

# Scale, Scope and Survival: A Comparison of Cooperative and Capitalist Modes of Production\*

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July 2012 [Preliminary]

## Abstract

This paper draws on a comprehensive data set from Portugal to investigate the activities undertaken by cooperatives and capitalist enterprises, their internal characteristics and rates of formation and demise. We find a marked difference in the industrial distribution of the two types of enterprise and strong support for hypotheses that cooperatives favour sectors with relatively low risk and high market power. Cooperatives were revealed to be larger, on average, than capitalist firms and to have more highly educated and productive workforces. Entry and exit rates were lower for cooperatives than capitalist firms and, on average, cooperatives enjoyed longer lifespans.

*JEL Classification:* J54, P12

*Keywords:* Cooperatives; capitalist firms; firm ownership

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\*We thank the Ministério do Trabalho e da Solidariedade Social for allowing access to data from the Quadros de Pessoal. We are also grateful to the Portuguese Foundation for Science and Technology and Santander for financial support. The support from the Portuguese Foundation for Science and Technology was provided through the Programa Operacional Temático Factores de Competitividade (COMPETE) of the Quadro Comunitário de Apoio III, which is partially funded by FEDER.

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# 1 Introduction

A long-standing and fundamental question in economics is why firms in market economies are typically owned by the suppliers of capital. Interest in this question, and firm ownership more generally, has increased in recent years as a result of developments in the theory of the firm, the recognition that, notwithstanding the predominance of investor-owned enterprises, alternative organisational forms are present in significant numbers, and indications that advances in technology are leading to fundamental changes in the organisation of production.<sup>1</sup>

In this paper we focus on cooperatives as an alternative to investor ownership. Cooperatives, as Hansmann (1999) points out, are a relatively new form of organisation - having emerged as recently as the latter half of the nineteenth century - but now have a significant economic presence. Notable contemporary examples include Associated Press and MasterCard - both of which are owned by consumers (media organisations and banks, respectively), the worker-owned cooperatives clustered around the town of Mondragon in the Basque region of Spain, which accounted for 8% of Basque industrial gross value added in 2008, and the farmer-owned cooperatives which are responsible for the marketing of substantial portions of agricultural output in many countries.

We address three recurring themes in the literature: the types of activity undertaken by cooperatives, their scale of operation and other internal characteristics, and their prospects for survival. Our aims are, first, to provide detailed descriptive evidence in each of these areas and second, to investigate the determinants of the pattern of cooperative production. In particular, we test two prominent hypotheses in the literature: that cooperatives are attracted to sectors characterised by low risk and by high levels of market concentration. Throughout the analysis we draw comparisons with investor-owned ("capitalist") enterprises.

Our data are drawn from the Portuguese Quadros de Pessoal. This, hitherto unexploited, data set has a number of attractive features in the present context.<sup>2</sup> First, it is a census of virtually all firms in the economy. Second, the Portuguese framework of commercial law specifically includes a cooperative legal form – the “Código Cooperativo” - and such firms can, along with capitalist firms, be identified in the Quadros de Pessoal. This allows the two types of enterprise to be examined under a common framework, with variables being defined and collected in a consistent manner. Third, it provides detailed internal information on each firm including the date of constitution, mode of formation and demise, industry of operation, and accurate measures of firm size. Finally, the data extend over a 12 year period from 1996

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<sup>1</sup>See, for example, Baker and Hubbard (2004) on the impact of computers on the ownership of assets in the trucking industry and Morrison and Wilhelm (2008) on the demise of partnerships in investment banking.

<sup>2</sup>The Quadros de Pessoal has been used extensively for the analysis of firms in aggregate but not, as far as we are aware, cooperatives.

to 2007, during the course of which the fate of individual firms can be tracked.

The main findings of the paper are, first, that cooperatives were widely distributed across sectors but in a pattern that differed from that of capitalist firms. Second, our analysis of these patterns provided strong support for the hypotheses on the implications of risk and market power for the organisation of production. Third, cooperatives were found to operate, on average, at a larger scale and with a more highly educated and productive workforce than capitalist enterprises. Fourth, the data revealed that ownership structure was not static, and that conversions of capitalist enterprises into cooperatives were more common than transformations in the opposite direction. Finally, we found that the lifespans of cooperatives typically exceeded those of capitalist firms, and by some margin. For instance, whilst approximately three-quarters of cooperatives were still in existence ten years from the date of entry, less than 40% of capitalist firms survived to this point.

The remainder of the paper is organised as follows. The next section provides a definition of both cooperatives and capitalist modes of production, and describes the data. Section 3 investigates the distribution of each type of firm across industries and also their internal characteristics. The findings on entry, exit and survival are presented in Section 4, and a concluding section then completes the paper.

## 2 Definitions and data

A satisfactory comparative analysis of cooperative and capitalist production requires, first of all, a precise theoretical distinction between the two organisational forms and, second, a close correspondence between these theoretical entities and the types of enterprise identifiable in the data.

Following a framework suggested by Grossman, Hart and Moore, the organisational form of an enterprise can be defined in terms of the ownership of - and thereby the residual rights of control over - its non-human assets (Grossman and Hart, 1996; Hart, 1995; Hart and Moore, 1990, 1996). Whilst, in principle, a particular firm might be owned by anyone, in practice, as Hansmann (1996) points out, ownership is generally assigned to parties that have a transactional relationship with the firm, either as suppliers of an input or as consumers of its output. The former category can usefully be divided into three groups: suppliers of financial capital; suppliers of labour; and suppliers of any other inputs such as raw materials.

