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What Do Cooperative Firms Maximize, if at All?
Evidence from Emilia-Romagna in the pre-Covid Decade°

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Abstract

The Italian region Emilia-Romagna ranks first among the world's most important cooperative districts. Using a unique dataset covering all firms registered in the region, we investigate the performance of active firms in the period 2010-18. By focusing on added value, employment and profits of cooperative firms as compared to conventional firms, we disentangle the differences between the average performance of the two types of companies and detect the presence of a "size effect" driving much of the difference between them. Moreover, our results strengthen previous empirical evidence about the behavior of cooperative firms: they seem to optimize a mixture of employment and profits, assigning a greater weight to the former during downturns and stagnation. Hence, as a type of firm, they look more resilient than conventional companies, at least as far as employment is concerned. Finally, we examine the regional logistics industry and compare also the productivity per employee in the two segments of the sector.

JEL Codes: L21, L25

Keywords: cooperative firms, employment, resilience, Gini decomposition

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1. **Introduction**

An apparent lasting issue in comparative economics deals with the differences between cooperative firms (sometimes labelled labour-managed firms, LMF)[1] and conventional, i.e., non-cooperative firms (*NCF*s, hereafter). To tackle this issue, theory is of little help. The overcited approach pioneered by Ward (1958) and retained by his epigones, is patently inadequate. His formulation, according to which a *workers' firm*[2] would maximize added value, net of non-labour costs, per member, raises two severe objections. On the theoretical grounds, in a competitive economy - as well as under monopoly, as shown in Gal-or *et al.* (1980) - such formulation entails the annoying negative relationship between output price shock and output response[3]. Moreover, such approach finds a poor empirical support.

However, one may arguably disregard such extreme and unlikely market structures. In reality, cooperative firms operate in oligopolistic markets[4]; more precisely, in *mixed oligopolies*, i.e., concentrated industries hosting companies pursuing different goals (see De Fraja and Delbono, 1990). Unfortunately, again, theoretical models do not provide significant insights about the "correct" maximand of cooperative firms, nor for the properties of the equilibria resulting from market interaction between LMFs à la Ward and profit-maximizing companies (see, for instance, Perotin 2006 and the literature cited in Delbono and Reggiani 2013).

As for the objective function, an interesting exception is the route explored by Kahana and Nitzan (1989)[5]. Under price-taking behaviour, a workers' firm (in which labour force coincides with

[1] We do prefer "cooperative firms" because such a category encompasses various types of companies, including cooperatives that are not owned and/or run by workers.

[2] A *workers' firm* is one in which all workers are members and all members are workers: Sertel (1982). It will be time saving to refer to the *membership ratio*, defined as the ratio between (working) members and total employment. Needless to say, the membership ratio makes sense when referred to production CFs, i.e., firms where members confer their work to the company that they co-own; it would not make sense to compute it for, say, users' CFs where members are customers as it happens in retail trade, utilities, credit, insurance, housing.

[3] This is the well-known perverse effect, and it is not the only one. For instance, as shown in Delbono and Lambertini (2014), in an oligopolistic supergame among Ward-like firms, in equilibrium tacit collusion is *increasing* in the number of participants, as opposed to the standard conclusion with profit-maximizing players.

[4] A notable exception is provided by some markets for childcare services, disadvantaged people, elderly: here buyers are often local public institutions auctioning the provision of such services to groups of *social cooperatives* (much active in Italy since the early '90s of the last century). Such markets often fit the form of oligopsony.

[5] For clarity, the route explored by Kahana and Nitzan (1989) goes back to Law (1977) who considers an augmented utility function of LMFs' members to include the membership size in addition to income. Law's paper, in turn, was inspired by Fellner (1947).

membership), selects inputs and output to maximize (i) income per worker/member subject to an employment constraint or, alternatively, (ii) employment subject to a profit per worker/member constraint (bounded below by the union wage). Standard duality arguments show the equivalence between (i) and (ii), both formulations trying to capture the concern for employment that should shape the behaviour of firms owned and controlled by workers-members. Of course, for a given number of workers, an LMF becomes indistinguishable from a profit-maximizer. We shall come back to the empirical relevance of this approach in the conclusions[6].

Hence, being the theory inconclusive and/or unfit to stylize actual markets, one is forced to resort to empirical investigation. This paper provides a simple descriptive statistical analysis to contribute to such still tiny stream of research and to have an insight about the underlying behavioural premises driving the choices of cooperative firms. We try to infer their implicit objective function from observed behaviour as measured by their performance.

Our benchmark is provided by the Italian region Emilia-Romagna (ER, hereafter) in the period after the great recession of 2009 and 2018. The regional setting allows one to detect the aggregate effect of the overall cooperative *magnitude*. With this, we mean the set of: (i) cooperative firms (labelled *CF*s); (ii) stock companies and business groups controlled (through the possession of at least 50% plus one voting right) by CFs; (iii) cooperative associations. While the weights of (iii) is negligible in terms employees - our rough estimate amounts to less than 500 white collars altogether - the size of (ii) is highly significant, especially in some industries, and cannot be ignored. Hence, by now, CCFs (*Cooperative Controlled Firms*) will mnemonics for both (i) and (ii), provided that we will specify if we refer to (i) only when needed[7].

Our main findings can be summarized as follows:

- Controlling for sectors, CCFs and NCFs are very different in average size, particularly when looking at the subset of large firms.
- Controlling for both sectors and size class, employment and added value are much less cyclical (when not countercyclical) in CCFs than in NCFs.

[6] Here it suffices to note that the comparative statics by Kahana and Nitzan (1989, p. 537) may avoid perverse effects, depending on whether labour is a normal input. If this is the case, the supply function of an LMF is positively sloped.

[7] See Borzaga *et al.* (2019, p. 70) for interesting comments also about Italian cooperative groups; incidentally, a cooperative consortium, often observed in constructions, falls into category (ii) above.

- CCFs "profits"[8], especially in recessions and stagnating periods, are pressed and employment levels are stabilized or increased.
- CFs seem to *optimize*[9] their employment levels under a non-negative profit constraint (or profits under an employment constraint).
- The industry case study of logistics strengthens the above conclusions hinting at a remarkable difference in labour productivity between CCFs and NCFs.

Our statistical findings regarding the modest (or anti-) cyclical behavior of CCFs and the resulting stabilizing effect on employment, may represent a significant contribution to the discourse about the *resilience* of the economic and territorial systems. This is particularly relevant in the present crisis fueled by the Covid-19 pandemic and its impact on social and economic environment.

This paper is organized as follows. In Section 2 we discuss the related literature. In Section 3 we sketch the Emilia-Romagna economy in the period 2010-18, describe the dataset and illustrate our sample. Section 4 focuses on a comparative analysis of CCFs wrt NCFs in terms of employment, added value and profits. In Section 5 we divide our sample in two groups depending on the added value being above or below the median and proceed to compare the relative performance of CCFs vs NCFs, controlling also for size classes and industry. Section 6 examines an industry case study by briefly replicating the aforementioned analysis for the regional logistics sector. Here we also deal with the apparently huge handicap of CCFs wrt NCFs in terms of labour productivity. Section 7 concludes.

2. Related literature

The empirical literature mostly related to this paper includes a fairly small group of contributions. Among the most influential ones are the seminal papers by Craig and Pencavel (1992, 1993, 1995) who investigate the plywood industry in the US Pacific Northwest between the late '60s and mid '80s of the last century. In the first paper, they conclude that, wrt conventional firms, a cooperative "is more likely to adjust earnings and less likely to adjust employment" (Craig and Pencavel 1992, p. 1103) as a reaction to changes in their economic environments. To our purposes, the 1993 paper is

[8] Profits are retrieved from balance sheets as *net profits (i.e., gross profits net of taxes)*. We postpone to Section 4 a discussion about the interpretation of "profits" in CFs.

[9] We do prefer this word to *maximize*, as the latter refers to a standard conceptual frame which unfits the variety of organizations belonging to our set of CCFs.

even more pertinent because they estimate the parameters of a general objective function for cooperatives which nests dividend maximization and employment maximization as special cases. Using micro data collected in the abovementioned area and describing 32 firms, they conclude that "employment seems figure more prominently than earnings in the cooperatives' objectives" (Craig and Pencavel 1993, p. 307). They reach this finding within a model where the product market is a mixed oligopoly in which price-taking cooperatives choose wages, hours, employment and the level of a non-labour input.

It is worth stressing that they consider: (i) *workers'* cooperatives where (ii) all members and almost all workers are (or are supposed to become) members, i.e., in fact they assume that the membership ratio is unitary; (iii) a homogeneous industry.

The same methodology of Craig and Pencavel (1993) is followed by Burdin and Dean (2012) to estimate the relevant parameters on the basis of a micro panel of Uruguayan firms between 1996 and 2005, including the entire population of work-managed firms (*WMF*s in their labelling) that correspond to Craig and Pencavel's workers' cooperatives. Burdin and Dean (2012) conclude that WMFs are concerned with both employment and income per worker.

Burdin and Dean (2009), using the same database as in their 2012 paper, compare employment and wage decisions within workers' cooperatives (WCs)[10]. They show, *inter alia*, that the employment adjustment is larger in capitalistic firms than in WCs (not necessarily in *OPC*s). They do not detect a countercyclical pattern by WCs, which displays however a neat positive relationship between wages and employment, as opposed to a negative one emerging in capitalistic enterprises.

