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New evidence on wages and employment in worker cooperatives compared with capitalist firms

Gabriel Burdín [a,b,*], Andrés Dean [a,*]

[a] Instituto de Economía, Facultad de Ciencias Económicas y de Administración, Universidad de la República, Uruguay
[b] Dipartimento di Economia Politica, Università degli Studi di Siena. Siena, Italia

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ABSTRACT

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This article presents new econometric evidence on the comparative behavior of worker cooperatives and capitalist firms, highlighting the differences in wages and employment responses. We use a comprehensive panel data set that covers the entire population of cooperatives and their capitalist counterparts registered in the social security records in Uruguay from April 1996 to December 2005. We analyze the data to study the employment and wage decisions in both types of enterprises, the results of which suggests that their adjustment mechanisms to idiosyncratic price changes and macroeconomic shocks may differ greatly. The data set also allows us to estimate wage and employment variations for members and non-members of cooperatives separately, and provides an empirical test for the so-called degeneration hypothesis. Our findings are broadly consistent with previous studies for Italian cooperatives and plywood cooperatives in the United States. As studies of this kind are so few, our research provides a significant contribution to the empirical literature on labor managed firms. Moreover, comparing worker cooperatives and capitalist firms offers an exceptional opportunity to determine how control by workers may lead to different organizational behavior. *Journal of Comparative Economics* **37** (4) (2009) 517–533. Instituto de Economía, Facultad de Ciencias Económicas y de Administración, Universidad de la República, Uruguay; Dipartimento di Economia Politica, Università degli Studi di Siena. Siena, Italia.

1. Introduction

Although worker cooperatives have occupied a marginal position in most economies, economists have paid attention to them since the 18th century, especially authors like Mill, Marx, and Walras. More recently, some theoretical literature has focused on why cooperatives rarely exist in capitalist market economies (Bonin et al., 1993; Dow and Putterman, 2000; Dow, 2001, 2003; Bowles, 2004; for a review see Burdín and Dean, 2008).

We analyze the comparative behavior of capitalist firms and worker cooperatives. We identify, in particular, the different wage and employment adjustment mechanisms in the two types of firms. We use a comprehensive panel data set based on monthly Uruguayan social security records. The data set covers the entire population of Uruguayan worker cooperatives and

* Corresponding authors. Address: Instituto de Economía, Universidad de la República, Joaquín Requena 1375, Montevideo 12000, Uruguay. Fax: +598 2 408 9586.
E-mail addresses: gburdin@iecon.ccee.edu.uy (G. Burdín), adean@iecon.ccee.edu.uy (A. Dean).

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capitalist firms in 31 economic sectors from April 1996 to December 2005. These data have never been used to compare the economic behavior of different types of organizations.

The importance of our study is twofold. First, comparing worker cooperatives and capitalist firms offers an exceptional opportunity to determine how different structures of organizational control may lead to different economic behaviors. Second, empirical studies on worker cooperatives, especially those that include comparisons with capitalist firms, are less common than theoretical studies. Bonin et al. (1993) emphasize that the dearth of suitable firm-level panel data sets extending for long periods explains this gap. In developed countries, empirical studies are infrequent, and when they do occur they are generally restricted to a few countries and a few cooperative groups. Italian cooperatives and US plywood cooperatives constitute the two most famous examples. For other countries, including Uruguay, numerous case studies exist, but econometric research contrasting well-defined behavioral hypotheses remains in its infancy.

In Section 2 we present a brief survey of the theoretical and empirical literature specific to our research problem. In Section 3, we describe the recent trends in the Uruguayan macroeconomic evolution including historical and institutional details of worker cooperatives. In Section 4, we deal with the research problem and the main hypotheses. We present the characteristics of the data set and basic descriptive statistics in Section 5. In Section 6, we specify the econometric models and present pertinent results. We conclude with comments on the limitations we encountered and our ideas for potential further research.

2. Theoretical framework and previous research

Following Bowles and Gintis (1996), we define a worker cooperative (WC) as an enterprise where the firm's labor force chooses the management and the administrative structure using a democratic political process.[1] By contrast, in a capitalist firm (CF) the owners of the firm's capital assets determine the management and the administrative structure. Controllers are those members who collectively set the rules of the organizations (Ben Ner et al., 1993). CFs and WCs differ in the identity of the organization's controllers so we can plausibly expect differences in their economic behavior.

The contemporary theoretical discussion comparing the employment decisions, wage decisions, and short-run supply responses of capitalist firms and worker cooperatives finds its origins in Ward (1958). In Ward's model, WCs are collectively owned by workers and their objective is to maximize the net income per worker, instead of maximizing total profits like their capitalist counterparts. Under this assumption, the model reveals some disturbing behavioral implications for WCs in the short-run. Paradoxically, facing an increase in the output price, WCs reduce employment and output.[2] Therefore, unlike a standard profit maximizing CF, WCs would exhibit a negatively sloped supply curve.

Ward's model has faced many criticisms. First, employment maximization was proposed as an alternative objective to income maximization for worker cooperatives (Kahana and Nitzan, 1989). Second, some authors pointed out that Ward's approach ignores the effect that variations in employment have on workers' welfare. (Moene, 1989; Berman and Berman, 1989). It is unclear how a specific group of "victims" would be chosen (Dow, 2003). As formalized by Steinherr and Thisse (1979), Bonin (1981), and Brewer and Browning (1982), members internalize the risk of becoming unemployed if lay-offs are decided through fair procedures (excluding any privilege for some worker-members), or if expelled members are compensated. The predicted result, then, is that a worker cooperative would not alter its employment level, resulting in an inelastic short-run supply response.

Third, other authors, like Dow (1986), introduced the possibility that workers own their enterprises through equal individual stock holdings that can be sold to new members or to the firm. In addition, according to Dow (2003), the Ward model assumes the absence of a labor market, and incorrectly generalizes the specific Yugoslavian institutional context of the 1950s. If a labor market is present and there is a gap between income per worker in WCs and market wages in CFs, then there are mutual beneficially bargains between the cooperative's members and outsiders pushing employment and output to optimal levels. Under these new conditions, the cooperative's behavior would be identical to that of a capitalist firm in a competitive environment.

Finally, WCs also employ non-member workers who can be laid-off and hired at market wages as in conventional firms. Ward does not include this kind of flexible employment policy in his model. Moreover, allowing WCs to employ non-members introduces another important issue: the potential transformation of a WC into a CF. Such transformation is the basis for the so-called degeneration hypothesis. Ben Ner (1984) showed that successful cooperatives, where the worker's net income is higher than the current market wage, would progressively replace retired members with hired workers,[3] because a WC can increase its members' remuneration if it replaces its members with hired workers.[4]

Although much theoretical literature has been developed on this issue, empirical work has been less frequent and more recent. For example, Bartlett et al. (1992) studied a sample of WCs and CFs in Northern Central Italy to estimate the differ-

[1] Bowles and Gintis (1996) use the more general term 'democratic firm' but there are no conceptual differences between their designation and ours. Discussions concerning the definition of worker coops can be found in Ben Ner (1987), Putterman (1984) and Moene (1989).

[2] This extreme result holds for the simple one output–one input case.

[3] Ben Ner (1988) has pointed out that the degeneration problem arises in collectively owned WCs. Under an alternative scheme of individual ownership with tradable shares, the problem would be mitigated.