A capitalist firm can then be defined as an enterprise in which the rights to residual control are assigned to the suppliers of financial capital, and in proportion to the amount of capital supplied. These control rights would typically cover matters such as the choice of products and prices, and decisions on employment and investment. In practice, such rights might be

exercised directly or indirectly through the appointment of specialist managers. In the latter case, the owners retain ultimate control through their right to dismiss the management.

In this framework, a cooperative can be defined as an enterprise in which the rights to residual control are assigned to one of the other (i.e. other than capital suppliers) contracting parties, and in which these "members" exercise control on the basis of one-member, one-vote. Once again, decisions-making might be delegated to specialist managers.

Our data are derived from the Quadros de Pessoal, an annual survey produced by the Portuguese Ministry of Labour and Social Security. All firms that have one or more wage earners are included in the survey with the exception of firms engaged in certain aspects of public administration and domestic work. As mentioned earlier, the Quadros de Pessoal classifies firms according to their legal form, which enables us to identify both cooperative and capitalist firms.

Under Portuguese commercial law, the rules governing the operation of cooperatives are set out in Article 3 of the "Código Cooperativo", which draw on principles set down by the International Co-operative Alliance. Two of these principles, concerning "democratic management" and "autonomy and independence" indicate a close correspondence with the above theoretical definition of a cooperative. On the issue of democratic management, the Código states: "The co-operatives are democratic organizations managed by their members, which actively participate in the formularization of policies and in making decisions. The men and women who exert their functions as representatives are responsible to the members who elected them. In the co-operatives of the first degree, the members have equal rights to vote (one member, one vote), and co-operatives of other degrees are also organized in a democratic form." On the matter of autonomy and independence, the Código requires that if a cooperative were to seek external capital then it must do so in a manner that maintains its autonomy as a cooperative.

In addition to cooperatives, no fewer than 39 alternative organisational forms are identified in the Quadros de Pessoal. However, the vast majority of enterprises (97%) fall into one of just three categories: sole proprietorship, private limited liability company and public limited liability company. Each of these three organisational forms can be considered a capitalist enterprise on the above definition. Thus a sole proprietorship, in which the ownership of assets and ultimate control rests in the hands of a single individual, is the classic capitalist firm of Alchian and Demsetz (1972). In limited liability companies, whether private or public, ultimate control rests in the hands of shareholders on the principle of one-share-one-vote. The shareholders are capital suppliers in the sense that they are entitled to the residual proceeds from the sale of the assets should the firm be liquidated. Thus such enterprises also correspond

to the definition of a capitalist enterprise.

Our objective is to compare cooperatives and capitalist firms *as alternative modes of production* and one complicating factor is that not all cooperatives engage in the production. Hansmann (1996), for instance, points out that some farmer-owned cooperatives are simply vehicles for negotiating the price of their produce. Similarly, some consumer-owned cooperatives are set up with the sole purpose of facilitating coordination among consumers when bargaining with suppliers over price. Ideally, we wish to exclude all such organisations and so focus attention on the set of cooperatives that do engage in production. We shall refer to these as "production cooperatives" (PCs).

The Quadros de Pessoal itself goes some way towards identifying the set of PCs by virtue of the fact that it excludes any organisation which does not employ at least one worker. To further refine the sample, we removed any firm (whether cooperative or capitalist firm) which reported zero revenue in all periods, and all enterprises engaged in wholesale and retailing activities (NACE Section G).<sup>3</sup> Section G includes, *inter alia*, "cooperative buying association", "cooperative associations engaged in the marketing of farm products" and retail "consumer cooperatives".

As a further data cleaning exercise, we excluded all enterprises engaged in agriculture, hunting, forestry or fishing on the grounds that there is general acceptance among users of the Quadros de Pessoal that these sectors are characterised by under-reporting.<sup>4</sup> Finally, we paid careful attention to a firm's legal status. In some instances a firm was present in the data at dates  $t$  and  $t + k$  but absent in between. Such firms were retained provided their status at  $t$  and  $t + k$  was the same. All other firms were checked for consistency of status. If a firm's status was missing in one or more years then, provided it was constant in the other years, the missing entries were imputed.<sup>5</sup>

In the analysis to follow, we will consider both a total capitalist firm measure - companies plus sole proprietorships (CF2) - and companies alone (CF1). The reason for this approach that sole proprietorships are distinct from both companies and cooperatives by virtue of the fact that ownership and control is restricted to a single individual. This restriction is, as we shall see, strongly reflected in the data on capitalist enterprises. Furthermore, since a cooperative must, by definition, have at least two members it seems natural to make comparisons with a capitalist organisation which similarly allows for multiple owners, as well

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<sup>3</sup>Firms are classified according to the Portuguese CAE (Rev.2.1) system of industrial classification which is equivalent to NACE (Rev.1.1).

<sup>4</sup>Specifically, we excluded enterprises in Sections A and B of the NACE Industrial Classification (Rev.1.1).

<sup>5</sup>A number of firms changed their legal status more than once. It is possible that this might indicate a classification error and thus all results were checked for robustness to the exclusion of these firms. Only the findings on the modes of PC formation and demise proved to be sensitive. This is addressed in Section 4.3.

as with the aggregate capitalist firm measure.

### 3 Industry distributions and firm attributes

In this section we investigate the types of activity undertaken by PCs and capitalist firms (CFs), and their internal characteristics. We begin with theory, with the aim of identifying testable hypotheses in the literature. This is followed, in Section 3.2, by presentation of the descriptive evidence on the distribution of PCs and CFs across industries, and their scale of operation and other internal attributes. Econometric evidence, including the results of hypothesis tests on determinants of the pattern of cooperative activity, is presented in Section 3.3.