The institutional settings considered in these empirical researches vary of course across countries and periods as for labour market rules, collective contracts, civil and fiscal legislations, and the like. However, overall, the evidence suggests that while NCFs tend to adjust employment relatively to fluctuations in demand, *production cooperatives* adjust pay to protect workplaces, at least towards their members (see Perotin 2012). This conclusion has been validated, for instance, by: Delbono and Reggiani (2013) for a large group of Italian production cooperatives immediately after the 2008 financial crisis; Euricse (2013, pp. 87-102) for a large sample of medium-large Italian CCFs between

[10] Notice that at the time the Uruguay's legislation classifies a cooperative as WC when the number of (nonmember) permanent employees does not exceed 20% of total employment (i.e., when the membership ratio is at least 80%). However, the identification requires splitting cooperatives into two groups, because in fact many of them exceeded such a threshold. As a result, Burdin and Dean (2009) distinguish between WCs with a membership ratio not lower that 90% and *OPC*s, Other Production Cooperatives, with an average membership ratio of 20%.

2006 and 2010; Navarra (2016) for a small sample of Italian production cooperatives between 2000 and 2005; Istat (2019, pp. 22-6) comparing employment in Italian cooperatives wrt to other firms in 2007 and 2015.

With respect to the existing literature, in this paper we show an employment stabilizing effect of cooperatives' behaviour not only within an industry - as in Craig and Pencavel's papers - but also at the macroeconomic level, given the size of ER regional economy. In this respect, our closest paper is Burdin and Dean (2009), but we obtain similar conclusions from a sample including all cooperatives in the region, not only to the workers' ones (their WCs). It is also worth underscoring that there are sizeable differences about the composition of their sample and ours's. The weight of WCs (but also of WCs plus the OPCs which are not included in their estimates) out of the total firms' population is of an order of magnitude lower in their sample than in ours. From their Table 1 (p. 527), indeed, one learns that in the entire time span 1996-2005, the employees in cooperatives account for less than 7% of the sample and this percentage shrinks to about 2.5% when restricted to WCs. As we shall see, in our regional sample, where the membership ratio of production CCFs is around 60%, they account for almost 30% of overall regional employment.

Moreover, our findings hint at a CCF's objective function along the lines (more deeply explored than in our paper) of Craig and Pencavel (1993). More precisely, we may cautiously infer from our analysis that the (implicit) CCFs' maximand is a weighted average of profits and employment, the weight assigned to the latter being risen during slums, even at the cost of incurring temporary losses. This looks consistent with Craig and Pencavel (1993, p. 307) result that "at least in the special case in which the objectives are described by the organizations' rents, the cooperative place more weight on employment and less on earnings net of disutility of work".

3. The dataset and sample

As measured by the impact of CCFs on employment and GDP, Italy ranks top in Western countries and ER comes first among the Italian regions[11]. Hence, ER represents a fairly sound environment to examine the relative performance of CCFs versus NCFs, as well as the differences within CCFs.

[11] See, for instance, Navarra (2016), Ammirato (2017), International Co-operative Alliance (2017), Zamagni (2019), Euricse (2020) and OECD (2021). According to Berranger *et al.* (2020, ch. 4), in 2017, while accounting for less than 7% of the 53,675 Italian CFs, ER hosts 21% of national cooperative employees and 46% of the larger (i.e., with a revenue ≥ 50 million euros) ones. The cooperative movement in Italy evolved around three main associations (Legacoop, Confcooperative and Agci), now coordinating their actions under the umbrella labelled ACI which includes the vast majority of sizeable cooperative organizations in terms of

It is worth emphasizing that modern cooperatives differ significantly from Sertel's ideal type of workers' cooperative often assumed in the theoretical literature or approximately met in industry studies as in Craig and Pencavel's papers. Indeed, the membership ratio is normally far lower than one, especially in the biggest CCFs. Unfortunately, the value of such ratio is absent in the balance sheets and it is only occasionally made public through reports of CFs associations at the aggregate (industrial and/or territorial) level. However, to envisage a reasonable approximation, we may notice that in a large sample of Italian *production* CCFs of Legacoop, the membership ratio was roughly 0.7 around approximately ten years ago (Delbono and Reggiani, 2013). Some recent figures from Legacoop[12] inform us that in 2019, 70% is still the average value of the membership ratio at the national level for production CFs, while the same percentage shrinks to 60% in ER. This is not unexpected because the membership ratio is usually inversely related to CFs' size and we already observed that most of the largest CFs are registered in ER (fn. 11). We shall come back on some consequences of the membership ratio being less than one when interpreting our empirical results at the end of Section 5.

Our dataset is retrieved from the platform *Madh* (Market Access Data Hub) made by the ER Union of Chambers of Commerce (*Unioncamere* ER) which includes, among the many information sets, the balance sheets of all companies registered in ER[13]. Specifically, we focus on the 2010-2018 *time* set because this period allows the most accurate dataset and come after the deep downturn following the 2008 financial crisis. The following table summarizes the regional GDP and the employee trends compared to the national ones.

revenue and employment. In 2017, 60% of cooperative firms registered in ER adhere to an association, accounting for almost 90% of overall cooperative employment (Region Emilia-Romagna, 2019). It is worth noting that ER ranks first as for the proportion of CCFs with at least half a million euros revenue: in 2015, for instance, 40.4% against an average of 23.1% across Italian regions (Istat 2019, p. 19, Table 1.9).

[12] We are grateful to Francesco Linguiti of the Research Area of Legacoop for these data. Notice that the value of such ratio is not bound above by one, as one may expect. For example, in the smallest production cooperatives of Legacoop, the average membership ratio at the national level is 1.2; it is then decreasing with the firms' size, shrinking to 0.62 for the largest CFs.

[13] By means of the fiscal code, for each company registered in ER, the dataset collects information coming from the Register of firms as recorded in the Chambers of Commerce, Inps, Minister of Economic Development (MISE), Aida-Bureau van Dijk (containing also balance sheets of companies and business groups), Istat and other sources. See Grazzi *et al.* (2017) for an insightful comparison among different firms' databases.

Table 1. GDP (at market prices, million euros, linked values, basis 2015) and employees, ER and Italy (source, Istat)

	GDP		Employment	
Year	ER	Italy	ER	Italy
2010	148.361	1.712.757	1.906.496	22.526.851
2011	152.278	1.724.872	1.934.279	22.598.244
2012	147.925	1.673.455	1.927.925	22.565.972
2013	146.834	1.642.646	1.904.093	22.190.535
2014	148.316	1.642.571	1.911.463	22.278.918
2015	149.111	1.655.355	1.918.318	22.464.753
2016	151.636	1.676.766	1.967.141	22.757.840
2017	155.156	1.704.733	1.973.043	23.022.958
2018	157.477	1.720.827	2.004.879	23.214.951

When inspecting this database, one must give attention to the geographical interpretation of figures about employment. Both CCFs and NCFs registered in ER – especially the largest ones – employ labour force also outside the regional boundaries (from here on, *employees*); on the other hand, in the regional area we observe employees of CCFs and NCFs registered in other regions (*local production unit employees*). In this paper we will focus on the *employees*. This means that we shall emphasize the economic consequences of decisions taken in the corporate headquarters located in ER, being obviously aware that they happen also elsewhere. First of all, we partition the total number of firms registered in ER into the two groups (Table 2A).

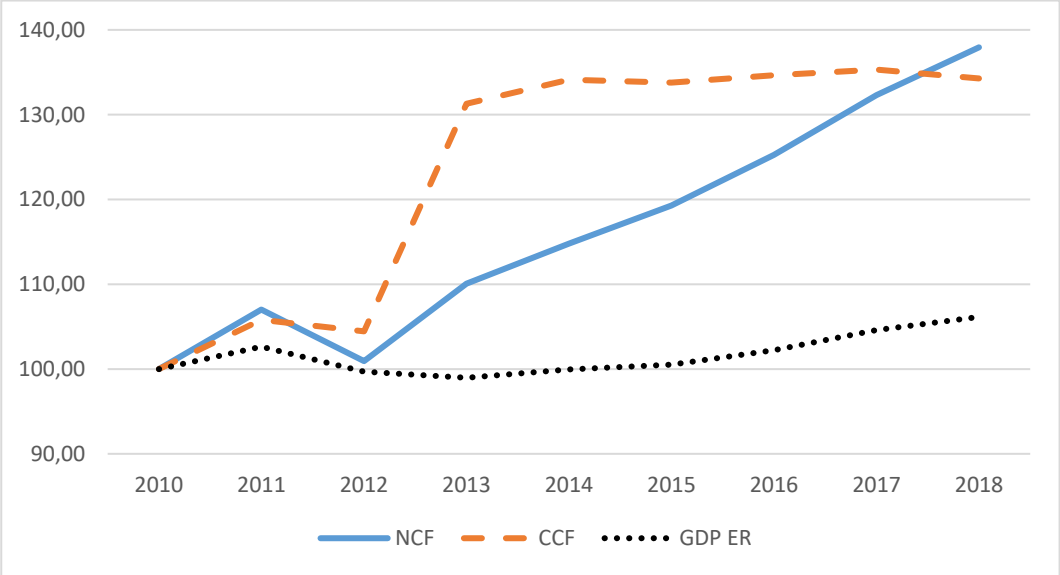
While we start considering the entire set of firms registered in ER, our intention is to focus on a sample composed only by those actually *active* firms. Therefore, we exclude all CCFs and NCFs that did not submit their balance sheets and/or that do not have employees at all. Table 3 summarizes the composition of the resulting sample: having our dataset been cleared from inactive firms, its size considerably shrinks.

