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Is degeneration present in the cooperative realm? Evidence from Portugal

¿Existe una degeneración en el ámbito cooperativo? Datos de Portugal

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¿Existe una degeneración en el ámbito cooperativo? Datos de Portugal

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Summary: 1. Motivation.—2. Related literature.—3. Hypotheses.—4. Dataset, variable's definition and descriptive evidence.—5. Empirical results.—6. Concluding remarks.—7. References.

Sumario: 1. Motivación.—2. Bibliografía relacionada.—3. Hipótesis.—4. Conjunto de datos, definición de las variables y análisis descriptivo.—5. Resultados empíricos.—6. Conclusiones.—7**.** Bibliografía.

Abstract: 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.

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

Resumen: Las cooperativas pueden sufrir un proceso de degeneración. La degeneración se produce cuando una cooperativa se transforma en una empresa capitalista o se comporta como tal.

En Portugal, solo es posible la degeneración conductual, ya que la transformación de las cooperativas en empresas capitalistas está prohibida por ley. Desde el punto de vista conductual, la degeneración cooperativa implica la sustitución de los antiguos socios de la cooperativa por empleados no socios. En este artículo investigamos si las cooperativas portuguesas se enfrentan a un entorno degenerativo mediante el estudio de la evolución de la proporción de empleados no socios en una cooperativa. Utilizando 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 las cooperativas portuguesas. 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 el proceso degenerativo. Cuando restringimos el análisis a las cooperativas que cuentan con trabajadores no socios, se observa que unos salarios más altos y una mayor proporción de trabajadoras también potencian la degeneración, mientras que el nivel de estudios reduce el proceso degenerativo. Por otra parte, no hemos podido encontrar pruebas de que la política de promoción de la cooperativa afecte al proceso degenerativo ni de que la degeneración cooperativa sea más habitual en los sectores intensivos en mano de obra.

Palabras clave: Cooperativas; Degeneración; Cuota de afiliación; Problema del horizonte.

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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.

Deusto Estudios Cooperativos
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2. **Related literature**

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.

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 oligar-

chy[1] (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 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. **Hypotheses**

In this study, we investigate if degeneration exists in Portuguese cooperatives. We make the following assumptions: there are no re-

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

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strictions 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 an 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 an 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 (Podi-

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vinsky 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.

4. **Dataset, variables' definition and descriptive evidence**

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.

4.2. *Variables' definition*

Table 1.1 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 1.1

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,

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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 one[2]. 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.

[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.

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 (Becchetti and Castriota, 2010; Magne 2017; Mishel, 2021). *Labour industries* is a dummy variable to capture the influence of labour-intensive industries on cooperative degeneration.

4.3. *Descriptive evidence*

As reported in Table 1.2, 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 1.2

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 1.3 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.

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Table 1.3

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	111 513,00	45 874,00	6,00
	S.D.	2 680 274,00	1 671 160,00	16,23
	Min	0,00	–383 949,00	1,00
	Max	16 900 000,00	10 800 000,00	111,00
Cooperatives with employees	**Mean**	2 644 138,00	1 890 780,00	29,64
	Median	587 086,00	377 111,50	13,00
	S.D.	4 669 361,00	3 725 319,00	48,19
	Min	0,00	–5 012 687,00	2,00
	Max	29 300 000,00	22 500 000,00	334,00

Source: QP and SCIE. Own elaboration.

Table 1.4 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 1.4

Descriptive statistics for the hired ratio in 2010-2019

		Hired ratio
Cooperatives with employees	**Mean**	0,660
	Median	0,750
	S.D.	0,267
	Min	0,020
	Max	0,990

Source: QP and SCIE. Own elaboration.

The *Hired ratio* may be a reflection of both constitutional and organisational degeneration. Table 1.5 presents some descriptive information about the membership fee and the promotions' ratio both for cooperatives with only members and with employees.