[4] Elster and Moene (1989) have shown that the degeneration problem can be interpreted as a negative externality suffered by isolated coops in a capitalist environment in which conventional firms prevail.

ences between both groups of firms. The authors discovered that CFs' managers are more concerned with profits than the managers of WCs. But, the employment and sales objectives of CFs and WCs do not differ. Barlett et al. also confirm that the wage structure in cooperatives is more compressed than it is in conventional firms.

Craig and Pencavel (1992) investigated the comparative behavior of WCs and CFs and their responses to changes in economic conditions. Their study is based on a panel of enterprises from the Pacific Northwest plywood industry in United States between 1968 and 1986. The authors distinguished between unionized and non-unionized capitalist firms. They estimated different models by regressing employment (output, work hours, or hourly income) on output and input prices. Their results indicated that an increase in output prices for CFs was associated with an increase in employment, working hours and output, but the increase had no significant effect on hourly incomes. By contrast, an increase in output prices for WCs was not significantly correlated with employment and working hours, but affected hourly incomes positively.

Craig and Pencavel (1993) tested directly the behavioral assumptions proposed by the theoretical literature by specifying a generic objective function subject to a budget constraint. Their estimates are based on a sample of enterprises in the plywood industry in the United States. According to the estimated parameters, worker cooperatives would have mixed objectives: they were concerned with income per worker – as Ward (1958) and others were centrally concerned – and with employment within the firm.[5]

More recently, Pencavel et al. (2006) found significant differences in employment, wage and capital decisions between WCs and CFs by using a micro-panel of Northern Italian enterprises during the period 1982–1994. They estimated three models for wages, employment and capital. Based on sales information, they used capital costs, a fixed cost measure, and a transitory product market shock indicator as independent variables for the Wage Equation for each firm. The authors also employed workers' characteristics (gender and age) and firms' attributes (size, industry and region) as control variables. Most importantly, for both types of firms they found that market shocks affected wages positively, though the effect was higher for WCs. Wages were more flexible in cooperatives than in capitalist firms. For the employment equation, the authors included the same variables, adding real wages as an explanatory variable. According to their results, for both types of firms product market shocks affect employment positively but the effect is lower for WCs. The results are broadly consistent with the idea that, when economic conditions change, then the enterprise's adjustment process could vary markedly, depending on the firm's organizational control structure.

Previous empirical work therefore provides several insights. First, the extreme implication of Ward's model – where worker cooperatives had a negative sloping supply curve and reduced their employment and output when output prices increased – has rarely been confirmed. Second, employment and output are less sensitive to product market shocks in cooperatives than in capitalist firms. Third, the evidence supporting the standard assumption that cooperatives exclusively maximize income per worker is not conclusive. In contrast, cooperatives' objective functions could include firm employment levels as a maximand. Finally, empirical studies have not paid sufficient attention to cooperatives hiring non-member workers.

3. Uruguay: background information

3.1. Macroeconomic scenario

The evolution of the Uruguayan economy reveals three distinct phases during the period 1996–2005 (Fig. 1). For the period 1996–1998, as for most of the 1990s, the Uruguayan economy expanded at a relatively high real GDP growth rate. By 1999, the deterioration of regional economic conditions negatively affected the Uruguayan economy. The economy entered a deep economic crisis during the period 1999–2002, with the greatest downturn in 2002. The crisis affected the labor market profoundly, with unemployment rate increasing to 20% during 2002 (Fig. 2). However, since 2003 the Uruguayan economy has recovered significantly and the unemployment rate has decreased. In 2005, approximately 13% of the labor force was unemployed and wages in the private sector began to rise.

3.2. Worker cooperatives in Uruguay

According to Uruguayan law, WCs are defined as producer cooperatives where the number of permanent employees cannot exceed 20% of the number of members (Law N° 17.794). In addition, WCs are legally permitted to hire short-term temporary workers in response to seasonal demand changes. WCs must fulfill this maximum level of hired workers to be entitled to certain tax advantages. Finally, a minimum requirement of six members is mandatory to launch a new cooperative firm.

Though certain key organizational features are predetermined by law, each WC is free to decide upon a broad range of associational rules. Regarding their governance structure, each cooperative has a General Worker Assembly that selects a Council to supervise the daily operations. Each member within the assembly has only one vote, regardless of his capital contribution.[6]

[5] Although under a restrictive technological assumption (a quadratic production function), similar results are obtained for Uruguayan coops following the same empirical strategy (Burdín and Dean, 2008b).

[6] Occasionally, some cooperatives require a monetary admission fee to admit new members. When a member leaves the cooperative, the value of his capital contribution is repaid by the enterprise.

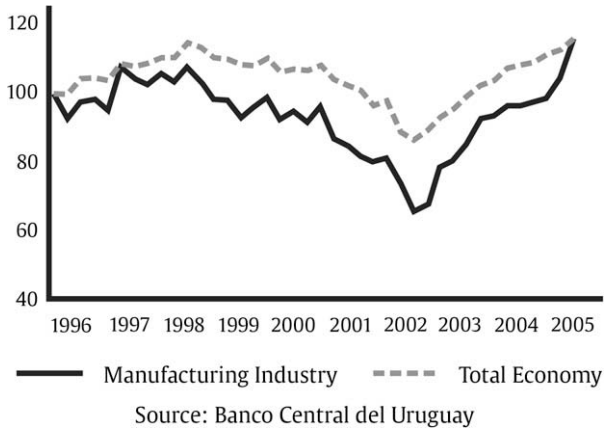

Fig. 1. Index of production.

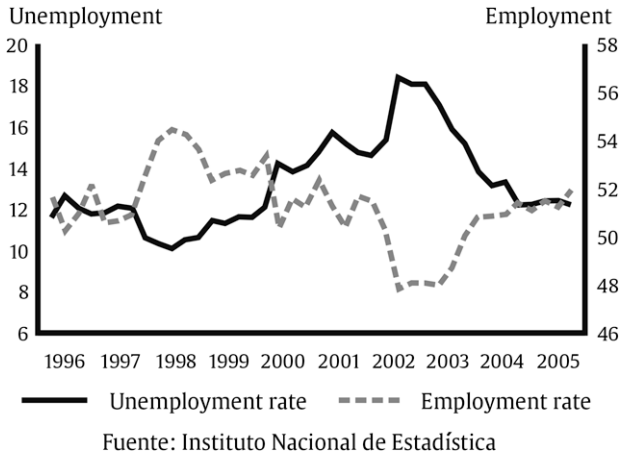

Fig. 2. Labor market conditions.

In Uruguay, WCs are collectively owned by their workers. As is common in other countries, membership markets are completely absent in Uruguay.[7] WCs customarily use two sources to acquire capital: bank loans (mostly from public and cooperative banks) and retained earnings. But, certain laws constrain the allocation of annual net revenues: no more than 80% of the annual net revenues can be distributed among members.

Trade unions do not play any role among Uruguayan WCs. They are not frequent at the firm-level, even in conventional firms. Historically, Uruguayan trade unions have been formed at the industry level, although their influence has been highly endogenous to the legal framework of collective bargaining (Cassoni, 2000). Industry-wide agreements enforced by governmental regulations have traditionally fostered unionism in Uruguay. Concerning wage determination, worker coops are obliged to comply with collective bargaining agreements at the industry level. However, during the period covered by our data, wage councils were suppressed. Therefore, both WCs and CFs chiefly made their wage adjustments according to labor market conditions and union density was very low.[8]

[7] Different models introducing markets for membership rights are presented in Sertel (1982), Dow (1986) and Fehr (1993). Dow (2003) extensively discusses the reasons why these kinds of markets are unusual in real economies.