Table 3. Number of CCFs and NCFs *active* in ER

	NCF	% NCF	CCF	% CCF
2010	36.037	91,69	3.264	8,31
2011	37.280	91,63	3.404	8,37
2012	37.213	91,55	3.433	8,45
2013	36.436	91,40	3.429	8,60
2014	36.237	91,50	3.366	8,50
2015	37.588	91,76	3.376	8,24
2016	38.578	91,99	3.361	8,01
2017	39.476	92,29	3.298	7,71
2018	39.885	92,56	3.208	7,44

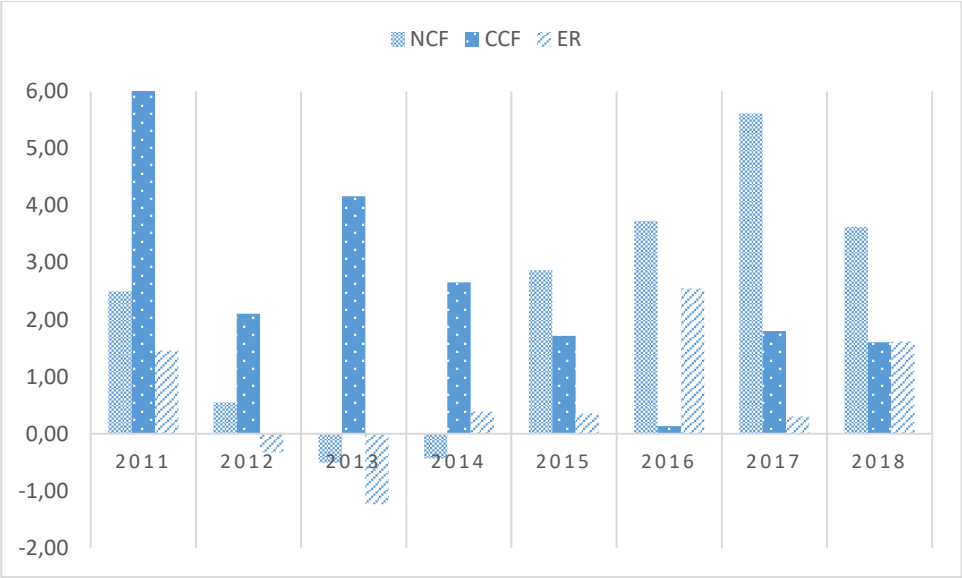
Moreover, due to entries and exits, the identity of active firms varies over time: restricting the attention solely to persistently active firms over the entire time span would reduce the sample even more. Hence, when needed to carry out comparisons, we shall summarize employment with its yearly rate of growth (as in Figure 2 and Table 14A).

Figure 1. Added Value and GDP (2010 = 100)



To provide an insight on the economic relevance of both types of firms in the regional system, we summarize their added value in Table 4A[14] and plot them in Figure 1. In order to assess the effects of the cooperative *magnitude* on the regional employment levels and trends, we now examine the distribution of the labor force occupied in the two subsets of total employment (Table 5A, visualized in Figure 2). While in the considered period the number of employees increases by about 52,000 and 111,000 units in the CCFs and NCFs, respectively, the relative weight of CCFs vrt NCFs *raises* within the regional occupied labor force.

Figure 2. Employees, yearly growth rates



If we divide the time frame into two sub-periods (2010-14, 2014-18), the different patterns of CCFs and NCFs reactions to "macroeconomic" trends at the regional level is even clearer. It is noteworthy to observe a neat countercyclical behavior in both added value (Fig. 1) and employment (Fig. 2) of the cooperative segment in the period 2010-14. When both the regional and national GDP are stagnating (Table 1), added value and employees uplift at quite a fast pace in CCFs, while this is not the case in NCFs, especially regarding the employment.

In the period 2014-18, instead, when in ER the GDP grows by more than 6% and employment by 4.9%, the CCFs' added value and employment increase less (0,10% and 5.35%, respectively), whereas in the NCFs added value increases by 20.17% and employment by 16.78%.

[14] When citing a Table, a number followed by A (e.g., Table 4A) indicates that such a Table can be found in the Appendix.

Table 6. Employees per type of firms, descriptive statistics[15]

	2010			2018		
	CCF	NCF	Total	CCF	NCF	Total
Obs	3264	36037	39301	3208	39885	43093
Average	64.27	16.12	20.12	81,47	17.36	22.13
Median	9.00	5.00	5.00	9.00	6.00	6.00
Std. Dev.	417.27	77.29	141.83	628,42	88.90	192,34
Skewness	18.72	34.44	45.35	21.29	37.91	59,47
Kurtosis	411.54	1857.41	2760.29	530.43	2307.02	4665.11
Gini	0.85	0.72	0.76	0.87	0.73	0.78

Other substantial differences emerge among CCFs and NCFs (Tables 5A and 6). Considering, for instance, the last year of our interval, while representing less than 8% of the sample, CCFs account for over 28% of total employment. This confirms that the presence of CCFs is biased towards labor-intensive industries. Indeed, in 2015, for instance, while accounting for almost 30% of regional employment (Table 5A), CCFs' added value is only 10.4% of the added value of NCFs in ER (Istat 2019, p. 21, Table 1.11)[16] and feature a value of almost 87% in the average ratio between labor cost and added value (against less than 53% in NCFs, Istat 2019, p. 42, Table 2.10). Using the industry average ratio (employees/social capital), Cori *et al*. (2021, p. 157) show that in the sectorial distribution of Italian cooperatives, the most labor-intensive sectors in 2017 are healthcare and social assistance, education, transport and logistics. The massive presence of CCFs in labor-intensive sectors nation-wide actually emerges also from their shares in the sectorial breakdown of total added value of Italian firms, excluding banking and insurance industries. While the average is 4%, CCFs accounts

[15] The entire time series of this statistics and the next ones are available upon request. *Obs* indicates the number of observations.

[16] According to Istat datasets, in 2015, for instance, the average added value per worker was 45,605 euros in the overall Italian companies, whereas in the cooperative subset of them (including cooperative groups), it was 24,851 euros (Borzaga *et. al.* 2019, p. 72, Table 6). Between 2012 and 2017, while at the national level NCFs are superior to CCFs in terms of Multi-Factor Productivity, this is not true in some regions; ER is one of the three Italian regions in which the inequality is reversed (OECD 2021, Fig. 3.5, p. 51). Moreover, both NCFs and CCFs display a positive correlation between size and productivity (Fig. 3.8, p. 54). Hence, the mean differences featuring employment in CCFs wrt NCFs seem depending more by between-industry heterogeneity in the sectorial distribution of CCFs than by within-industry heterogeneity in production technologies. We thank an anonymous referee for this remark. All these figures about cooperative employees and added value exclude financial and insurance activities; for instance, they ignore the cooperative credit banks.

for 21.6% in healthcare and social assistance, 18.7% in education, 10.2% in transport and logistics (Istat 2019, p. 13, Table 1.3).

Besides being greater than NCFs in terms of average number of employees, CCFs also differ regarding the overall distribution of labor force around their average size (Table 6). This is self-evident from the values of the Coefficient of Variation (CV), the difference between average and median and the value of the Gini index (G). These features underline the presence of a heavy right tail and a strong positive skewness in the distribution of employment across CCFs.

4. CCFs vs NCFs: added value, employment and profits

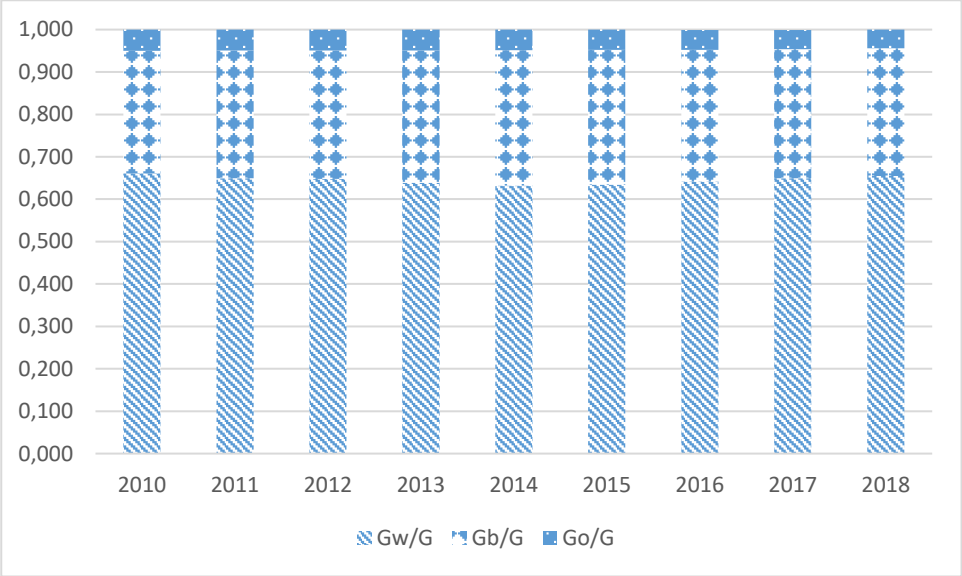
To elaborate on the differences between the two distributions of employees in both types of firms, we decompose the Gini index by following the approach pioneered by Dagum (1997). Accordingly, the differences among all pairs of values embedded in the Gini formula are subdivided into three components: inequality *within* the group (G_w); inequality *between* the groups (G_b) and the *overlapping* factor (G_o).

The overlapping factor represents an important, and often neglected aspect in the analyses of the key factors driving inequalities in statistical distributions. To clarify its relevance - if not too pedagogically - suppose that all CCFs are “large” (wrt some dimension), whereas all NCFs are “small”. Here the size is fully explained by the nature of the company. In the opposite scenario, suppose the distributions of the two groups of firms fully coincide; in this case, the size is not explained at all by the company being CCF or NCF. In reality, however, the distributions of two groups usually overlap; hence, to continue our illustration, we will observe also small CCFs and large NCFs. Here is where G_o kicks off, by measuring a portion of total variability which is not captured by G_w nor by G_b. To add a potential policy implication of Dagum’s approach, consider a setting in which all rich people are college graduate, and all poor people are not. To reduce poverty, one may then tax the graduate ones. In presence of an overlap between the two distributions, however, such a policy would result in making poor graduates even poorer and the population of rich nongraduated people even richer; the ultimate goal of reducing poverty would be weakened as the size of the overlap grows.

