hired ratio) to get an idea of the explanatory power of each model. Since we do not have members' wages in our database, this first set of models does not allow us to test hypothesis H4.

Table 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

(continúa)

(viene)

		Fractional response models		
		All Coops		
Hired ratio's Models		Logit	Probit	Cloglog
Regressors	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)
	Labor 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 parentheses.

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 indicate that the higher the membership fee, the higher the hired ratio. This suggests that the 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 behavior 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 in 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 organizational 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 increases, 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 1.9, but restricted the sample to cooperatives that have non-member employees for whom the database has information about their wages. Table 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 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***	0,121***	0,122***
		(0,057)	(0,033)	(0,034)
	Size	0,014	0,008*	0,011**
		(0,008)	(0,005)	(0,004)
	Size ²	-0,0001**	-0,0001**	-0,0001***
		(0,0000)	(0,0000)	(0,0000)
	Promotions	-0,231	-0,139	-0,173
		(0,322)	(0,192)	(0,188)

(continúa)

(viene)

		Fractional response models		
		Coops with workers		
Hired ratio's Models		Logit	Probit	Cloglog
Regressors	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)
	Labor industries	-0,091 (0,246)	-0,059 (0,15)	-0,114 (0,145)
	Year dummies	Yes	Yes	Yes
	Region dummies	Yes	Yes	Yes
	R ²	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 Labor 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 increases, 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 labor supply for the former type of organizations. 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 lie in the fact that higher wages attract more workers, who may be satisfied with their non-member status and thus potentially degenerating.

Concluding remarks

Hiring employees appears to be common in Portuguese cooperatives. This degenerative process is apparently enhanced by the high membership fee requested and the 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 the cooperative's reserves and enabling capital shortage reduction. For instance, if for the membership fee's calculation, the firm's reality, candidate's capacity, and the cooperative principles were considered, more individuals would be able to join in. This would allow cooperatives to bolster their capacity to invest and thus increase their weight in the economy.

Similarly, an increase in a firm's size puts 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 disclose members' income. In future research, we would like to collect members' wages to fully understand if increases in income indeed propel degeneration.

Individual experience seems to mitigate degeneration, affecting in a negative, significant way the proportion of non-member 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 labor-intensive industries were never significant.

The reversion of the degenerative process contributes 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.

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