#### 3.1 Theory

The theoretical literature has identified a number of potential links between a firm's ownership structure and its behaviour and performance.<sup>6</sup> Here we restrict attention to arguments that can be addressed using our data set.

One long-standing argument is that due to the inherent divisibility of financial capital, investors in a CF are more able to spread risks than are the members of a cooperative. Thus, in the context of worker cooperatives, Meade (1972) wrote: "While property owners can spread their risks by putting small bits of their property into a large number of concerns, a worker cannot put small bits of effort into a large number of different jobs" and thus "we are likely to find cooperative structures in lines of activity in which the risk is not too great" (p. 426). Empirical analyses of worker cooperative entry into UK manufacturing industries by Podivinsky and Stewart (2007, 2012) provide support for this prediction.<sup>7</sup> Meade's indivisibility argument can be applied, to a degree, to other forms of cooperative and thus we would expect a general tendency for cooperatives to concentrate in relatively low-risk sectors of the economy.

Hansmann (1999) points to market power as an additional factor influencing the pattern of cooperative production. He notes that consumer cooperatives have often been set up in situations where the members would otherwise have to deal with a monopoly supplier. Similarly, monopsony power provides a rationale for input suppliers to form cooperatives. This form of market power, he suggests, may be an important factor underlying the formation

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<sup>6</sup>See Hansmann (1996), the contributions by Grossman, Hart and Moore cited above and, for the specific case of worker cooperatives, Dow (2003).

<sup>7</sup>Dong and Bowles (2002) found that risk played an important role in workers' decisions on whether to buy shares in privatised Chinese enterprises.

of agricultural marketing and processing cooperatives. Hence, we might expect to find a positive relationship between market concentration and the presence of cooperatives.

Two arguments that are frequently advanced to explain why cooperatives are far less numerous than CFs are first, that they are more susceptible to problems associated with collective governance and second, that they face particular difficulties in raising external finance. On the former, Hansmann (1988, 1996) and more recently, Dow and Skillman (2007) argue that the owners of cooperatives are likely to have more heterogeneous preferences than investors in capitalist firms and that heterogeneity raises the costs of collective decision-taking. The implication is that cooperatives are likely to be more successful in situations where it is possible to maintain a relatively homogeneous membership.

The basis of the finance argument is that in the presence of adverse selection or moral hazard, agents will be reluctant to lend money to organisations in which they are unable to exercise any control. An implication is that cooperatives may be largely confined to sectors of the economy with relatively low capital requirements.<sup>8</sup>

We are not able to address the governance or finance arguments directly, nor do we have data on industry capital requirements. However, both arguments carry the suggestion that cooperatives might be more constrained in their scale of operation than CFs, and we are able to examine the size distribution of each type of firm and to test whether minimum efficient scale affects the pattern of cooperative activity.

### **3.2 Descriptive evidence**

In this section we describe the pattern of activity of cooperatives and then examine their scale of operation.

Table 1 presents the broad industry distribution of PCs and CFs, the latter defined here as companies plus sole proprietorships (CF2). As explained in the previous section, firms engaged in agriculture, forestry, hunting and fishing have been excluded, as have those in the wholesale and retail sectors.

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<sup>8</sup>Podivinsky and Stewart (2007) found that high levels of capital intensity acted as a barrier to worker cooperative entry into UK manufacturing industries.

Table 1: Broad industry distribution of firms in 2007

	PC		CF2		PC/Total
	No.	%	No.	%	%
Mining and quarrying	1	0.11	840	0.45	0.12
Manufacturing	215	23.57	40,773	21.98	0.52
Electricity, gas and water	8	0.88	149	0.08	5.10
Construction	94	10.31	40,502	21.83	0.23
Services	594	65.13	103,277	55.66	0.57
Total	912	100.0	185,541	100.0	0.49

The table shows, first of all, that services was by far the major area of activity for PCs, accounting for almost two-thirds of the 912 enterprises in 2007. The next most important areas were manufacturing (23.6%), and construction (10.3%), with the remaining sectors - electricity, gas and water, and mining and quarrying - accounted for only a few firms.

In comparison with CFs it can be seen that cooperatives were markedly overrepresented in services and underrepresented in construction, whilst manufacturing accounted for a similar proportion of both enterprise types. A Pearson Chi-square test revealed that the overall pattern of activity of cooperatives and capitalist enterprises was significantly different at the 1% level.

Table 2 presents more detailed information on the manufacturing sector. It reveals a high degree of concentration of cooperative activity, with almost three-quarters of the 215 firms in the food, beverages and tobacco sector, a further 7% in printing and publishing and 6% in clothing, textiles and leather.<sup>9</sup> Only a small number of PCs were active elsewhere in manufacturing.

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<sup>9</sup>A more detailed breakdown revealed that no cooperatives were engaged in the production of tobacco products.

Table 2: Distribution of firms within Manufacturing in 2007

	PC		CF2		PC/Total
	No.	%	No.	%	%
Food, beverages and tobacco	159	73.95	5,582	13.69	2.77
Clothing, textiles and leather	13	6.05	8,941	21.93	0.15
Wood and furniture	2	0.93	3,901	9.57	0.05
Printing and publishing	16	7.44	2,778	6.81	0.57
Chemicals and pharmaceuticals	1	0.47	1,456	3.57	0.07
Glass and ceramics	2	0.93	2,947	7.23	0.07
Mechanical and metal products	5	2.33	9,044	22.18	0.06
Electrical and electronics	5	2.33	1,604	3.93	0.31
Other	12	5.58	4,520	11.09	0.26
Total	215	100.0	40,773	100.0	0.52

Whilst we are unable to distinguish different forms of cooperative within our data, we note in passing that both printing and publishing and clothing, textiles and leather have previously been identified as important areas of activity for worker cooperatives (see, for example, Ben-Ner, 1988a).