The overall number of firms[17] is then divided in two groups - CCFs and NCFs – and all differences are analyzed according to the above decomposition of the Gini index. G_w measures the variability observed in each group and it is by far the most relevant component, since it accounts for almost two thirds of the total variability (G_w/G = 65.9% in 2010 and 64.8% in 2018). The differences between employees in CCFs and NCFs are captured by G_b, which accounts for roughly 30% of the value of G. The last component G_o is responsible for approximately 5% of total variability. Table 7A quantifies and Figure 3 visualizes the factorization of G.

To summarize, concerning the distributions of employees around their average, the differences inside each group count more that double the external ones (i.e., wrt the other group).

Figure 3. Employment, Gini decomposition, relative weights



We now focus on profits (Table 8). This is instrumental to the attempt of inferring the implicit objective function motivating the CCFs' behavior. However, before proceeding, it is worth stressing that the very meaning of profits may be misleading when referred to CFs. It would be preferable to use another term to capture the counterpart of NCFs' profits, as, for instance, *social dividend*, i.e., a

[17] To the best of our knowledge, this is the first application of Dagum's (1997) method with reference to distributions of *firms*' characteristics and performances. Indeed, usually such method has been applied to individuals or households; e.g., Giorgi (2011) and Costa (2016). The component we measure with G_o is the one that Dagum (1997) labels as the "intensity of transvariation between subpopulations".

residual to be computed differently from the procedure delivering profits in NCFs[18]. Moreover, our overall sample includes a large variety of CFs: workers', producers', users', social, credit's and so on (see Zamagni and Zamagni 2011 and Istat 2019). Hence these different roles of members within their CFs may entail differences in CCFs' ultimate goals. Indeed, it is worth remembering that in this paper by CCFs we mean also joint stock companies controlled by cooperative holdings as well as cooperative groups and these business companies (or groups) may well maximize profits to be distributed as dividends to the controlling cooperative firms. This withstanding, we conform to the prevailing terminology, while recommending caution when comparing "profits" between CCFs and NCFs as well as within heterogeneous CCFs.

Table 8. Profits (million euros, prices 2015)[19]

	NCF	CCF
2010	614	283
2011	802	- 244
2012	495	11
2013	2.221	- 664
2014	3.846	- 343
2015	5.256	449
2016	5.942	411
2017	7.398	284
2018	8.700	433

Let us first concentrate on the CCFs performance. It is worth observing that the dramatic shock in aggregate demand hitting the constructions industry, between the first and the second decade of this century, explains mostly of the negative sign (and the remarkable size) of CCFs' aggregate profits in three years. Among the top companies operating in the construction industry at the *national level*, some of them were indeed CCFs all registered in ER. Hence, their eventual bankruptcy being preceded by substantial losses, these drive down the overall figure at the regional level.

[18] At least in *production* CFs, the so-called profits are calculated net of rebates (included among costs) distributed to members and are mostly plough-back into equity (= capital + indivisible reserves + operating profits). We shall come back to comment on this strategy in Section 5.

[19] Because of the coverage of the available data, we do not consider part of the insurance and the banking industries from both groups. This happens only for profits.

It is useful to analyze jointly the patterns of added value (from Table 4A), employment (from Table 5A) and profits (from Table 8) in the two categories of firms, as compared to the regional GDP (from Table 1) and employment (from Istat).

Table 9. GDP, Added Value, Employment and Profits (2010 = 100)

	ER		NCF			CCF		
	GDP	EM	AV	EM	PR	AV	EM	PR
2010	100,00	100	100,00	100,00	100,00	100,00	100,00	100,00
2011	102,64	101,46	107,03	102,50	130,71	105,81	108,32	-86,14
2012	99,71	101,12	100,93	103,06	80,58	104,45	110,59	3,74
2013	98,97	99,87	110,08	102,54	361,91	131,30	115,19	-234,18
2014	99,97	100,26	114,79	102,09	626,60	134,12	118,25	-120,89
2015	100,51	100,62	119,29	105,02	856,49	133,80	120,28	158,30
2016	102,21	103,18	125,25	108,94	968,17	134,65	120,44	145,02
2017	104,58	103,49	132,29	115,05	1205,42	135,31	122,61	100,18
2018	106,14	105,16	137,94	119,22	1417,52	134,26	124,58	152,77

Table 9 shows other striking differences between CCFs and NCFs. For instance, let us consider the interval 2010-14, a period of stagnation in which the Italian GDP falls by over 4% (Table 1) and the regional one is experiencing a zero growth. As for the NCF, while their added value increases by about 15% and their profits *grows* over six-fold, their employment level only slightly in*creases* (+2,09%). In contrast, the CCFs' added value goes up by 34%, profits *decrease* by 220% and, above all, employment *raises* by more than 18%. In the 2014-18 timeframe, when the regional GDP is growing at an average rate of 1.5% per year, the added value and employment levels of CCFs grow slower and they regain profits. The NCFs, instead, uplift their added value and employment and keep their high profitability.

In the entire time span, while the regional GDP is at a standstill averaging a rate of about 0.65% per year, the performances of CCFs and NCFs are very different, especially as for the way in which employment and profits accompany the course of their added value. The latter increases by almost 38% for the NCFs and by slightly less (34%) for the CCFs. However, such a similar expansion in added value yields drastically diverging consequences: profits grow fourteenfold in CNFs and only 53% in CCFs, whereas the number of employees increase by 19% in NCFs and almost by 25% in CCFs. Here is one of the major findings of our statistical investigation. We have indeed registered a remarkable difference in the reaction to demand shocks hitting both the local and national economy.

Table 10. Added Value and Labor Cost per Employee, weighted average

	total				social			
	NCF		CCF		NCF		CCF	
	AV	LC	AV	LC	AV	LC	AV	LC
2010	70.685	44.423	41.593	31.221	40.025	29.227	25.866	23.914
2011	66.052	41.904	38.561	29.273	36.654	27.621	26.325	24.156
2012	61.597	40.669	37.005	29.217	39.321	27.595	25.746	23.705
2013	64.575	41.971	37.000	29.384	36.716	27.358	26.223	25.003
2014	68.053	42.573	36.394	29.619	38.091	26.264	24.819	24.022
2015	68.557	42.185	35.917	30.440	35.469	25.315	25.069	23.964
2016	69.787	42.344	36.748	28.622	33.886	25.772	24.279	23.830
2017	68.188	42.099	36.522	28.701	35.105	25.284	24.428	22.901
2018	70.169	42.822	36.399	28.844	32.408	25.278	23.489	23.308

While (basically profit-maximizing) NCFs tend to be procyclical, CCFs tend to stabilize their employment and, given their critical mass, they contribute to flatter also the overall regional employment level, even by giving up profits.

This evidence seems confirming that NCFs "would produce a socially inefficient level of lay-offs due to their inability to establish credible commitments between owners and workers". On the other hand, CCFs "would have more egalitarian adjustment mechanisms at their disposal" (Burdin and Dean 2009, p. 526). We will come back on this at the end of the next Section.

To obtain a quantitative summary of the relationships added value (AV), profits (PR) and employment (EM) within the two group of firms, we calculate the pairwise (Pearson's) correlation coefficients for all relevant pairs. The next three tables collect the value of the correlation coefficient for the entire sample (Table 11), the CCFs and the NCFs (Table 12). Considering the averages reported in the bottom line of Table 11, we notice a fairly low correlation between profits and employees as well as between profits and added value. We see in Table 12 that this occurs because of the extremely tiny correlation featuring the same pairs of variables in the CCFs. For these firms, these correlations are quite impressively low, and even negative in some years.

Table 11. Correlation between EM, AV and PR: *all firms*

	EM-AV	EM-PR	AV-PR
2010	0,71	0,14	0,42
2011	0,72	0,08	0,29
2012	0,69	0,16	0,52
2013	0,67	0,16	0,38
2014	0,68	0,25	0,51
2015	0,66	0,24	0,58
2016	0,67	0,23	0,55
2017	0,65	0,16	0,47
2018	0,67	0,16	0,67
Average	0,68	0,18	0,49

Table 12. Correlation between EM, AV and PR: *CCFs* and *NCFs*

	CCFs			*NCFs*		
	EM-AV	EM-PR	AV-PR	EM-AV	EM-PR	AV-PR
2010	0,87	0,22	0,42	0,74	0,21	0,45
2011	0,88	0,05	0,10	0,81	0,15	0,34
2012	0,87	0,12	0,16	0,71	0,27	0,63
2013	0,67	-0,01	-0,14	0,83	0,42	0,62
2014	0,65	0,08	0,05	0,87	0,52	0,73
2015	0,66	0,16	0,52	0,87	0,49	0,64
2016	0,70	0,14	0,19	0,85	0,49	0,68
2017	0,68	0,00	0,08	0,82	0,48	0,72
2018	0,69	-0,14	0,44	0,86	0,53	0,76
Average	0,74	0,07	0,20	0,82	0,39	0,62

This confirms the trade-off faced by CCFs when trying to enhance both profits and employment, with a bias in favor of the latter, especially during downturns. This is not the case with NCFs. The bottom line of Table 12, indeed, shows that profits, added value and employment are significantly (and always positively) correlated.

A further confirmation of the differences between CCFs and NCFs may be obtained using the chi-squared test[20]. In our setting, the *anticipated* values are the relative weights of CFs and NCFs on the overall population of ER firms (Table 3). Next table summarizes the outcome of the test in 2018.

[20] The test statistics and the related p-values are available upon request.