[8] Information on union activity at the firm level was not available. It was not possible to match information on union density with social security records at three digits of the ISIC. However, aggregate union density was very low during the period 1996–2005, representing on average 10.5% for private sector workers. Since 2005, collective bargaining agreements have been progressively reinstalled by the new government and unionization has increased. Further research should take into account these facts. Depending on the availability of information, future studies should compare WCs and CFs, distinguishing unionized CFs from those not unionized.

3.3. Previous research on Uruguayan worker coops

Studies considering the economic behavior of Uruguayan worker cooperatives are extremely rare. Some reports based on the last National Census of Cooperatives presented a general overview of the cooperative sector in Uruguay (Errandonea and Superville, 1992). But, these studies did not focus on worker cooperatives, and provided only general information on the number of firms and total employment.

Previous research on worker cooperatives relied on qualitative techniques, such as case studies (Martí et al., 2004; Torrelli, 2006; Camilletti et al., 2006). But, these studies could not analyze how WCs adjusted employment and wages. Furthermore, they could not assess the different responses for members and non-members within WCs to shocks, or to changes in employment or wages. In addition, econometric studies based on representative samples of worker cooperatives and comparison between WCs and CFs are rare in Uruguay, because suitable data sets that include firm-level observations are scarce.

4. Research problem and main hypotheses

Studying Uruguayan conventional and cooperative firms, we focused on the following problems. Can we identify differences in the way that WCs and CFs react to similar changes in their economic environment? *And importantly*, do WCs and CFs use different employment and wage adjustment mechanisms to respond to output price changes and macroeconomic shocks?

We test five main hypotheses derived from the theoretical and empirical literature.

(H1) Wages are more sensitive to changes in relative output prices in WCs than in CFs.
(H2) Changes in relative output price are positively correlated with employment in CFs, while employment responses would be less elastic in WCs. Moreover, we expect a negative wage–employment relationship in CFs, while this relationship is indeterminate for WCs.
(H3) We also hypothesize that, in WCs, the employment and wages of non-members will move in a similar manner to those exhibited by CFs.
(H4) During the macroeconomic crisis of 2002, both types of firms adjusted their wages and employment level. However, we expect that the wage fall in WCs is greater than in CFs to protect employment levels.
(H5) According to the degeneration hypothesis, we expect a positive relationship between output price changes and the relative employment of hired workers within the coops.

5. Data set and descriptive evidence

The study employs a long micro-panel at the firm-level based on social security records provided by the 'Banco de Prevision Social', the public social security agency in Uruguay.[9] This data set has never been used before to compare different types of organizations.

The data set comprises monthly wages and employment observations between April 1996 and December 2005 and covers the entire population of registered producer cooperatives and capitalist firms of 31 industries at three digits of the International Standard Industrial Classification (ISIC, second revision).

In addition, the data set allows us to distinguish between wages and employment for members and non-members. Besides enabling us to identify WCs, the data set allows us to compare the differences between members and non-members' adjustments within the coops and, especially to provide an empirical test of the so-called 'degeneration hypothesis'. Previous researchers could not undertake such in-depth analyses because this crucial information was unavailable.

We also matched an industry-specific output price index for each enterprise, using information provided by the Instituto Nacional de Estadística (INE)[10], as a proxy for the idiosyncratic changes in the product market faced by all firms in the same industry.

Information on work hours and workers' skills was unavailable.[11] Such information is important because movements in observed labor compensation could embody unobserved movements in work hours. Also, a firm's average compensation costs will vary with the quality mix of the workers in the firm, overlapping with genuine changes in the price of labor the firm faces (Bond and Van Reenan, 2007). Though, there is no evidence to indicate that variation in working hours is significant in Uruguay, some variability in work hours may be expected for members of coops. Moreover, the skill composition of the labor forces of both WCs and CFs may differ.[12] These limitations must be considered when interpreting the results.

[9] www.bps.gub.uy.
[10] www.ine.gub.uy.
[11] Unfortunately, these limitations are common in studies based on firm-level data sets. In general, these studies have relied on rough measures of labor compensation such as average wages (Bond and Van Reenan, 2007). Even in the most recent study on worker coops (Pencavel et al., 2006), in which a richer matched worker-firm panel was available, information concerning work hours and workerś education levels was not available.
[12] For example, WCs may exhibit a smaller proportion of skilled workers than capitalist firms. As Kremer (1997) has pointed out, the egalitarian wage policies of WCs could affect their ability to recruit skilled workers.

Finally, as in previous studies, we use an unbalanced panel. Thus we observe the entries and exits of the firms during the period under assessment. An important potential issue arises if entry and exit are non-random. Bond and Van Reenan (2007) pointed out that the determinants of entry and exit from a panel of firms may be potentially correlated with the shocks that affect employment decisions. According to the authors, non-random entry into the sample does not present a serious estimation problem, since the entry decision is a function of the variables dated at the time of entry. Non-random exit could potentially cause more serious attrition bias. But, if selection is only due to time-invariant characteristics of the firms, which may be observed or unobserved, then the fixed effect estimator is consistent, controlling for the effects of entry and exit (Machin et al., 1993; Cameron and Trivedi, 2005).

5.1. Descriptive evidence

Descriptive statistics on the firm sample for CFs and WCs are presented in Table 1 for three representative years.

Average employment and wages in WCs tend to be greater than in CFs. WCs and CFs are distributed differently across industries: WCs are more frequent in Transport (bus and taxi services), followed by Social Services, and Manufacturing. In the manufacturing sector, worker cooperatives were most often formed by buyouts of capitalist firms. By contrast, the distribution of CFs across sectors is relatively uniform.[13]

Employment and wages appear to evolve differently for WCs and CFs. While the evolution of employment and wages in CFs is consistent with the general evolution of the Uruguayan economy described in Section 3, the path observed for WCs differs starkly. Fig. 3 indicates that while employment in CFs in 2003 averaged 87% of employment in 1998, employment in WCs in 2003 was 106% of the 1998 level. Fig. 4 plots the evolution of wages, showing that, while real wages in CFs in 2003 averaged 76% of the wages in 1998, wages in WCs in 2003 averaged 67% of the wages in 2003. During this period, the total employment in WCs was relatively more stable than in CFs, while wages in WCs were also more flexible than in CFs. Fig. 4 also plots the proportional difference in average wages for coops and CFs. Interestingly, the wage gap grew between 1996 and 2001 and then decreased, returning approximately to its original value.[14]

As we mentioned, Uruguay faced a profound macroeconomic crisis from 1999 to 2002 – but especially in 2002 – during which all firms had to reduce labor costs, therefore comparing WCs and CFs reveals that they adjusted quite differently. Seemingly, WCs tended to protect employment levels and accepted more reductions in earnings than CFs. A final assessment of the two types of firms, however, requires a more systematic treatment of the differences in size and distribution across industries.

5.2. On the distinction between Worker Cooperatives and other producer cooperatives

As stated previously, WCs are legally defined as those producer cooperatives where the number of permanent employees does not exceed 20% of the number of members. As the data corresponded to all producer cooperatives, the identification of WCs was far from straightforward.

The average percentage of employees in producer cooperatives was 43% of their total employment, which clearly exceeds the upper boundary to be defined as a WC. As we intend to focus on the comparative behavior of CFs and WCs, we used the information concerning the proportion of non-members to identify WCs in the data set and to distinguish them from other producer cooperatives (OPCs). But, as WCs are legally permitted to temporarily exceed the mandatory 20% ratio between employees and members, the operative criterion to classify a firm as a WC was that its average lifetime ratio did not exceed 20%.