The distribution of CFs within manufacturing is quite different to that of cooperatives. Most noticeably, less than 14% of capitalist firms were engaged in food, beverages and tobacco, whereas clothing, leather and textiles and mechanical and metal products each accounted for more than 20% of firms. In broad terms, it can be seen that CFs were more evenly spread than cooperatives across the spectrum of manufacturing. A Pearson Chi-square test confirmed, once again, that two distributions are significantly different at the 1% level.

Information on the service sector is presented in Table 3.

Table 3: Distribution of firms within Services in 2007

	PC		CF2		PC/Total
	No.	%	No.	%	%
Hotels and restaurants	9	1.52	31,625	30.62	0.03
Transport and communications	43	7.24	13,209	12.79	0.32
Finance	89	14.98	1,893	1.83	4.49
Real estate	73	12.29	32,111	31.09	2.27
Public administration and defense	13	2.19	19	0.02	40.63
Education	113	19.02	2,913	2.82	3.73
Health and social work	87	14.65	10,022	9.70	0.86
Other	167	28.11	11,485	11.12	1.43
Total	594	100.0	103,277	100.0	0.57

The table reveals that both PCs were present in all subsectors, with the main concentrations being in education (19%), finance (15%), health and social work (15%) and real estate

(12%).<sup>10</sup> Once again, CFs exhibit a significantly different pattern of activity, with hotels and restaurants and real estate each accounting for roughly 31% of the total and transport and communications a further 13%.<sup>11</sup>

We now turn to consider the sizes distributions of the two types of firm measured in terms of first, employment and then sales revenue.

Table 4: Firm size by employment (2007)

Number of employees	PC	CF1	CF2
Mean	24	14	11
Median	9	4	3
	Size distribution (%)		
0-9	53.07	76.78	81.41
10-49	34.86	19.43	15.65
50-99	7.79	2.16	1.68
100+	4.28	1.62	1.25
Total	912	143,414	185,541

Table 4 reveals, first of all, that the mean employment level in PCs was greater than that in both companies (CF1) and capitalist enterprises in aggregate (CF2).<sup>12</sup> PCs employed, on average, 24 workers, compared with an average of 14 in capitalist companies and 11 in all capitalist enterprises.

The table also shows that, for all firm categories, the size distribution is heavily skewed. In the case of PCs, the median firm employed 9 workers and 53% of firms employed fewer than 10 workers. The predominance of small enterprises is even more pronounced among CFs, with approximately 77% of companies, and 81% of all CFs, having fewer than 10 employees.<sup>13</sup>

Perhaps surprisingly in view of the theoretical arguments, the data also reveal the presence of a significant number of medium and large PCs: 12% of PCs employ 50 or more workers and a third of these have a workforce of 100 or more. By contrast, only 2% of capitalist firms employ 50 or more workers.

This finding that PCs are capable of operating on a large scale is not new even in the case of worker cooperatives, which one might expect to face the most severe constraints on size. Dow (2003, p.47), for example, reported the existence of construction firms in Italy

<sup>10</sup>The "other" category includes, among other activities: arts, entertainment and recreation, repair of household goods and various personal services.

<sup>11</sup>The difference is significant at the 1% level using a Pearson Chi-square test.

<sup>12</sup>Sole proprietorships employ two people on average.

<sup>13</sup>The difference between the PC and CF means, and the difference in medians, are significant at the 1 % level.

which employed about 3,000 workers and enterprises in the Mondragon group employing 200-300 workers. Indeed, Ben-Ner (1988a) reports that, in the 1980s, the mean employment level among Mondragon worker cooperatives exceeded 200 workers. We should note, however, that elsewhere the typical worker cooperative was considerably smaller: 27 workers, on average, in France and 40 in Italy. More recently, Burdín and Dean (2009) report that in Uruguay in 2005, the average worker cooperative employed 26 workers, which was almost twice the CF average.

In Table 5 we consider sales revenue as an alternative indicator of firm size.

Table 5: Firm size measured by sales revenue (2007)

Annual revenue (millions of euros)	PC	CF1	CF2
Mean	2.006	1.151	0.910
Median	0.190	0.132	0.101
	Size distribution (%)		
Less than 1	72.26	88.41	90.92
1-2	7.46	5.09	4.02
2-3	5.15	2.02	1.58
3+	15.13	4.47	3.48
Total	912	143,414	185,541

The data reinforce the message that PCs are, on average, substantially larger than their capitalist counterparts, with the average mean annual revenue of 2 million euros in PCs being approximately twice the CF figure.

### 3.3 Estimation and results

We now examine the relationship between organisational form, firm attributes and industry characteristics within a multivariate framework. Specifically, we estimate the following logit model:

$$\Pr(y_{i,t} = 1 | x) = G\left(\beta^f x_{i,t}^f, \beta^s x_{i,t}^s, D_s, D_r, D_t\right)$$

where  $y_{i,t}$  takes the value 1 if firm $_i$  is a PC and 0 if it is a CF (CF2),  $x_{i,t}^f$  is a vector of firm characteristics,  $x_{i,t}^s$  is a set of industry characteristics and  $D_s$ ,  $D_r$ ,  $D_t$  are sector, region, and year dummies respectively.<sup>14</sup>

In addition to firm size (employment), the vector of firm characteristics comprises, a multiplant dummy, firm age and age squared, log labour productivity, the average education

<sup>14</sup>The sector dummies are defined at the 2-digit level.

of the workforce (years of schooling) and the proportion of males in the workforce. This set of variables allows us to further explore the relative size of the two types of enterprise and also to consider the attributes of their workforces.