Table 13: chi-squared test, 2018

	Employment		Added Value		Profits	
	NCF	CCF	NCF	CCF	NCF	CCF
Observed	72,60	27,40	84,57	15,43	95,47	4,53
Anticipated	92,56	7,44	92,56	7,44	92,56	7,44

The results confirm what the previous analysis had already suggested. The largest gap between anticipated values and the observed ones occurs for employment in CCFs. These indeed operate primarily in labor-intensive sectors and, as we know, their average size in terms of employees is much larger than in NCFs. Moreover, the sign of the gap between anticipated and observed values in CCFs' profits underlines that they are more employment oriented than profit oriented.

5. Small vs large firms

Comprehending the substantial differences between the distribution of employees in the CCF population vis-à-vis the NCF one, we now try to detect the presence of a *size effect* capable of affecting the distribution of employees in the two subpopulations. To this end, we rank firms wrt their added value level and divide each subpopulation in two groups depending on their position being above (large firms) or below (small firms) the median.

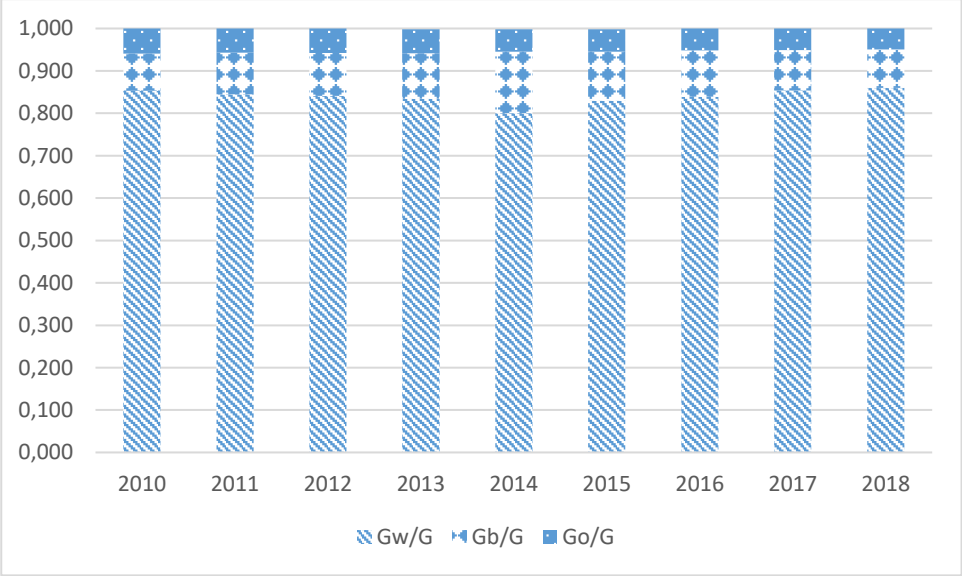
We know that CCFs account in 2018 for over 8.1% of employees, although representing 6.3% of the subsample of small firms. In the overall period, the number of CCFs employees is reduced by 6%while we observe a mild increase in NCFs ones (Table 14A). Descriptive statistics (Table 15) confirms what emerges in the general sample (Table 4A), even if the differences between types of firms are not so sharp.

Table 15. Employees, small firms, descriptive statistics

	2010			2018		
	CCF	NCF	Total	CCF	NCF	Total
Obs	1421	18230	19651	1356	20191	21547
Average	4.69	3.86	3.91	4.61	3.50	3.57
Median	3.00	2.00	2.00	3.00	2.00	2.00
Std. Dev.	6.67	44.51	42.91	5.63	5.21	5.25
Skewness	10.63	130.58	135.21	6.44	23.17	21.79
Kurtosis	205.22	17420.03	18710.58	70.39	1006.73	923.84
Gini	0.49	0.51	0.51	0.46	0.44	0.44

We now decompose the value of the Gini index: the results can be found in Table 16A and visualized in Figure 4. We now decompose the value of the Gini index: the results can be found in Table 16A and visualized in Figure 4. It is apparent that the variability within groups is by far the most important component explaining the total variability (G_w/G = 85,3% in 2010) and it is constantly relevant over time, while the weights of G_b and of the overlap are stable at 10% and 5% respectively.

Figure 4. Employment, small firms, Gini decomposition, relative weights



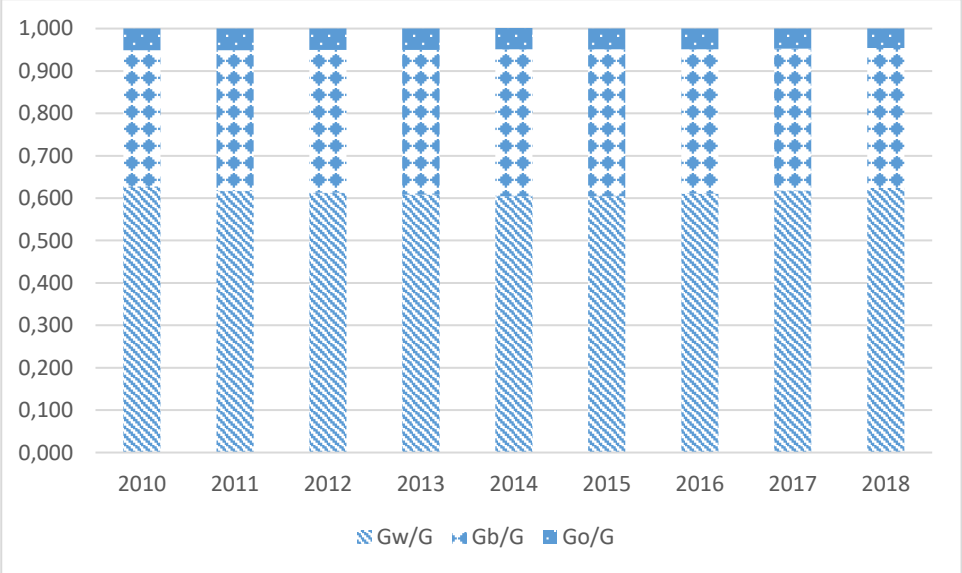
Replicating the same analysis for large firms, we know that while representing only a stable 9% of the sample, CCFs account for almost 30% of employment in 2018 and their number of employees grew in the period by about 25%, against an increase of 22% in NCFs's employees. (Table 5A). In

the region, the trend of large firms differs markedly from the one of small firms, suggesting that the main differences between the two type of firms concentrate mostly in the subset of the large ones. Table 17 shows that the average number of employees per large firm is much higher in CCFs than in NCFs (and increasing over time) and the gap too is much higher than for small firms. Overall, the two distributions exhibit more differences than their respective distributions among small companies.

Table 17. Employees, large firms, descriptive statistics

	2010			2018		
	CCF	NCF	Total	CCF	NCF	Total
Obs	1843	17807	19650	1852	19694	21546
Average	110.21	28.67	36.31	137.73	31.57	40.69
Median	22.00	12.00	12.00	24.00	12.00	13.00
Std. Dev.	550.88	98.74	194.59	822.52	124.81	270.70
Skewness	14.16	20.88	33.43	16.24	27.40	42.46
Kurtosis	235.15	669.99	1503.05	308.59	1189.84	2366.67
Gini	0.80	0.65	0.70	0.83	0.66	0.72

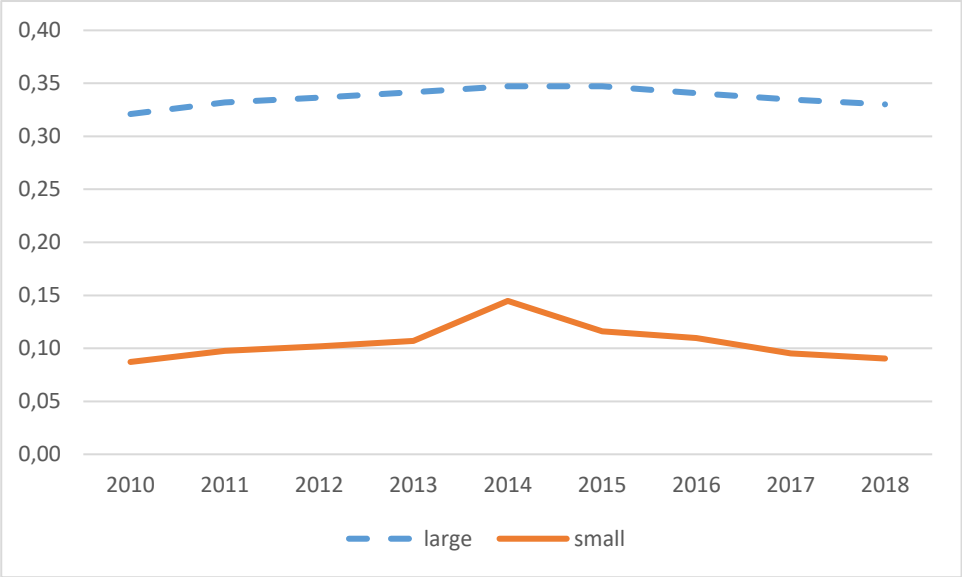
Figure 5. Employment, large firms, Gini decomposition, relative weights



Proceeding with the analysis of total variability, we observe that G_w is still the main driving component, although not as much as for small firms, and G_b accounts for over one third of the total value of G (Table 16A and Figure 5).

Figure 6 provides an additional insight about G_b which is used to compare the distributions of employees summarized in Figures 4 and 5. As we know, the greater is the value of the ratio G_b/G, the broader is the difference between CCFs and NCFs, and numbers confirm that the "size effect" matters in disentangling the different performances of either firm. Indeed, during the entire period under scrutiny, the main differences between the two types of firms concentrate especially on the subset of large companies, as the value of G_b/G oscillates steadily around 35% for large firms, while for small firms the value of such ratio is significantly lower and stable over time.