The identification criterion results in a clear distinction of firms registered as producer cooperatives as two different types. On the one hand, those firms classified as WCs reveal a low proportion of non-member workers (less than 10% of total employment). Contrastingly, in those firms classified as OPCs, on average employees represent approximately 80% of their total employment. As in conventional firms, most workers in OPCs are hired, and, hence are excluded from the ownership and the control structures of the firm.

The high proportion of non-member workers in OPCs should not be associated with the 'degeneration problem'. The data assist us to identify the formation of firms during the period and firms classified as OPCs generally form with a high proportion of employees. Thus they do not move from having a high proportion of members and a low proportion of employees, to having a low proportion of members and a high proportion of employees as the 'degeneration problem' would predict.

Information on OPCs is presented in Table 1. OPCs and WCs can be distinguished not only because OCPs employ a high proportion of non-member workers, but also because their industry and size distribution differ markedly from WCs. OPCs on average are twice the size of WCs. Moreover, while OPCs are frequent in Services, they are relatively infrequent in Transport.

OPCs participate in industrial farming and they manufacture agricultural products. Many OPCs originate in mergers between conventional agricultural firms. The new OPC performs the industrial processes, while taking advantage of greater scale economies. In this case, neither farms nor industrial plants exhibit the typical features of worker cooperatives. These typical features include workers' control over the ownership and decision-making process of the firm. In addition, as in conventional firms, the owners of OPCs do not necessarily engage in their labor processes. OPCs frequently operate in health care services as typified by medical care cooperatives. In many cases, the legal status of the firm is chosen merely to fulfill the

[13] See also Burdín and Dean (2007).

[14] We also compute the wage gap by sector and firm size (see Table 2).

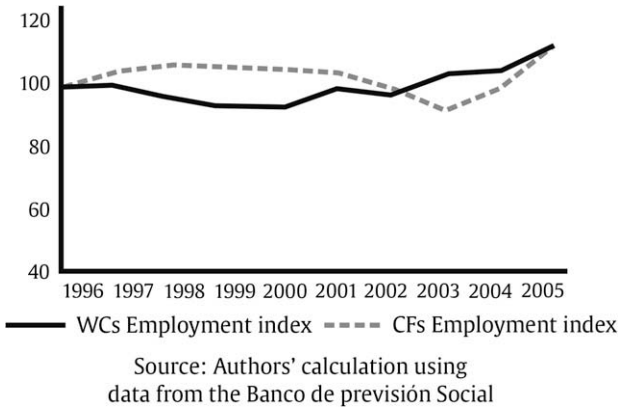

Fig. 3. Employment Index.

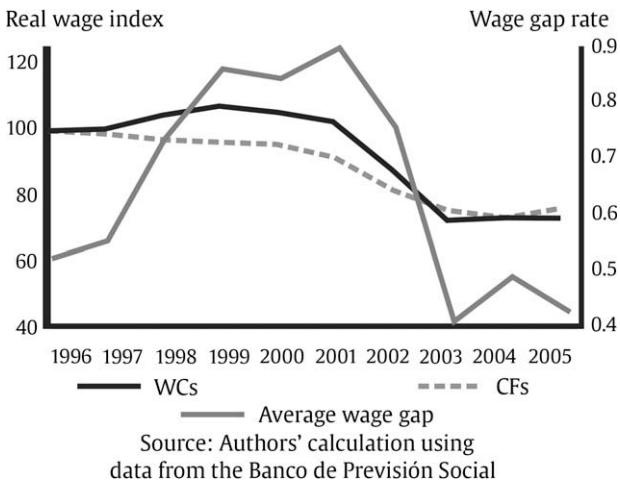

Fig. 4. Real Wage Index and Average Wage Gap.

official requirements to operate in the health assistance market. Usually, a small group of doctors establishes and controls such an OPC; the group also hires the majority of workers (including other professionals).

Finally, we must consider switches between organizational types. There are three possible switches between the organizational forms studied here. First, a CF can be transformed into a producer cooperative (either into a WC or into an OPC). Second, a producer cooperative formed with a low proportion of hired workers (that is a WC) can be transformed into an OPC. Lastly, an OPC could switch to a WC. The data allow us to identify only the last two types of switches. But, they represent a negligible proportion of total WCs. Estimates presented below were performed excluding OPCs. The consideration of switches between organizational forms relates to the analysis of the degeneration problem mentioned previously, and which we will analyze in Section 6.4.

6. Empirical strategy and main results

We based our empirical strategy predominantly on Pencavel et al. (2006). Observations reflect the average wages and employment in firm i in month t. Models are estimated by Pooled OLS and Within Group.[15]

6.1. Empirical specification and results for wages

First, we specify and estimate the following general model to test H1.

$$\Delta \ln w_{it} = \Delta \ln w_{it-1}\alpha_0 + \Delta \ln w_{it-1}C_i\alpha_1 + \Delta \ln p_{it}\gamma_0 + \Delta \ln p_{it}C_i\gamma_1 + \omega_i + \nu_{it} \quad (1)$$

[15] Our comments refer to the results for the Within-Group estimates, as they clearly address the problem of unobserved heterogeneity across firms. However, OLS estimates are also presented in the tables. Table 3 provides a description of the variables included in the models.

where $\Delta \ln w_{it}$ represents the annual change in real wages for company i in month t; $\Delta \ln p_{it}$ the annual change in the specific sector output price (relative to the rest of the economy) relevant for company i in month t; C_i is a dummy which takes the value 1 for WCs; ω_i captures unobservable factor affecting wages that vary across firms but are fixed over time for each firm; finally, v_{it} represents unobservable factors that vary across firms and over time. Eq. (1) includes a lag of the dependent variable, to capture the dynamics of the wage determination process.[16] Industry and yearly dummies and company size variables (the logarithm of initial employment) were also included as control variables.[17]

According to the theoretical and empirical literature, the industry's idiosyncratic demand shocks should have a greater effect on WCs than on CFs wages. The γ_0 coefficient directly captures the effect of price changes on capitalist firms' wages. The same effect for WCs is represented by $\gamma_0 + \gamma_1$.

The results for our first estimation of Eq. (1) are displayed in Table 4a. Considering the Within Group estimation of Eq. (1), the coefficient for CFs is significant at the 1% level: wage changes are positively related to changes in output prices. As expected, the magnitude of this effect is larger for WCs. The estimated responses of both types of firms differ in a statistically significant way: wages are more flexible in WCs than in CFs. Also, the estimates show that the relationship between current wage changes and its lag are significantly greater for WCs.

Finally, we assessed the effects of the 2002 macroeconomic crisis on wages for both types of firms. We used a dummy variable which takes a value of 1 for every month of 2002 (year 2002) and its interaction with the cooperative's status, C_i. The results are reported in Table 4a. The crisis had a significantly negative effect on the change in wages for both WCs and CFs, although adjustment responses did not differ significantly.