The industry variables were selected with the particular objective of testing the hypotheses on the implications of risk and market power for the pattern of cooperative production.

The risk of entering an industry can be expected to be positively related to the volatility of industry demand and the sunk costs of entry and exit. To capture demand volatility we employ a measure of the variation in sales suggested by Cuñat and Merlitz (2012) in their analysis of the implications of volatility and labour market flexibility for comparative advantage. The variable is constructed by first calculating, for each firm, the standard deviation of the annual growth rate of its sales, the latter being measured by the year-difference in sales. The volatility measure, *Volatility*, is then calculated as the employment-weighted average of these standard deviations across all firms in the industry. This measure, as Cuñat and Merlitz point out, is unaffected by any trend growth in firms' sales.<sup>15</sup>

In the absence of a direct measure of industry sunk costs of entry and exit, we constructed a proxy based on entry and exit rates. This approach has been used in the literature on entry and survival by, for example, Mata and Machado (1996) and more recently, Bernard and Jensen (2007). The premise is that, in steady state, entry and exit rates will covary with the level of sunk costs. Following Bernard and Jensen (2007), we utilize the following proxy which allows for the fact that industries might not be in equilibrium:

$$Entry\ costs_{s,t} = 1 - \{\min(Entry_{s,t}, Exit_{s,t})\}$$

where  $Entry_{s,t}$  is the industry entry rate defined as the number of firms entering the industry during the period  $t - 1$  to  $t$  divided by the total stock of firms at time  $t$ . Similarly,  $Exit_{s,t}$  is the industry exit rate defined as the number of firms exiting the industry during the period  $t$  to  $t + 1$  divided by the total stock of firms at time  $t$ .

To test the hypothesis that market power is conducive to the formation of cooperatives, we include a market concentration variable, *Concentration*, measured as the Herfindahl-Hirschman Index.

Ideally, we would also include a measure of industry capital requirements to assess the argument that cooperatives are at a comparative disadvantage in activities that have high capital requirements. Unfortunately, we do not have data on capital. Instead,

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<sup>15</sup>In line with the procedure adopted by Cuñat and Merlitz, we excluded any observation for which the absolute value of the growth rate exceeded 300%.

we incorporate a proxy for minimum efficient scale, *MES*. The proxy, suggested by Lyons (1980), is based on the employment level in firms that operate, on average, 1.5 plants.<sup>16</sup> If it were the case that the capital-output ratio was constant across industries, then there would be a direct relationship between minimum efficient scale and capital requirements. However, in practice the capital-output ratio can be expected to vary across industries and thus *MES* cannot be given this interpretation.

Each of the above industry variables is measured at the 4-digit NACE (5-digit CAE) level.

Table 6 reports the estimates from the logit model, using pooled data for the years 1995-2007. All specifications include region and NACE 2-digit sector fixed effects.

Table 6. Multivariate logit of Production Cooperatives on characteristics

	(1)	(2)	(3)	(4)	(5)
<i>Firm characteristics</i>					
Size (employment)	0.405***	0.402***	0.202***	0.202***	0.203***
Multiplant	0.308***	0.306***	0.434***	0.427***	0.437***
Firm age	0.105***	0.110***	0.083***	0.083***	0.109***
Firm age squared	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
Labour productivity (log)	0.162***	0.118 ***	0.090***	0.063	0.094**
Average education (years)	-	0.106***	-	0.089***	-
Male (proportion)	-	-0.601***	-	-0.630***	-
<i>Industry characteristics</i>					
Volatility	-	-	-8.447***	-9.667***	-176.5***
Entry costs	-	-	-0.316*	-0.365**	-0.360*
Concentration	-	-	1.069***	0.858***	1.042***
MES (log)	-	-	0.664***	0.664***	0.657***
Year fixed effects	Yes	Yes	No	No	Yes
Observations	1,245,308	1,015,642	1,245,308	1,015,642	1,245,308

Notes: Significance levels: \* : 10% \*\* : 5% \*\*\* : 1%. All regressions include region and industry sector fixed effects.

We first consider the firm characteristics. The coefficient on firm size is positive and highly significant in all specifications indicating that, other things being equal, the probability of a firm being organised as a cooperative increases with size. Thus the earlier size differential finding continues to hold after controlling for age, other firm characteristics, industry, region and the year of operation. Furthermore, the results reveal a positive relationship between a firm operating more than one plant and being organised as a cooperative.

<sup>16</sup>The method involves identifying the employment size band in which the firms, on average, operate 1.5 plants. The minimum efficient scale is then deemed to be one half of average employment in these firms.

The coefficients on age and age squared indicate that, up to a point, there is a positive relationship between a firm's age and the probability that it is a cooperative. This is pursued in Section 4, where we examine the survival prospects of the two types of firm. The probability that an enterprise is organised as a cooperative is also increasing in labour productivity and the educational level of the workforce, and negatively related to the proportion of males.<sup>17</sup> However, the lack of significance of the coefficient on productivity in column (4) indicates a degree of correlation among these variables. With this one exception, the signs and significance of all of the firm attributes are robust to the inclusion of the set of industry variables.

In columns (3) - (5) the four industry variables are introduced alongside the firm attributes. The demand volatility variable is negative and significant at the 1% level in all three specifications. This is consistent with the hypothesis that cooperatives offer owners less protection against risk than capitalist enterprises. The hypothesis receives further support from the similarly negative coefficient on the proxy for sunk entry and exit costs.

The coefficient on market concentration is positive and significant at the 1% level, thus offering strong support to the argument that market power encourages the formation of cooperatives.