Table 1.5

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	0,00
	S.D.	64 694,87	0,27
	Min	0,00	0,00
	Max	414 574,90	1,00
Cooperatives with employees	**Mean**	51 251,63	0,21
	Median	23 502,38	0,00
	S.D.	86 969,69	0,32
	Min	0,00	0,00
	Max	697 668,30	1,00

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 1.6 presents some descriptive information about those variables for both groups of coop-

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eratives. Note that we cannot compare wages in both type of cooperatives because members' wages are not available.

Table 1.6

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	8,00	30,33	0,50
	S.D.	NA	3,87	9,91	0,41
	Min	NA	3,20	6,50	0,00
	Max	NA	19,00	54,00	1,00
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	14,00	4,00	7,13	0,00
	Max	2 172,64	19,00	51,63	1,00

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 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 seem to have more weight in cooperatives with employees and be equally predominant in cooperatives with only members.

Table 1.7 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 1.7

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 1.8 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 1.8

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.

Deusto Estudios Cooperativos
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doi: https://doi.org/10.18543/dec.3274 • https://dec.revistas.deusto.es

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 mean[3]:

$$E\,(Hired\ Ratio_{it} \mid X_{it};\ Membership\ Fee_{it};\ Promotions_{it}) = G\,(X_{it}\alpha + Membership\ Fee_{it}\partial + Promotions_{it}\,\theta) \quad (1.1)$$

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 1.9 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.

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

Table 1.9

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**	0,3440*** (0,09)	0,2030*** (0,051)	0,2570*** (0,065)
	Size	0,0320** (0,015)	0,0180** (0,008)	0,0180** (0,008)
	Size²	–0,0002** (0,0001)	–0,0001*** (0,0000)	–0,0001** (0,0000)
	Promotions	0,4570 (0,472)	0,2810 (0,277)	0,3440 (0,314)
	Wages	NA	NA	NA
	Experience	–0,0400* (0,022)	–0,0250* (0,013)	–0,0310** (0,015)
	Schooling	–0,0040 (0,065)	–0,0040 (0,039)	–0,0090 (0,045)
	Women	–0,4200 (0,42)	–0,2680 (0,252)	–0,2440 (0,305)
	Labour industries	–0,3630 (0,406)	–0,2250 (0,24)	–0,2150 (0,272)
	Year dummies	Yes	Yes	Yes
	Region dummies	Yes	Yes	Yes
	R^2	0,3810	0,3760	0,3670
	RESET Test	0,6350	0,6010	0,0460**
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.

Deusto Estudios Cooperativos
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doi: https://doi.org/10.18543/dec.3274 • https://dec.revistas.deusto.es

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 1.9, but restricted the sample to cooperatives that have non-member employees for whom the database has information about their wages. Table 1.10 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 1.10

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**	0,2000*** (0,057)	0,1210*** (0,033)	0,1220*** (0,034)
	Size	0,0140 (0,008)	0,0080* (0,005)	0,0110** (0,004)
	Size²	–0,0001** (0,0000)	–0,0001** (0,0000)	–0,0001*** (0,0000)
	Promotions	–0,2310 (0,322)	–0,1390 (0,192)	–0,1730 (0,188)
	Wages	0,0010*** (0,0005)	0,0010*** (0,0002)	0,0010*** (0,0002)
	Experience	–0,0770*** (0,016)	–0,0460*** (0,009)	–0,0460*** (0,009)
	Schooling	–0,1950*** (0,051)	–0,1190*** (0,03)	–0,1210*** (0,03)
	Women	1,1760*** (0,379)	0,6980*** (0,224)	0,6440*** (0,222)
	Labour industries	–0,0910 (0,246)	–0,0590 (0,15)	–0,1140 (0,145)
	Year dummies	Yes	Yes	Yes
	Region dummies	Yes	Yes	Yes
	R^2	0,4770	0,4720	0,4700
	RESET Test	0,2630	0,2610	0,6540
	Nr. of observations		482	

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

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doi: https://doi.org/10.18543/dec.3274 • https://dec.revistas.deusto.es

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.

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.

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