Because WCs also hire non-member workers,[18] estimations based on WCs' total employment could obscure different adjustment mechanisms for member and non-member workers. Surprisingly, this issue has been neglected in the empirical literature.[19]

Our second set of estimates for Eq. (1), considering members and employees in WCs separately, is presented in Table 4b. Changes in wages are positively related to changes in output prices for members. Contrastingly, when only employees are considered there is no significant relationship between output prices and wages. The result is plausible: risk-neutral cooperative members operate as insuring agents, assuming the short-run losses as well as the extraordinary returns associated with demand fluctuations. If employees are risk-averse, conventional microeconomic theory indicates that an optimal contract would establish a fixed wage for employees, and it would establish variable earnings for members as a function of a firm's financial outcomes.[20]

6.2. Empirical specification and result for employment

We use the following model of employment to test H2:

$$\Delta \ln E_{it} = \Delta \ln E_{it-1}\delta_0 + \Delta \ln E_{it-1}C_i\delta_1 + \Delta \ln w_{it}\eta_0 + \Delta \ln w_{it}C_i\eta_1 + \Delta \ln p_{it}\eta_3 + \Delta \ln p_{it}C_i\eta_4 + \mu_i + \varepsilon_{it} \quad (2)$$

where $\Delta \ln E_{it}$ is the annual change in employment for company i in month t; $\Delta \ln w_{it}$ is the annual change in wages; $\Delta \ln p_{it}$ represents, as in Eq. (1), the annual change of the sector-specific output price relevant to company i in month t; C_i is a dummy variable which takes a value of 1 for WCs; μ_i captures the unobservable factors affecting employment variations that vary across firms but are fixed over time for each firm; finally, ε_{it} represents also unobservable factors that vary both across firms and over time. Eq. (2) also includes a lag of the dependent variable to capture any inertia in the employment's adjustment process. To control for the observed attributes and business cycle effects of firms, industry dummies, yearly dummies and the log of initial employment are also included.

While we expect a negative correlation between wages and employment variations in CFs ($\eta_0 < 0$), this relationship ($\eta_0 + \eta_1$) is theoretically indeterminate for WCs.

At the centre of most debates about WCs is the effect of a change in output prices on employment. Idiosyncratic output price changes should have a positive effect on employment in CFs. On the contrary, a change in output prices should not elicit as elastic a response in employment levels in WCs as it does in CFs. As stated in H2, when workers control a firm they should tend to smooth employment levels over the business cycle, avoiding lay-offs during difficult periods as well as having more conservative expansion plans during favorable times.

In Eq. (2), we address endogeneity issues that arise because, in WCs, wages and employment are simultaneously determined. We follow the strategy adopted by Pencavel et al. (2006), using two and three lagged values of $\Delta \ln w_{it}$ as instruments.[21] We present these results in Table 5a. The coefficients for CFs have the expected signs and are significantly different

[16] As we have an unusually long monthly panel ($T = 117$), the Within-Group estimates are consistent, even including a lag of the dependent variable as an explanatory variable (Nickell, 1981; see also Arellano and Bover, 1990; Baltagi, 1995; Arellano, 2003). Originally given by Nickell, the form of the Within-Group estimator bias can be represented as follows: $\underset{N \to \infty}{p\lim}(\hat{\alpha}_{EF} - \alpha) = -\frac{(1-\alpha^2)h_T(\alpha)}{(T-1)}\left(1 - \frac{2\alpha h_T(\alpha)}{(T-1)}\right)^{-1}$. Therefore the bias tends to zero as $T \to \infty$.

[17] As variables are expressed as annual changes, we control for potential season effects.

[18] In terms of formal control rights, there are no differences in employees' position within both CFs and WCs.

[19] Craig and Pencavel (1992) recognize that worker cooperatives could respond differently to market product changes depending on the proportion of non-members in their total employment. However, probably due to lack of information, the authors did not consider this issue in their econometric estimations. Pencavel et al. (2006) argue that in the case of Italy the proportion of non-member workers is insignificant.

[20] See for instance Mas-Colell et al. (1995).

[21] To test the validity of the extra instruments, an over-identifying-restriction test was performed. The results are reported at the lower end of Table 5a. The validity of the instruments was not rejected at the 1% level.

from zero. Thus, changes in employment are negatively related to changes in wages, and changes in output prices are positively correlated with adjustments in the employment level.

By contrast, for WCs the wage–employment relationship is significantly positive. But, the effect of output price changes on employment is not significantly different from zero. For WCs, we cannot reject the hypothesis that employment responds inelastically to output prices changes. The estimates also show that for WCs the relationship between the current change in employment and its lag is significantly smaller than in CFs, indicating that WCs adjust more slowly than CFs.

As shown in Table 5a, we estimated the effect of macroeconomic shocks on employment. The 2002 economic crisis negatively affected the change in employment for both types of firms, but the effect was significantly less dramatic in WCs than CFs. The evidence therefore shows that during the recent crisis, Uruguayan WCs were more inclined than their capitalist counterparts to protect employment.

Finally, in Eq. (2) we separately considered members and non-members in WCs. Our results are shown in Table 5b. The results for cooperative members are similar to those obtained in the general model for WCs. However, when we fitted the employment equation to non-member workers only, in WCs, as in CFs, there is a significant negative wage–employment relationship.

As in the estimation for members, the effect of output price changes on the employment change of non-members is not significantly different from zero. We cannot reject the hypothesis that employment of employees in WCs responds inelastically to output prices changes. Contrary to our expectations, when jointly interpreting both models, we observe that wages and employment of hired workers in WCs would be relatively stable.

6.3. Robustness checks

As mentioned in Section 3.2 most cooperatives formed from the remnants of failed capitalist firms operate in the manufacturing industry. The existence of a WC is therefore considered consistent only in an environment where a CF is expected to become insolvent. When a CF is likely to file for bankruptcy the firm may survive by becoming a WC. The reorganization of the CF into a WC enables the firm to attain the wage bill reduction which is necessary for the firm's survival (Miyazaki, 1984). Traditionally, the literature has explained employee buyouts by arguing that workers may prefer to run the firm in which they work, instead of conceding large wage reduction to the owners. In so doing, workers ensure themselves against unemployment by instituting more flexible compensation schemes than those in CFs (Ben Ner and Jun, 1996).[22]

To ensure that our results are not affected by such dynamics, we re-estimated Eq. (1) while excluding manufacturing coops. We consider this a rough check as not all manufacturing coops originated in failed capitalist firms. The data, however, do not allow us to identify those WCs formed from failed CFs.

Moreover, we performed an additional estimation to consider whether differences in firm size could affect the dynamics of output prices on wages. Hence, Eqs. (1) and (2) were estimated including an interaction term between price changes and firm size dummies. These terms would reflect any differential effect of output price changes on wages and employment that depends on a firm's size.

However, neither the interaction between price changes and firm size (Tables 6a and 6b), nor the exclusion of the manufacturing coops (Tables 7a and 7b) altered the main results presented in Sections 6.1 and 6.2.

6.4. The degeneration hypothesis

In Sections 6.1 and 6.2, we explored information concerning employment of non-members within WCs to determine whether the observed differences between WCs (considering aggregate employment and wages) and CFs remained unchanged when members and non-member workers are considered separately.

But these estimates only address how wages and employment of non-member workers within WCs behave in comparison with wages and employment in conventional firms. We cannot therefore interpret the results as the effects of wages and output price changes on the relative employment of non-members within coops. Hence, we followed a more straightforward strategy to provide an empirical test of the so-called 'degeneration hypothesis'. We estimated the following model.

$$\Delta \ln R_{it} = \Delta \ln R_{it-1}\varphi_0 + x_{it}\phi_1 + \Delta \ln w_{it}\varphi_2 + \Delta \ln p_{it}\varphi_3 + \sigma_i + u_{it} \quad (3)$$

where R_{it} is the ratio of hired workers to total employment for firm i in month t and $\Delta \ln R_{it}$ is the annual change in the logarithm of R_{it}; $\Delta \ln w_{it}$ and $\Delta \ln p_{it}$ are the annual change in the logarithm of wages and prices, respectively. Eq. (3) is estimated for WCs only. As the change in the proportion of non-member workers and wages might be simultaneously determined, $\Delta \ln w_{it}$ is instrumented using its second and third lagged values. Estimates of Eq. (3) also include a lag of the dependent variable and additional control variables to consider the difference in size and distribution across industries. Yearly dummies are also included to control for potential business cycle effects. The results are presented in Table 8.[23]

[22] Ben Ner and Jun (1996) suggest an alternative explanation for employee buyouts within the framework of strategic bargaining. Employees may attempt to overcome their informational handicap regarding firm profitability by making simultaneous offers on wages and a purchase price for the firm.