Finally, the positive and significant coefficient on the proxy for minimum efficient scale reinforces our earlier contention that cooperatives are capable of producing on a large scale.

## 4 Entry, exit and survival

There is now a large empirical literature on the entry, exit and survival of capitalist firms. By comparison, empirical work on cooperatives is in short supply and, with a few exceptions, focussed solely on worker cooperatives.<sup>18</sup>

Our aim in this section is to provide basic information on the entry, exit and survival of cooperatives of the form provided - for the aggregate of all firm types - by Dunne et al. (1988) for US manufacturing and, more recently, Disney et al. (2003) for the UK. Such information, as Dunne et al. point out, provides a valuable foundation for both theoretical and empirical analyses.

We therefore begin with a detailed description of entry and exit over the period 1996-2006. Data are presented on the annual number of PC entrants, exitors and continuing firms, and comparisons drawn with equivalent figures for CFs. For PCs, we also identify the modes of

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<sup>17</sup>For analyses of productivity in cooperatives, see Estrin and Jones (1995), Estrin, Jones, and Svejnar (1987) and Maietta and Sena (2008).

<sup>18</sup>Recent empirical analyses of worker cooperatives include Arando et al. (2009), Kalmi (2012), Pérotin (2006) and Podivinsky and Stewart (2007).

entry and exit. The remainder of the section then examines the lifespans of the two types of enterprise.

Stayer	Present in $t$ , $t - 1$ and $t + 1$
Entrant	Present in $t$ , absent in $t - 1$
Exitor	Present in $t$ , absent in $t + 1$
Transient	Present in $t$ , absent in $t - 1$ and $t + 1$

Following a classification suggested by Disney et al. (2003), a firm that appears in the data in year  $t$  is categorised as a stayer, entrant or exitor as shown below. In addition, a firm that is present in  $t$ , but absent in  $t - 1$  and  $t + 1$  is identified as a transient firm. Such firms are a subset of both the entrant and exitor categories. Thus the total stock at any point in time is the sum of the stayers, entrants and exitors minus the number of transient firms.

Our interest lies with the organisational form of an enterprise (PC or CF) and thus each of the above categories is defined in terms of the specific enterprise type. Thus, for example, in the data on PCs a stayer is a firm that was present in the market in  $t$ ,  $t - 1$  and  $t + 1$  and was constituted as a PC in each of these years. Similarly, a PC entrant is an enterprise that existed as a PC in  $t$ , but did not exist *as a PC* in  $t - 1$  (it was either absent from the market or present in the market but constituted as a CF).

#### 4.1 Entry, exit and continuation rates

The basic data on PC stocks and flows over the period 1996-2006 are presented in Table 7. The number of PCs increased gradually from 769 in 1996 to 968 in 2006, which represents an average annual growth rate of just over 2.5%.

Table 7: PC entry and exit, 1996-2006

Year	Total	Stayers		Entrants		Exitors		Transients	
		No.	%	No.	%	No.	%	No.	%
1996	769	626	81.4	121	15.7	25	3.3	3	0.4
1997	790	697	88.2	66	8.4	34	4.3	7	0.9
1998	797	728	91.3	50	6.3	23	2.9	4	0.5
1999	824	750	91.0	50	6.1	26	3.2	2	0.2
2000	873	774	88.7	61	7.0	44	5.0	6	0.7
2001	859	782	91.0	38	4.4	42	4.9	3	0.3
2002	870	770	88.5	48	5.5	56	6.4	4	0.5
2003	871	797	91.5	56	6.4	21	2.4	3	0.3
2004	898	810	90.2	54	6.0	36	4.0	2	0.2
2005	957	855	89.3	46	4.8	63	6.6	7	0.7
2006	968	875	90.4	41	4.2	57	5.9	5	0.5
96-06	873	774	89.3	56	6.7	40	4.5	4	0.5

Table 8: CF entry and exit, 1996-2006

Year	CF1					CF2				
	Total	Distribution (%)				Total	Distribution (%)			
		Stay.	Ent.	Exit	Tran.		Stay.	Ent.	Exit	Tran.
1996	72,353	79.7	16.5	4.9	1.1	112,834	76.2	18.6	6.9	1.8
1997	78,173	81.9	14.0	4.9	0.9	123,640	78.2	16.3	7.0	1.5
1998	85,232	82.0	13.8	4.9	0.7	134,490	78.5	15.6	7.2	1.4
1999	91,923	83.0	12.6	5.1	0.7	145,545	78.0	15.0	8.6	1.6
2000	103,819	79.0	16.6	5.5	1.1	162,058	72.6	18.1	11.7	2.4
2001	118,462	76.4	18.1	6.3	0.9	173,567	72.6	18.4	10.9	1.9
2002	133,205	76.1	17.6	7.4	1.2	183,856	75.1	16.8	9.7	1.7
2003	139,993	81.4	11.7	7.8	0.9	189,154	79.7	12.0	9.6	1.3
2004	144,456	83.2	9.8	7.7	0.7	192,821	81.1	10.5	9.6	1.1
2005	152,840	81.4	9.5	10.1	1.0	204,343	78.5	10.9	12.3	1.7
2006	157,071	82.6	9.5	8.7	0.8	207,485	80.4	10.1	10.6	1.1
96-06	121,845	80.6	13.2	7.1	0.9	172,420	77.5	14.3	9.7	1.6

At any point in time 89.3%, on average, of these firms would have been in the market for at least a year and would still be present in the following year. We refer to these as "continuing firms" or "stayers". The annual number of entrants was, on average, 56 which gives a mean entry rate of 6.7%. The average number of exitors was somewhat lower at 40 which yields a exit rate of 4.5%. The sum of these three percentages slightly exceeds one hundred due to the presence of a small number of "transient firms". These are firms that are present in the market for only one year and thus count as both entrants and exitors. On average, there were 4 such firms in any one year, which represents 0.5% of the stock.