Figure 6. Employment, Gb/G, large versus small firms



We observed (fn. 12 above) that the membership ratio declines with the cooperative firms' size. Hence, the presence of non-member workers, usually ruled out from theoretical models, is far from negligible, especially in the major CFs. In ordinary times, both working members and dependent workers are paid according to national collective contracts negotiated by trade unions for each sector (with the exception of social cooperatives which have their own contract, irrespective of the operating sector). During hard times, one may envisage a weaker position of non-member workers wrt working members because of their lack of voting rights. Indeed, in the past, they were often fired during downturns, especially if occupied as adventitious workers. However, the Italian legislation permits flexibility in both working time and pay, with the ultimate goal of protecting employment (Ammirato

2017, pp. 24-27). Hence, an overall resilience of the cooperative compartment, unrestricted to members only, results from such flexibility in more recent times (Menzani 2018, Zamagni 2019). It is worth stressing here the role of the cooperative movement, as rooted in the mission of the three major Italian organizations (fn. 11), in fostering shields designed to protect jobs. They are actively involved in enforcing the so-called cooperative mutuality, which applies within as well as between cooperatives. Shifting workers across different lines of business, promoting mergers and workers buy-out; this is an incomplete list of actions undertaken to limit laid-offs.

Last but not least, most of the cooperative resilience relies upon a widespread and lasting financial strategy which is rarely observed in stock companies. We refer to CCFs' (especially production CFs) policy about profits, mostly plough-back into reserves or equity. This distinctive feature of CFs[21], driven also by fiscal benefits, entails a strategic role of indivisible reserves as a buffer to be used during slums to the end of safeguarding employment. As detailed in Delbono and Reggiani (2013, p. 393), retained profits yield a sort of partly intergenerational insurance against negative contingencies. This strategy may go hand-in-hand with a consistent wage policy which may end with benefitting nonmember employees even more than working members. Indeed, the company might have paid higher, or not lower, wages and members have decided to withdraw lower dividends. This twofold strategy would actually be enjoyed more by nonmembers (experiencing no wage reductions, but possibly a lower number of working hours, without any sacrifice in terms of dividends) and higher job stability eased from strengthening financial resources.

To the end of detecting the presence of a size effect in CCFs across sectors as well as an anticyclic behavior of CCFs across class sizes and sectors, we select a group of industries and the resulting findings are collected in Table 18. The composition of such a group is meant also to consider industries hit comparatively less than others by the 2009 shock to be used as counterfactuals to investigate different firms' reactions[22].

In addition of the logistics (*L*), an industry which will be investigate in depth in the next section, we choose three other sectors: wholesale and retail trade (*WRT*), social assistance (*SA*), accommodation and catering (*AC*). L and SA are top ranked in labor-intensive sectors (see comments to Table 9).

[21] Even if the comparison is biased towards large companies, in 2007, for instance, almost 92% of Legacoop cooperatives' profits have not been distributed, against one third of the biggest NCFs recorded in the yearly Mediobanca report: Delbono and Reggiani 2013, p. 394. On the financial strategy of production CCFs see also Navarra (2016). On the anti-cyclical role of cooperative banks, see Ammirato (2017), ch. 8.

[22] We own the suggestion about this control to an anonymous reviewer.

Remember that, in aggregate, CCFs expanded their added value and employment also in the recessionary phase 2010-14 (Table 9); we report here what happened to added value in these four sectors, distinguishing the "recessionary" period and the "recovery" one. Between 2010 and 2014 the added value experienced the following average rates of growth: L: 6.9%; WRT: - 0,1%; SA: 12.3%; AC: 14.8. Between 2014 and 2018, instead: L: 14.5%; WRT: 17.3%; SA: 19.6%; AC: 34.1.

First of all, it is worth noting the countercyclical pattern of *large CCFs* in the first period, in terms of AV as well as EM. The EM of such firms grows always, and usually more than their AV.

Looking at the logistics, the size effect features CCFs' EM in both periods. Moreover, wrt large NCFs, large CCFs stabilize employment by growing faster during the first period and growing slower (even slower that the overall sector) in the second period.

The WRT industry, which is responsible of a large fraction of overall regional GDP, provides an excellent benchmark, as its AV has been flattened during the recessionary period. Indeed, our general conjecture about the concern for *employment* featuring CCFs behavior and not the NCFs one is confirmed for both large and small companies in the first period, whereas between 2014 and 2018 CCFs grow less than NCF. As a consequence of this twofold temporal pattern, CCFs succeed in responding anticyclically and stabilizing employment.

In the SA industry, we observe a substantial size effect within CCFs' EM during the recessionary period, an expansion in the AV of large CCFs which is greater than the industry one, and a minor growth in EM wrt to NCFs during recovery (for both size classes).

Lastly, in the AC sector, during the recession all CCFs outperform the industry growth in AV, their EM increase outperforms their AV increase. Between 2014 and 2018, instead, the EM in CCFs is lower than in NCFs, but still we detect a size effect in AV as well as in EM within CCFs.

Table 18. Sectors, size classes and periods: CCFs vs NCFs

Sector	Added Value				Employment			
	small		large		small		large	
	NCF	CCF	NCF	CCF	NCF	CCF	NCF	CCF
				2010/2014				
L	36,94	5,77	4,18	8,38	3,49	-14,70	3,28	11,30
WRT	-1,12	159,22	0,02	-0,50	0,17	17,79	-1,22	3,72
SA	17,48	-13,13	0,12	16,64	35,71	-5,10	-2,18	20,95
AC	44,64	56,97	10,72	17,76	-8,47	73,20	1,58	25,06
				2014/2018				
L	9,48	-0,95	16,26	12,69	21,14	-21,52	22,85	5,31
WRT	6,91	-11,23	24,64	-6,02	10,15	-4,23	19,46	4,64
SA	-2,46	-17,41	22,21	21,71	36,84	-12,67	41,07	28,45
AC	63,25	-16,16	50,01	11,63	66,26	-17,26	55,91	16,00

3. The logistics industry

The regional logistics industry may provide a useful benchmark to develop the previous analysis. In fact, our sample is very heterogeneous as for the variety of industries considered, preventing one from extracting easy-to-interpret figures about performance. Moreover, among the companies that we label CCFs, the sample includes various types of cooperative firms; here, instead, we concentrate on a sector hosting only *production* (or labor) cooperative firms. Hence it should be easier to reappraise some of our previous findings.

However, before dwelling with figures, it is worth noting some peculiarities of this regional industry. In 2017 only about one third of CCFs belong to a cooperative association (Region Emilia-Romagna, 2019; see also footnote 11 above) and many of such CFs are qualified as *spurious*, i.e., fake. Indeed, the cooperative associations claim that the logistics sector is the one that mostly attracts CCFs created to underpay workers, circumvent rules and prone to frequent bankruptcies in order to avoid periodical controls by authorities and circumvent fiscal compliance. However, at the national level (Istat 2019, p. 12) in 2015, the logistics industry, as compared to the cooperative segment in other industries, is in a high ranked position with reference to both added value and employment.

To begin with, let us notice that CCFs operating in this industry represent in 2018 slightly more than 21.5% of our overall sample investigated in previous sections. Such a proportion has been declining over time (26.9% in 2010), whereas the number of NCFs has been growing by over 22% in the same period.

Table 22. Employees, logistics, descriptive statistics

	2010			2018		
	CCF	NCF	Total	CCF	NCF	Total
Obs	449	1132	1581	382	1390	1772
Average	49.50	19.34	27.91	66.18	19.96	29.92
Median	16.00	6.00	8.00	18.00	7.00	8.00
Std. Dev.	100.47	81.22	88.18	148.04	87.97	105.62
Skewness	5.30	18.10	12.45	5.02	19.57	12.14
Kurtosis	42.49	434.34	242.62	36.15	499.92	219.86
Gini	0.696	0.720	0.741	0.736	0.716	0.758

Of course, the sample we are going to employ has been cleared as we did with the entire regional sample. Tables 19A, 20A and 21A summarize, respectively, the number of active firms, added value and employees, for both CCFs and NCFs in the regional logistics industry. It emerges that employees are almost split evenly between CCFs and NCFs, although the former group is much less numerous than the latter. This confirms that also in this highly labor-intensive sector, CCFs are (increasingly) larger than NCFs, as summarized in Table 22.

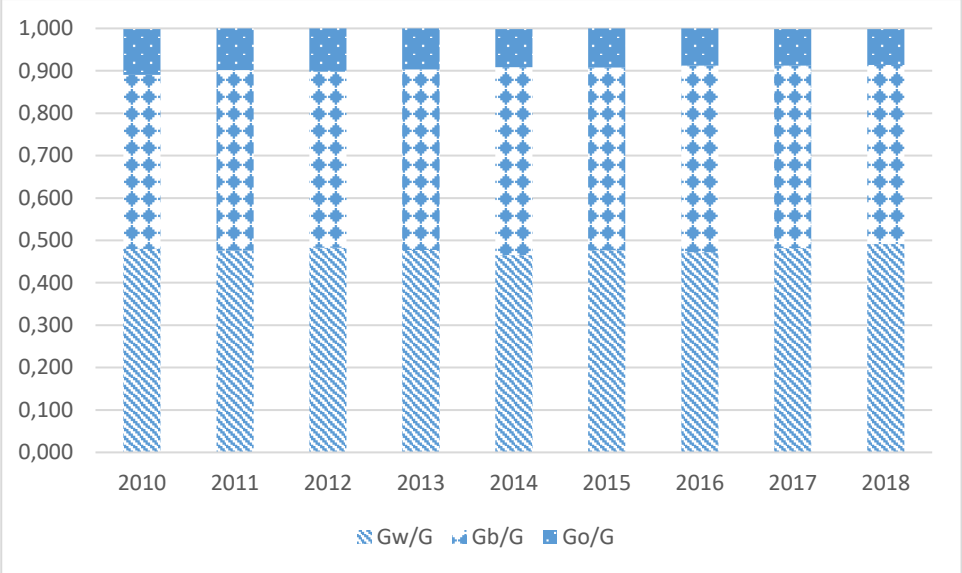
As for the contribution of the three components concurring to the overall variability, Table 23 collects data for the extreme years of our time interval and Figure 7 illustrates the relative weights.