[23] To test the validity of the extra-instruments we performed the Sargan test. The results are reported at the lower end of Table 5. The validity of the instruments was not rejected at the 1% level.

The change in the ratio between hired workers is negatively related to the change in wages. This relationship is significant at the 5% level. Therefore, an increase in wages results in a reduction of the relative employment of hired workers within coops.

However, we are especially concerned with the coefficient ϕ_3 which reflects the relationship between the change in output prices and the change in the proportion of hired workers. According to the 'degeneration hypothesis', ϕ_3 should be positive. But no significant positive relationship was found.

We obtained similar results when we estimated Eq. (3) for all producer cooperatives, that is, for both WCs and OPCs. The proportion of hired workers in WCs seems to be stable at low levels. However, OPCs also show a stable proportion of hired workers but at high levels.[24] As discussed in Section 5.2, OPCs should not be considered as degenerate WCs. They began with a high ratio of hired workers. Though WCs and OPCs are both registered in the social security records as producer cooperatives, they exhibit very different organizational features. Only WCs fulfill the definition presented in Section 2, and hence correspond to the model generally discussed in the literature.[25] Our evidence suggests that Uruguayan worker cooperatives do not exhibit the kind of degeneration process suggested by the theoretical literature.

This result appears reasonable given the legal framework in Uruguay that regulates WCs' operations. As mentioned in Section 3, to qualify for tax benefits, WCs must keep the ratio of non-member to member from exceeding 20%. This rule seems to provide the appropriate incentive to dynamically enforce high membership ratios within Uruguayan WCs.[26]

Some case studies also reveal that Uruguayan coops usually hire employees to perform tasks that require specific skills. Normally, cooperative members are blue-collar workers participating in direct production activities, while employees are mainly hired to perform managerial tasks (administration, marketing, and accounting). According to this interpretation, WCs would hire non-members merely to compensate for the lack of certain strategic organizational skills among their members. Hence, it is reasonable to expect a relatively constant proportion of non-members.

7. Concluding remarks and further research

Our study demonstrates that capitalist firms and worker cooperatives use different wage and employment adjustment mechanisms. The estimates were conducted using a long-run micro-panel based on Uruguayan social security records.

The evidence we presented is broadly consistent with our initial hypotheses as well as with the previous empirical work. The effect of output price changes on wage variations is positive for both types of firms, but larger in WCs than in CFs. CFs exhibit a well-defined and negative relationship between wages and employment. By contrast, WCs display a well-defined and positive relationship between wages and employment. Thus, for WCs, wages and employment move in the same direction. Additionally, for CFs the effect of output price changes on employment is significantly positive, whereas for WCs we cannot reject the hypothesis that employment variations are insensitive to output price changes.

An analysis of the wage and employment responses to the 2002 crisis suggests that CFs and WCs adjust to shocks differently. For both types of firms, the crisis negatively affected both wages and employment, although the employment adjustment was larger in CFs than in WCs. CFs would produce a socially inefficient level of lay-offs due to their inability to establish credible commitments between owners and workers. By contrast, because of their unique control structure, WCs would have more egalitarian adjustment mechanisms at their disposal.

On the hypothesis of different adjustment mechanisms for members and non-members within WCs, the evidence is inconclusive. As in capitalist firms, there is a significantly negative wage–employment relationship when we exclusively consider employees within WCs. However, non-members, like members, seem to enjoy similar employment guarantees within WCs. Therefore, alternative hypotheses could be plausible and probably more research on this specific issue is required. First, daily workplace interactions could enhance reciprocity and internal solidarity between cooperativess' members and employees, extending employment guarantees to non-member workers within WCs (Bowles and Gintis, 2002). Second, employees could be more qualified than cooperative members, providing them with strong bargaining power enabling them to defend their employment positions and to compensate for their lack of formal control rights over the firm.

We provided an empirical test of the degeneration hypothesis, but there was no evidence to support this hypothesis. Thus, no significant relationship between changes in output prices and changes in the relative employment of hired workers obtained.

Certainly, more research is required to resolve certain limitations of this study. For example, information on work hours and inputs was unavailable. Additionally, due to lack of information on capital, we could not analyze the interdependence between wages, employment, and investment decisions within CFs and WCs. Furthermore, our empirical analysis took the capital stock as predetermined. Lastly, further research should be done focusing on the investment behavior of worker cooperatives.

[24] This result is also important because it proves that the criteria we used to distinguish between WCs and OPCs, based on the relative proportion of hired workers, is not correlated with price changes, which is a key explanatory variable in the models estimated in the previous sections. In other terms, our results are not affected by how we identify WCs within the total population of producer cooperatives.

[25] In addition, an estimation of Eqs. (1) and (2) was performed considering only OPCs. The results indicate that their behavior is similar to CFs.

[26] The importance of the legal framework to enforce a low proportion of hired workers in WCs was also emphasized by Pérotin (2006) when considering the French case.

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Appendix. Tables 1–8

Table 1
Descriptive statistics. Source: Authors' calculation using data from the Banco de Previsión Social.

	1996			2002			2005		
	CFs	WCs	OPCs	CFs	WCs	OPCs	CFs	WCs	OPCs
Number of enterprises	14,784	152	150	13,772	175	125	14,171	198	135
Total employment	171,091	4504	7901	171,582	4434	7079	195,916	5170	7439
Average employment	11.54	29.6	52.58	12.37	25.07	56.4	13.79	26.05	54.86
Employment standard error	66.77	97.95	112.3	74.39	88.37	138.8	76.13	80.64	138.04
Employees (%)	100	7	79	100	7	82	100	8	82
Average wages	9098	14,758	16,343	7296	12,851	11,025	6678	10,448	10,615
Wages standard error	6793	8004	7829	7588	8123	6018	6482	7817	5732
Manufacturing (%)	27.2	18.4	16.0	23.6	16.6	16.0	22.3	17.2	18.5
Transport (%)	15.7	64.5	15.3	19.6	54.9	15.2	22.4	43.9	11.9
Services (%)	16.6	9.9	44.7	17.9	21.7	54.4	17.8	29.8	56.3
Other sectors (%)	40.5	7.2	24.0	38.8	6.9	14.4	37.5	9.1	13.3
Micro-enterprises (%)	68.0	2.6	36.0	67.3	12.0	40.0	64.1	8.6	39.3
Small enterprises (%)	22.8	86.2	23.3	22.5	77.1	28.8	24.4	75.8	23.7
Medium enterprises (%)	7.7	5.9	29.3	8.6	6.9	19.2	9.7	10.6	27.4
Large enterprises (%	1.5	5.3	11.3	1.5	4.0	12.0	1.8	5.1	9.6

Notes: Wages are defined as monthly labor costs per worker and measured as pesos uruguayos deflacted by the official Consumer Price Index (IPC). Enterprises are classified in four sectors: Manufacturing, Transport, Services and Other Sectors. Also, they were classified in four categories according to their size; micro (less than 6 workers), small (between 6 and 19), medium (20 and 100) and large (more than 100 workers).