The difference between the mean entry and exit rates reflects the growth in the population of PCs over the period. The table also reveals considerable variation around the means, with the entry rate ranging from 15.7% in 1996 to 4.2% for the most recent observation in 2006 and the exit rate from 6.6% in 2005 to just 2.4% in 2003.

The equivalent data for companies (CF1) and all capitalist firms (CF2) are presented in Table 8.

Notice first that the stocks of both CF1 and CF2 grew strongly over the period, approximately doubling in size. Since the population of cooperatives grew at a slower rate, caution should be exercised when making comparisons. Nevertheless, there is a marked contrast in the figures, which can be seen most clearly in the proportions of stayers and transients,

Referring back to Table 7 it can be seen that, for cooperatives, the percentage of stayers varied between 81.4% and 91.5% and exceeded 90% in the majority of years. In the case of capitalist firms, by contrast, the percentage of stayers never reaches 90%; for companies, the maximum figure is 83.2% and for all capitalist enterprises, 81.1%. Table 7 also revealed that among PCs the proportion of transient firms was just 0.5% on average, whilst in Table 8 we see that for capitalist companies the figure is 0.9%, and for all capitalist firms, 1.6%. These differences are reflected in the entry and exit rates. For cooperatives, the average entry rate was 6.7%, whereas for companies and all capitalist companies the rates were 13.2% and 14.3% respectively. Similarly, the average cooperative exit rate of 4.5% is appreciably below that of companies (7.1%) and all capitalist firms (9.7%).

## 4.2 Modes of formation and demise

A common theme in the literature concerns the possibility that an established enterprise might convert from one ownership structure to another. This has been a particular focus of attention in the theoretical literature on worker cooperatives. Miyazaki (1984) and Ben-Ner (1984, 1988b), for example, argue that the members of a successful worker cooperative may have an incentive to replace any departing members with workers hired at the market wage and thus over time the worker cooperative will become transformed into a CF. There may also be situations under which worker cooperative members will find it worthwhile to sell the firm to an external investor. On the other hand, an entrepreneur who initially chose to set up a CF might find that, at a later date, there are gains to be made from selling the firm to the workforce. This might be due to a gradual diminution of informational asymmetries within the firm or a change in the external environment. Ben-Ner and Jun (1996) examine the incentive for an entrepreneur to sell the firm within a bargaining framework and show

that a takeover by the workforce is more likely when profits are low.<sup>19</sup>

The issue of conversions has been discussed in relation to cooperatives more generally by Hansmann (1996). Hansmann's premise is that organisational form is, in the main, determined by efficiency considerations and that the costs associated with changes in ownership are relatively modest. Thus, he notes that, due to the specific nature of entrepreneurial activity, a firm might initially be owned by a single individual or small set of individuals but later sold to a different set of patrons. Similarly, a subsequent change in the external environment might trigger a change in ownership structure.<sup>20</sup>

In the light of these arguments we examine the modes of formation and the frequency and direction of firm conversions within the data. We focus attention on cooperatives distinguishing, on the entry side, between PCs that were created de novo and those that arose as a result of the transformation of a previously existing CF and, on the exit side, dissolutions (where the productive unit ceased to exist) from transformations into a CF.<sup>21</sup>

Table 9 presents the findings expressed as annual averages over the whole period and, as an indicator of recent experience, for the five years from 2001 to 2006.

Table 9: Modes of PC formation and demise

	PC formation					PC demise				
	Annual	De novo		From CF		Annual	Dissolution		To CF	
	mean	No.	%	No.	%	mean	No.	%	No.	%
1996-2006	58	50	86.2	8	13.8	38	37	97.4	1	2.6
2001-2006	49	41	83.7	8	16.3	47	45	95.7	2	4.3

The table reveals that transformations occurred in both directions, but those from CFs to PCs were the more common. Taking the period as a whole, transformations from pre-existing CFs accounted for approximately 14% of annual PC entry on average, whilst conversions into CFs accounted for less than 3% of exits. The more recent period from 2001 to 2006 saw a slightly higher contribution of transformations to both entry and exit.<sup>22</sup>

A number of firms in the sample changed their legal status more than once. It is possible that this might indicate a classification error and thus all results were checked for robustness to the exclusion of such firms. The findings on modes of PC formation and demise proved

<sup>19</sup>See Dow (2003) for further theoretical discussion of transformations and Abramitzky (2008) for an analysis of membership levels in the specific case of Israeli kibbutzim.

<sup>20</sup>Hansmann does recognise that there may be impediments to changes in ownership structure. See, for example, the discussion in Hansmann (1996, p.46).

<sup>21</sup>In the case of CFs, transformations account for a negligibly small proportion of both entry and exit.

<sup>22</sup>For evidence on transformations specifically involving worker cooperatives, see Ben-Ner (1988a). Kalmi (2012) notes that almost all worker cooperative entrants in Finland over the period 1988-2005 were created de novo.

to be sensitive, and in Table 10 we therefore present results for the restricted sample which excludes all firms that changed status more than once.

Table 10: Modes of PC formation and demise (restricted sample)

	PC formation					PC demise				
	Annual	De novo		From CF		Annual	Dissolution		To CF	
	mean	No.	%	No.	%	mean	No.	%	No.	%
1996-2006	56	50	89.3	6	10.7	37	37	100.0	0	0.0
2001-2006	47	41	87.2	6	12.8	46	45	97.8	1	2.2

The effect is to slightly reduce the contribution of transformations to both entry and exit, but without changing the message that conversions from CFs to PCs are numerically more important than those in the reverse direction.