Table 23. Employment, logistics industry, Gini decomposition

	G_w	G_b	G_o	G	G_w/G	G_b/G	G_o/G
2010	0.355	0.304	0.080	0.740	0.480	0.411	0.108
2018	0.371	0.319	0.064	0.755	0.491	0.423	0.085

It is interesting to remark that, as compared to the overall sample, in this case the variability within (between) groups is much lower (higher); consequently, the type of company, more than the differences within each type of distribution, matters greatly in explaining how employment differs across companies. Moreover, the overlap factor is more significant than in the overall economy.

Figure 7. Employment, logistics, Gini decomposition, relative weights



Given the fairly homogeneous nature of the services offered in this industry, we compare now the added value per employee in the two groups. The obtained values may be interpreted as proxies of the average labour productivity in the two segments.

Table 24. Added value per employee (thousand euros, prices 2015), logistics

	NCF	CCF
2010	222	101
2011	252	109
2012	249	111
2013	258	108
2014	258	99
2015	257	108
2016	250	103
2017	248	111
2018	249	115

The difference between types of firms is stably large: it takes more than *two* employees in CCFs to obtain the same added value generated by *one* employee in NCFs. This handicap should raise some

concerns about the efficiency of CCFs that may be worth exploring further in the future[23]. Table 25 shows that this enormous gap is reflected also in profits.

Table 25. Profits (million euros, prices 2015), logistics

	NCF	CCF
2010	-22	-29
2011	-41	-2
2012	-65	-24
2013	8	-23
2014	43	-16
2015	1	8
2016	100	2
2017	111	-0
2018	91	-1

In general, the relationships among our main variables are hugely different for CCFs vs NCFs, as we can verify in Tables 26 and 27, which collect the correlation coefficients. Notice that we report two bottom lines, depending on whether we compute the simple arithmetic mean, which may be misleading when measuring also negative yearly correlations, or when averaging (*) the absolute values of the coefficients.

Table 26. Correlation between EM, AV and PR, logistics, CCFs

	EM-AV	EM-PR	AV-PR
2010	0,79	-0,37	-0,02
2011	0,84	-0,10	0,15
2012	0,85	-0,01	0,09
2013	0,89	-0,05	0,09
2014	0,91	0,04	0,20
2015	0,91	0,05	0,29
2016	0,93	0,04	0,16
2017	0,93	0,03	0,15
2018	0,96	-0,19	-0,10
Average	0,89	-0,06	0,11
Average*	0,89	0,10	0,14

[23] For such an exploration it would also be necessary to examine wages in the two segments; see Clemente *et al*. (2012) for the case of Spain and the rich bibliography.

Table 27. Correlation between EM, AV and PR, logistics, NCFs

	EM-AV	EM-PR	AV-PR
2010	0,98	0,02	0,15
2011	0,92	-0,24	-0,14
2012	0,97	-0,40	-0,31
2013	0,98	-0,13	-0,06
2014	0,98	0,08	0,20
2015	0,97	-0,05	0,05
2016	0,97	0,36	0,44
2017	0,96	0,43	0,60
2018	0,96	0,36	0,52
Average	0,96	0,05	0,16
Average*	0,96	0,23	0,27

Some remarks are in order. First, as compared to the overall sample (Tables 11 and 12), CCFs exhibit an even lower correlation between employment and added value, which is in turn much lower than the one observed for NCFs. Second, when distancing from zero (as in 2010 and 2011, the worst years of our interval), the correlation between employment and profits levels for CCFs is negative. Third, looking at the bottom line of Tables 26 and 11, the behavior of CCFs reveals a small correlation between profits and employment as well as added value. On the contrary, for the NCFs, Table 27 reveals that such correlations are not negligible, although much lower than in the overall economy (Table 12).

Notwithstanding the aforementioned peculiarities, we can summarize our analysis of the regional logistics industry as follows. Here, more than in the entire economy, CCFs seem to care more about employment than about profits. As compared to NCFs, the CCFs attitude of protecting employees[24] is associated with a poorer performance in terms of labor productivity, as it is evident from the lower level of both added value per worker and aggregate profits.

[24] To detect whether the shield applies to all workers or mainly the member ones, one should know at least the average membership ratio. This is unfortunately unavailable at the regional level, also because only 30% of CFs of the logistics adhere to some cooperative association in ER. Moreover, at the national level, 60% of cooperative firms in the logistics sector in 2015 are active for less than 5 years (Istat 2019, p.15) and this reveals the high turnover displayed by the supply side of the industry.

4. Conclusions

In this paper we investigate the ER economy in order to shed light on the differences between the performance of cooperative firms and the conventional ones. A related key question we aimed at tackling deals with the objective function of cooperative firms as apparently revealed by their decisions. We employ a unique data set covering the entire universe of firms registered in ER from which we select appropriately the sample. Our statistically descriptive analysis, although simple, allows us to underline that: CCFs are larger, in terms of employees, than NCFs; a "size effect" seems at work in driving differences between CCFs and NCFs; CCFs tend to act countercyclically, or at least more resiliently, than NCFs during downturns; CCFs tend to stabilize employment by sacrificing profits.

As for the last evidence, our analysis seems to support the formulation of the objective function by Kahana and Nitzan (1989) and the predecessors of their approach. Hence, the assumption of maximizing employment under a profit constraint (or, equivalently, maximizing profits under an employment constraint) fits quite squarely the empirical evidence offered in this paper as well as in previous empirical research. However, both Ward (1958) and Kahana and Nitzan (1989) assume price-taking behavior and ideal (in the sense of Sertel's workers' firms) LMFs, while we witness *oligopolistic markets* where profit-maximizing firms cohabit with cooperatives that are *heterogeneous* (as for the operating sector and the nature of their membership) and in which the *membership ratio* is sizably lower than one. Hence, we can hardly employ either model to stylize the real industries we are dealing with, but we acknowledge that the concern for employment, firstly embedded in a fully-fledged market model in Kahana and Nitzan (1989), received an empirical support few years later as we observed in Section 2. Our empirical findings too seem to validate their behavioral assumption that CCFs (especially CFs) do care about their own employment levels even if this policy entails sacrificing profitability.

There is another implication of our results. It is by now well known that the main source of income inequality is *labour* income inequality[25]. Hence, to shrink the former, actions to reduce the latter are in order. By preserving employment, especially during slums, CCFs participate in the process of containing labour income inequality because unemployment, by zeroing market incomes of a fraction of labor force, cannot but uplift income inequality. We may claim that CCFs strategies operate as an

[25] See, for instance, the interesting contribution by Milanovic (2019) and the huge bibliography cited there.

ex-ante redistributive mechanism, as opposed to *ex-post* public policies designed to mitigate the consequences of falls in labour incomes[26]. Moreover, we know that the pay-ratio within CFs employees (not necessarily in companies controlled by cooperatives) is usually lower than in NCFs[27]. By limiting wage dispersion between white collars and blue collars, CFs provides another contribution to limit, once again *ex-ante*, an exceedingly high-income inequality among their employees and then, given their critical mass, also within the overall employment in ER[28].

Last but not least, we believe that, while showing how different regional producers reacted to the financial crisis and the subsequent recession, our empirical analysis may also establish a fairly useful benchmark to assess in due time the economic effects of the pandemic severely hitting also the ER economy.

[26] This is particularly true in *social* CFs which function combining workers and users of a vast range of social services and hire people with profiles in high risk of employment exclusion. Moreover, according to Kruse (2016, p. 1, italics added), a large empirical evidence suggests that: "*Employee ownership companies* have more stability, higher survival rates, and fewer layoffs in recessions, potentially leading to lower unemployment in the overall economy. … The broader sharing of economic rewards may help reduce economic inequality." Production cooperatives belong to such a category of companies.

[27] For instance, in its ethical code, Legacoop sets an upper bound of 8 between the values of the highest and the lowest salary within the various layers of the organization. Craig and Pencavel (1995, p. 133) too noticed the narrow wage differential range within cooperative mills with respect to prevailing manufacturing contracts.

[28] Indeed, this interpretation is supported from the observation that ER excels among Italian regions when comparing average households' disposable real incomes (negatively) weighted by the Gini index of income distribution: on this, one may see Costa *et al*. (2021).

References

Amorato, P. (2018), *The Growth of Italian Cooperatives. Innovation, Resilience and Social Responsibility*, NewYork-London, Routledge.

Berranger, C., S. Monni and A. Realini, eds, (2020), Cooperative bene comune, Rome, Rome Tree Press.

Borzaga, C., M. Calzaroni, C. Carini and M. Lori (2019), "Structure and performance of Italian cooperatives: a quantitative analysis based on combined used of official data", *Journal of Entrepreneurship and Organizational Diversity*, 8, 65-83.

Burdin, C. and A. Dean (2009), "New evidence on wages and employment in worker cooperatives compared with capitalist firms", *Journal of Comparative Economics*, 37, 517-33.

Burdin, C. and A. Dean (2012), "Revisiting the objectives of worker cooperatives: an empirical assessment", *Economic Systems*, 36, 158-71.

Clemente, J., M. Diaz-Fonced, C. Maruello, and M. Sanso-Navarro (2012), "The wage gap between cooperative and capitalist firms: evidence from Spain", *Annals of Public and Cooperative Economics*, 83, 337-56.

Cori, A., M. Granata, K. Lelo and S. Monni (2021), "Mapping cooperatives in Italy", *Entrepreneurship and Sustainability*, 8, 136-162.