Table 2
Wage gap. Source: Authors' calculation using data from the Banco de Previsión Social.

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Manufacturing	−0.658	−0.685	−0.760	−0.756	−0.705	−0.685	−0.694	−0.694	−0.668	−0.625
Transport	0.562	0.600	0.694	0.710	0.677	0.722	0.884	0.743	0.898	1.101
Services	−0.447	−0.577	−0.563	−0.534	−0.547	−0.497	−0.420	−0.429	−0.326	−0.304
Other sectors	−0.020	0.148	0.066	0.016	−0.009	−0.155	−0.399	−0.462	−0.507	−0.471
Micro-enterprises	−0.656	−0.490	0.170	0.187	0.404	−0.294	−0.507	−0.059	−0.026	−0.261
Small enterprises	0.088	0.083	0.076	0.054	0.073	0.050	−0.028	−0.189	−0.229	−0.178
Medium enterprises	−0.345	−0.439	−0.588	−0.682	−0.644	−0.625	−0.619	−0.620	−0.623	−0.482
Large enterprises	0.628	0.695	0.903	1.030	1.063	1.164	1.075	0.816	1.017	0.969
Total	0.622	0.643	0.750	0.826	0.815	0.849	0.761	0.551	0.604	0.564

Notes: Enterprises are classified in four sectors: Manufacturing, Transport, Services and Other Sectors. Also, they were classified in four categories according to their size; micro (less than 6 workers), small (between 6 and 19), medium (20 and 100) and large (more than 100 workers). The category "other sectors" includes few observations on worker coops.

Table 3
Definition of variables involved in Eqs. (1)–(3).

Variables	Definition
$\Delta \ln w_{it}$	Annual change in wages (in log form) = $\ln w_{it} - \ln w_{it-12}$. W is derived dividing total labor compensation by total employment and deflacted by consumer price index with December 2005 as base
$\Delta \ln E_{it}$	Annual change in employment (in log form) = $\ln E_{it} - \ln E_{it-12}$. E is total employment
$\Delta \ln p_{it}$	Annual change in output price index (in log form) = $\ln p_{it} - \ln p_{it-12}$
$\Delta \ln R_{it}$	Annual change in the proportion of hired workers (in log form) = $\ln R_{it} - \ln R_{it-12}$. R = hired workers/E
C_i	Dummy variable = 1 if the firm i is WCs and 0 otherwise
Micro_i	Dummy variable = 1 if the firm i employs less than 6 workers and 0 otherwise
Small_i	Dummy variable = 1 if the firm i employs between 6 and 19 and 0 otherwise
Medium_i	Dummy variable = 1 if the firm i employs between 20 and 100 and 0 otherwise
Large_i	Dummy variable = 1 if the firm i employs more than 100 workers and 0 otherwise

Notes: Industry and yearly dummies were also included.

Table 4a
Estimates of the Wage Equation.

	OLS	Within group
Parameter estimates		
$\Delta \ln w_{it-1}$	0.687	0.659
	(0.004)	(0.004)
$\Delta \ln w_{it-1} * C_i$	0.067	0.060
	(0.018)	(0.017)
$\Delta \ln p_{it}$	0.031	0.031
	(0.005)	(0.006)
$\Delta \ln p_{it} * C_i$	0.044	0.121
	(0.032)	(0.035)
Year 2002	−0.036	−0.143
	(0.002)	(0.002)
Year 2002 $* C_i$	0.010	0.007
	(0.007)	(0.008)
Implied effects		
Lagged wage change effect (CFs)	0.687	0.659
	(0.004)	(0.004)
Lagged wage change effect (WCs)	0.755	0.719
	(0.017)	(0.017)
Output price change effect (CFs)	0.031	0.031
	(0.005)	(0.006)
Output price change effect (WCs)	0.075	0.152
	(0.031)	(0.034)
Crisis effect (CFs)	−0.036	−0.143
	(0.002)	(0.002)
Crisis effect (WCs)	−0.026	−0.136
	(0.007)	(0.008)
Observations	860,129	860,129

Notes: Cluster-robust estimated standard errors allowing for intragroup serial correlation are in parentheses. In addition to the variables listed above, the estimates include yearly, sectoral and size dummies.

Table 4b
Estimates of the Wage Equation distinguishing members and employees in WCs.

	Employees		Members	
	OLS	Within group	OLS	Within group
Parameter estimates				
$\Delta \ln w_{it-1}$	0.693	0.666	0.693	0.666
	(0.004)	(0.004)	(0.004)	(0.004)
$\Delta \ln w_{it-1} * C_i$	−0.047	−0.061	0.066	0.060
	(0.033)	(0.038)	(0.017)	(0.017)
$\Delta \ln p_{it}$	0.032	0.032	0.032	0.032
	(0.005)	(0.005)	(0.005)	(0.005)
$\Delta \ln p_{it} * C_i$	−0.178	−0.064	0.053	0.122
	(0.107)	(0.123)	(0.032)	(0.034)
Year 2002	−0.037	−0.140	−0.037	−0.140
	(0.002)	(0.002)	(0.002)	(0.002)
Year 2002 $* C_i$	−0.006	−0.014	0.009	0.005
	(0.018)	(0.022)	(0.007)	(0.008)
Implied effects				
Lagged wages change effect (CFs)	0.693	−0.061	0.693	0.666
	(0.004)	(0.038)	(0.004)	(0.004)
Lagged wages change effect (WCs)	0.646	0.604	0.760	0.725
	(0.033)	(0.038)	(0.017)	(0.017)
Output price change effect (CFs)	0.032	0.032	0.032	0.032
	(0.005)	(0.005)	(0.005)	(0.005)
Output price change effect (WCs)	−0.146	−0.032	0.085	0.155
	(0.108)	(0.123)	(0.032)	(0.034)
Crisis effect (CFs)	−0.037	−0.140	−0.037	−0.140
	(0.002)	(0.002)	(0.002)	(0.002)
Crisis effect (WCs)	−0.043	−0.154	−0.028	−0.135
	(0.018)	(0.022)	(0.007)	(0.008)
Observations	836,792	836,792	846,454	846,454

Notes: Cluster-robust estimated standard errors allowing for intragroup serial correlation are in parentheses. In addition to the variables listed above, the estimates include yearly, sectoral and size dummies. In the first two columns the change in wages for WCs is computed exclusively considering the remuneration of hired workers. On the contrary, in the last two columns the change in wages for WCs is computed exclusively considering members.

Table 5a
Estimates for the Employment Equation.