### 4.3 Survival

We now turn to consider the survival prospects of cooperatives in comparison with capitalist enterprises. We begin by examining the survival of the firm as a specific organisational type. Thus the lifespan of a PC is defined as the period from its formation *as a PC* to its demise, either through dissolution or conversion to a CF.<sup>23</sup> As we saw in the previous section, conversions into CFs accounted for approximately 3% of total PC exits. In the case of CFs, transformations account for a negligibly small proportion of both entry and exit.<sup>24</sup>

Table 11 presents the findings on the survival rates of both PCs and CFs. The figures show the percentage of firms of each type that were still surviving at specified intervals following their formation (entry).<sup>25</sup>

Table 11: Organisational form survival rates

	PC and CF survival rates (%)								
	Years after entry								
	1	2	3	4	5	10	15	20	
PC	95.5	93.4	90.6	88.6	86.1	74.2	65.5	50.6	
CF1	92.5	84.8	77.7	71.0	63.1	36.8	23.4	14.2	
CF2	91.4	83.5	76.4	69.8	62.8	38.0	23.7	13.6	

The table reveals that over 95% of PCs survived beyond their first year, more than 93% survived beyond the second and 86% were still in operation five years after the date of entry.

<sup>23</sup>The date of formation is taken as the date on which the firm was constituted, as reported in the data set.

<sup>24</sup>Our interest lies in the distinction between PCs and CFs and so a change in status from sole proprietorship to company, or vice versa, is not regarded as a transformation.

<sup>25</sup>The lifespan of each firm was computed as the difference between the last year that the firm was observed in the data set and the year the firm was constituted as reported in the data. The data are right censored.

Almost three-quarters of PCs were still in existence ten years after entry and one half survived for 20 years or more. One important finding then, is that PCs are capable of surviving in the market for considerable periods of time and a substantial proportion do so. The second clear message to emerge from the data is that PCs typically survived longer than CFs, and by some margin. It can be seen that, at every specified interval following entry, the proportion of PCs that were still in operation exceeded the proportion of surviving CFs (CF1 or CF2). Thus, for example, less than 40% of CFs remained in existence ten years after the date of entry and only 14% survived beyond 20 years.

An alternative approach to the issue of firm survival is to consider the lifespan of the production unit. That is, to measure the lifespan of the enterprise as the period from its formation to its dissolution, rather than to its dissolution or transformation. At least from the standpoint of the founders of a firm, this might be the more interesting measure. In Table 12, therefore, we distinguish firms on the basis of their legal status at the time of formation and measure the time to dissolution, disregarding any changes in status along the way.

Table 12: Production unit survival rates

PC and CF survival rates (%)								
Years after entry								
	1	2	3	4	5	10	15	20
PC	97.3	95.5	93.4	91.9	90.2	79.7	70.6	54.7
CF1	92.3	85.2	78.1	71.4	63.6	37.2	23.6	14.3
CF2	91.8	84.0	76.9	70.4	63.4	38.3	23.8	13.6

In the case of CFs the survival rates are almost identical to those in Table 11. For PCs, on the other hand, there is a noticeable increase, albeit a small one. For instance, the proportion of PCs surviving to the age of 10 rises from 74.2% to 79.7% and the proportion that survived for 20 years or more increases from 50.6% to 54.7%.

## 5 Conclusions

In this paper we have drawn on a comprehensive data set from Portugal to provide a detailed comparison of cooperative and capitalist modes of production, and to test hypotheses on the implications of risk and market power for the pattern of cooperative activity.

The industry distributions of the two types of firms were shown to be markedly different. Within manufacturing, for instance, cooperatives were highly concentrated into food, beverages and tobacco and printing and publishing, whilst capitalist firms were more evenly distributed throughout the sector. We found strong support for the hypotheses that market

power is conducive to the formation of cooperatives, and that cooperatives are relatively unsuited to markets characterised by a high degree of risk. These industry-level findings complement the cross-country analysis undertaken by Jones and Kalmi (2009), which showed that the incidence of cooperatives is strongly related to the level of interpersonal trust in a society.

An examination of firms' internal characteristics revealed that cooperatives were, on average, larger than capitalist firms and had more highly educated and productive workforces. The data set permitted the tracking of individual firms over time and the detection of any changes in ownership structure. Conversions of capitalist firms into cooperatives were shown to be more common than transformations in the opposite direction, and accounted for approximately 14% of cooperative formations. Finally, the data revealed that the lifespans of PCs generally exceeded those of CFs, and by some margin. For instance, whilst almost three-quarters of PCs were still in existence ten years from the date of entry, less than 40% of CFs survived to this point.

On the fundamental issue of why cooperative enterprises are in a minority in market economies, our analysis suggest that the exposure of members to risk may be part of the answer. We can also point to some possible misconceptions. First of all, it is not the case that cooperatives are restricted to a small and peripheral set of economic activities. Whilst there were instances of clustering - particularly within manufacturing - the data also reveal that PCs were distributed fairly widely throughout the economy. Within services, for example, there were PCs operating in all of the subsectors.

Second, the scarcity of PCs cannot be attributed to an inability to operate on a large scale. The vast majority of all enterprises are small, with 81% employing fewer than 10 workers. Moreover, not only are PCs larger, on average, than CFs but some 12% employ 50 or more workers. Finally, it is clear from our analysis that the explanation for the comparative rarity of PCs does not lie with an inability to survive in the market. Rather, our findings suggest that cooperatives are in a minority because they are created much less frequently than CFs.

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