Costa, M. (2016), "Overlapping component and inequality decomposition: a simulation study for the Gini index", *Metron*, 74, 193-205.

Costa, M., F. Delbono and F. Linguiti (2021), "Cooperative Movement and Prosperity across Italian Regions", WP 1161, Dept of Economics, University of Bologna and WP 186, Aiccon.

Craig, B. and J. Pencavel (1992), "The behaviour of workers cooperatives: the plywood companies of the Pacific Northwest", *American Economic Review*, 82, 1083-105.

Craig, B. and J. Pencavel (1993), "The objectives of workers cooperatives", *Journal of Comparative Economics*, 17, 288-308.

Craig, B. and J. Pencavel (1995), "Participation and productivity: a comparison of workers cooperatives and conventional firms in the plywood industry", *Brookings Papers on Economic Activity*, 26, 121-74.

Dagum, C. (1997), "A new decomposition of the Gini income inequality ratio", *Empirical Economics*, 22, 515-31.

De Fraja, G. and F. Delbono (1990), "Game theoretic models of mixed oligopoly", *Journal of Economic Surveys*, 4, 1-17.

Delbono, F. and L. Lambertini (2014), "Cartel size and collusive stability with non-capitalistic players*", Economics Letters*, 125, 156-9.

Delbono, F. and C. Reggiani (2013), "Cooperative firms and the crisis: evidence from some Italian mixed oligopolies", *Annals of Public and Cooperative Economics*, 84, 383-97.

Delbono, F. and G. Rossini (1992), "Competition policy vs horizontal merger with public, entrepreneurial and labor-managed firms", *Journal of Comparative Economics*, 16, 226-40.

Euricse (2013), *The Italian cooperative movement during the crisis*, in Italian.

Euricse (2020), *Exploring the co-operative economy*.

Fellner, W. (1947), "Prices and wages under bilateral monopoly", *Quarterly Journal of Economics*, 61, 503-32.

Gal-or, E., M. Landsberger and A. Subotnik (1980), "Allocative and distributional effects of a monopolistic cooperative firm in a capitalist economy", *Journal of Comparative Economics*, 4, 158-72.

Giorgi, G.M. (2011), "The Gini inequality index decomposition. An evolutionary study", in Deutsch, J. and J. Silber (eds.), *The measurement of individual well-being and group inequalities*, 185–218, London, Routledge.

Grazzi, M., C. Piccardo and C. Vergari (2018), "Building a firm level dataset for the analysis of industrial dynamics and demography", *Journal of Economic and Social Measurement*, 43, 169-97.

International Cooperative Alliance (2017), *Co-operatives and employment*.

Istat (2019), *Structure and performance of Italian cooperatives: year 2015*, in Italian.

Kahana, N. and S. Nitzan (1989), "More on alternative objectives of labor-managed firms", *Journal of Comparative Economics*, 13, 527-38.

Kruse, D. (2016), "Does employee ownership improve performance?", IZA World of Labor, 311.

Law, P. (1977) "The Ilyrian firm and Fellner's union-management model", *Journal of Economic Studies*, 4, 29-37.

Menzani, T. (2018), "The cooperative firms of ER within the economic crisis: 2007-17", in V. Zamagni (ed.), *Job creation in the age of the fourth industrial revolution: the case of ER*, Bologna, Il Mulino, pp. 143-72, in Italian.

Milanovic, B. (2019), *Capitalism. Alone. The future of the system that rules the world*, Belknap Press of Harvard University Press, Cambridge (Mass.).

Navarra, C. (2016), "Employment stabilization inside firms: an empirical investigation of worker cooperatives", *Annals of Public and Cooperative Economics*, 87, 563-85.

OECD (2021), "The spatial dimension of productivity in Italian cooperatives", LEED, 2021/2.

Perotin, V. (2006), "Entry, exit, and the business cycle: are cooperatives different?", *Journal of Comparative Economics*, 34, 295-316.

Perotin, V. (2012), "The performance of workers cooperatives", in Battilani P. and H. Schroter (eds.), *The cooperative business movement, 1950 to the present*, Cambridge, Cambridge University Press, 195-221.

Region Emilia-Romagna (2019), *Biennial report on the state of the cooperative movement*, in Italian.

Sertel, M. (1982), *Workers and incentives*, North-Holland, Amsterdam.

Ward, B. (1958), "The firm in Ilyria: market syndicalism", *American Economic Review*, 48, 566-89.

Zamagni, S. and V. Zamagni (2011), *Cooperative Enterprise*, Chelthenaum, Edward Elgar.

Zamagni, V. (2015), "The Cooperative Movement", in Jones, E. and G. Pasquino (Eds.), *The Oxford Handbook of Italian Politics*, Oxford, Oxford University Press, 554-67.

Zamagni, V. (2019), "Why we need cooperatives to make the business world more people-centered", paper presented at UNFTSSE International Conference, Geneve.

Appendix

Table 2A. Number of CCFs and NCFs *registered* in ER

	NCF	CCF	TOTAL
2010	68.127	4.475	72.602
2011	68.979	4.411	73.390
2012	68.193	4.351	72.544
2013	67.889	4.290	72.179
2014	68.141	4.252	72.393
2015	68.762	4.176	72.938
2016	69.960	4.093	74.053
2017	70.656	3.983	74.639
2018	70.750	3.798	74.548

Table 4A. Added Value (million euros, 2015 prices)

	NCF	% NCF	CCF	% CCF
2010	37.090	81,34	8.507	18,66
2011	39.697	81,52	9.001	18,48
2012	37.434	80,82	8.886	19,18
2013	40.828	78,52	11.170	21,48
2014	42.576	78,87	11.409	21,13
2015	44.245	79,54	11.382	20,46
2016	46.454	80,22	11.455	19,78
2017	49.068	81,00	11.511	19,00
2018	51.161	81,75	11.421	18,25

Table 5A. Number of employees

	NCF	% NCF	CCF	% CCF
2010	580.762	73,46	209.774	26,54
2011	595.263	72,37	227.223	27,63
2012	598.525	72,07	231.998	27,93
2013	595.497	71,13	241.648	28,87
2014	592.926	70,50	248.063	29,50
2015	609.923	70,74	252.317	29,26
2016	632.670	71,46	252.659	28,54
2017	668.180	72,21	257.212	27,79
2018	692.399	72,60	261.339	27,40

Table 7A. Employment, Gini decomposition

	G_w	G_b	G_o	G
2010	0.505	0.221	0.038	0.764
2011	0.497	0.230	0.038	0.765
2012	0.498	0.233	0.038	0.769
2013	0.494	0.241	0.038	0.773
2014	0.492	0.248	0.038	0.778
2015	0.493	0.247	0.037	0.777
2016	0.498	0.241	0.036	0.776
2017	0.504	0.236	0.035	0.776
2018	0.509	0.234	0.034	0.777

Table 14A. Employment, yearly rate of growth

	Small firms		Large firms	
	NCF	CCF	NCF	CCF
2011	-3,27	0,84	3,29	8,56
2012	9,33	15,30	-0,59	1,70
2013	-10,04	-6,58	0,85	4,53
2014	-8,25	10,21	0,56	2,42
2015	2,44	-13,19	2,92	2,21
2016	1,36	-4,91	4,00	0,28
2017	10,04	-1,43	5,12	1,89
2018	0,78	-3,53	3,96	1,74

Table 16A. Employees, Gini decomposition

	Small firms				Large firms			
	G_w	G_b	G_o	G	G_w	G_b	G_o	G
2010	0,431	0,044	0,030	0,505	0,442	0,226	0,036	0,704
2011	0,398	0,046	0,027	0,471	0,437	0,235	0,036	0,708
2012	0,438	0,053	0,030	0,521	0,435	0,239	0,036	0,710
2013	0,398	0,051	0,027	0,477	0,436	0,245	0,036	0,717
2014	0,365	0,066	0,024	0,456	0,435	0,250	0,036	0,720
2015	0,365	0,051	0,023	0,44	0,435	0,250	0,035	0,720
2016	0,359	0,047	0,022	0,428	0,439	0,245	0,035	0,719
2017	0,386	0,043	0,023	0,452	0,445	0,241	0,034	0,720
2018	0,380	0,040	0,022	0,442	0,450	0,238	0,033	0,721

Table 19A. Number of CFs and NCFs, logistics

	NCF	% NCF	CCF	% CCF
2010	1.173	72,18	452	27,82
2011	1.199	73,56	431	26,44
2012	1.194	73,75	425	26,25
2013	1.192	73,95	420	26,05
2014	1.209	74,45	415	25,55
2015	1.266	75,58	409	24,42
2016	1.289	75,96	408	24,04
2017	1.345	77,34	394	22,66
2018	1.376	78,49	377	21,51

Table 20A. Added Value (million euros, 2015 prices), logistics

	NCF	% NCF	CCF	%CCF
2010	1.221	63,27	709	36,73
2011	1.243	62,68	740	37,32
2012	1.226	63,68	699	36,32
2013	1.238	64,40	684	35,60
2014	1.295	62,78	768	37,22
2015	1.352	62,40	815	37,60
2016	1.402	63,14	818	36,86
2017	1.423	63,11	832	36,89
2018	1.499	63,49	862	36,51

Table 21A. Number of employees, logistics

	NCF	% NCF	CCF	%CCF
2010	21.896	49,63	22.224	50,37
2011	21.407	49,57	21.780	50,43
2012	22.464	50,67	21.866	49,33
2013	22.029	49,92	22.102	50,08
2014	22.620	48,17	24.337	51,83
2015	23.903	50,06	23.841	49,94
2016	24.437	49,42	25.009	50,58
2017	26.284	51,45	24.807	48,55
2018	27.743	52,32	25.280	47,68