	OLS	Within group
Parameter estimates		
$\Delta \ln E_{it-1}$	0.862	0.835
	(0.002)	(0.002)
$\Delta \ln E_{it-1} * C_i$	−0.084	−0.091
	(0.033)	(0.032)
$\Delta \ln w_{it}$	−0.043	−0.052
	(0.002)	(0.002)
$\Delta \ln w_{it} * C_i$	0.070	0.079
	(0.011)	(0.013)
$\Delta \ln p_{it}$	0.013	0.007
	(0.003)	(0.004)
$\Delta \ln p_{it} * C_i$	−0.002	−0.006
	(0.025)	(0.023)
Year 2002	−0.036	−0.035
	(0.001)	(0.001)
Year 2002 $* C_i$	0.013	0.013
	(0.005)	(0.006)
Implied effects		
Lagged employment change effect (CFs)	0.862	0.835
	(0.002)	(0.002)
Lagged employment change effect (WCs)	0.777	0.744
	(0.033)	(0.032)
Wage change effect (CFs)	−0.043	−0.052
	(0.002)	(0.002)
Wage change effect (WCs)	0.027	0.027
	(0.011)	(0.013)
Output price change effect (CFs)	0.013	0.007
	(0.003)	(0.004)
Output price change effect (WCs)	0.015	0.002
	(0.025)	(0.023)
Crisis effect (CFs)	−0.036	−0.035
	(0.001)	(0.001)
Crisis effect (WCs)	−0.024	−0.022
	(0.005)	(0.006)
Sargan test	0.018	0.255
	(1)	(1)
	[0.6743]	[0.6137]
Observations	816,392	816,099

Notes: Cluster-robust estimated standard errors allowing for intragroup serial correlation are in parentheses. In addition to the variables listed above, the estimates include yearly, sectoral and size dummies. We report the value of the statistic, the degrees of freedom (in parentheses), and the *p*-value of the Sargan (over-identification) test in square brackets.

Table 5b
Estimates of the Employment Equation distinguishing members and employees in WCs.

	Employees		Members	
	OLS	Within group	OLS	Within group
Parameter estimates				
$\Delta \ln E_{i-1}$	0.855	0.828	0.863	0.835
	(0.002)	(0.002)	(0.002)	(0.002)
$\Delta \ln E_{it-1} * C_i$	−0.024	−0.039	−0.003	−0.003
	(0.025)	(0.029)	(0.023)	(0.025)
$\Delta \ln w_{it}$	−0.045	−0.054	−0.044	−0.054
	(0.002)	(0.002)	(0.002)	(0.002)
$\Delta \ln w_{it} * C_i$	−0.003	−0.010	0.063	0.071
	(0.019)	(0.022)	(0.008)	(0.008)
$\Delta \ln p_{it}$	0.014	0.008	0.012	0.007
	(0.003)	(0.004)	(0.003)	(0.003)
$\Delta \ln p_{it} * C_i$	−0.067	−0.030	−0.017	−0.014
	(0.082)	(0.088)	(0.023)	(0.02)
Year 2002	−0.011	−0.037	−0.037	−0.035
	(0.001)	(0.001)	(0.001)	(0.001)
Year 2002 $* C_i$	−0.012	−0.032	0.019	0.023
	(0.018)	(0.022)	(0.003)	(0.004)

(*continued on next page*)

Table 5b (*continued*)

	Employees		Members	
	OLS	Within group	OLS	Within group
Implied effects				
Lagged Employment change effect (CFs)	0.855	0.828	0.863	0.835
	(0.002)	(0.002)	(0.002)	(0.002)
Lagged Employment change effect (WCs)	0.831	0.789	0.860	0.832
	(0.025)	(0.029)	(0.023)	(0.025)
Wage change effect (CFs)	−0.045	−0.054	−0.044	−0.054
	(0.002)	(0.002)	(0.002)	(0.002)
Wage change effect (WCs)	−0.047	−0.065	0.019	0.017
	(0.018)	(0.022)	(0.008)	(0.008)
Output price change effect (CFs)	0.014	0.008	0.012	0.007
	(0.003)	(0.004)	(0.003)	(0.003)
Output price change effect (WCs)	−0.053	−0.021	−0.005	−0.007
	(0.082)	(0.088)	(0.023)	(0.019)
Crisis effect (CFs)	−0.011	−0.037	−0.037	−0.035
	(0.001)	(0.001)	(0.001)	(0.001)
Crisis effect (WCs)	−0.023	−0.069	−0.018	−0.012
	(0.018)	(0.022)	(0.003)	(0.004)
Sargan test			2.976	1.508
			(1)	(1)
			0.0845	0.2195
Observations	836,792	836,792	801,588	801,588

Notes: Cluster-robust estimated standard errors allowing for intragroup serial correlation are in parentheses. In addition to the variables listed above, the estimates include yearly, sectoral and size dummies. In the first two columns the change in employment for WCs is computed exclusively considering the employment of hired workers. On the contrary, in the last two columns the change in wages for WCs is computed exclusively considering members. We report the value of the statistic, the degrees of freedom (in parentheses), and the *p*-value of the Sargan (over-identification) test in square brackets.

Table 6a
Estimates of the Wage Equation controlling price-slope by size.

	Within group	Within group slope control
Parameter estimates		
$\Delta \ln w_{it-1}$	0.659	0.659
	(0.004)	(0.004)
$\Delta \ln w_{it-1} * C_i$	0.060	0.060
	(0.017)	(0.017)
$\Delta \ln p_{it}$	0.031	0.020
	(0.006)	(0.007)
$\Delta \ln p_{it} * C_i$	0.121	0.104
	(0.035)	(0.035)
$\Delta \ln p_{it} * \text{small}_i$		0.028
		(0.012)
$\Delta \ln p_{it} * \text{medium}_i$		0.027
		(0.017)
$\Delta \ln p_{it} * \text{large}_i$		0.037
		(0.029)
Implied effects		
Lagged wages change effect (CFs)	0.659	0.659
	(0.004)	(0.004)
Lagged wages change effect (WCs)	0.719	0.719
	(0.017)	(0.017)
Output price change effect (CFs)	0.031	0.020
	(0.006)	(0.007)
Output price change effect (WCs)	0.152	0.124
	(0.034)	(0.036)
Observations	860,129	860,129

Notes: Cluster-robust estimated standard errors allowing for intragroup serial correlation are in parentheses. In addition to the variables listed above, the estimates include yearly, sectoral and size dummies.

Table 6b
Estimates for the employment equation controlling price-slope by size.

	Within group	Within group slope control
Parameter estimates		
$\Delta \ln E_{it-1}$	0.835	0.835
	(0.002)	(0.002)
$\Delta \ln E_{it-1} * C_i$	−0.091	−0.092
	(0.032)	(0.031)
$\Delta \ln w_{it}$	−0.052	−0.052
	(0.002)	(0.002)
$\Delta \ln w_{it} * C_i$	0.079	0.076
	(0.013)	(0.013)
$\Delta \ln p_{it}$	0.007	0.009
	(0.004)	(0.005)
$\Delta \ln p_{it} * C_i$	−0.006	0.003
	(0.023)	(0.022)
$\Delta \ln p_{it} * \text{small}_i$		−0.003
		(0.009)
$\Delta \ln p_{it} * \text{medium}_i$		−0.005
		(0.013)
$\Delta \ln p_{it} * \text{large}_i$		−0.019
		(0.02)
Implied effects		
Lagged employment change effect (CFs)	0.835	0.835
	(0.002)	(0.002)
Lagged employment change effect (WCs)	0.744	0.743
	(0.032)	(0.031)
Wage change effect (CFs)	−0.052	−0.052
	(0.002)	(0.002)
Wage change effect (WCs)	0.027	0.023
	(0.013)	(0.013)
Output price change effect (CFs)	0.007	0.009
	(0.004)	(0.005)
Output price change effect (WCs)	0.002	0.012
	(0.023)	(0.023)
Sargan test	0.255	0.339
	(1)	(1)
	0.614	0.561
Observations	816,099	816,099

Notes: Cluster-robust estimated standard errors allowing for intragroup serial correlation are in parentheses. In addition to the variables listed above, the estimates include yearly, sectoral and size dummies. We report the value of the statistic, the degrees of freedom (in parentheses), and the *p*-value of the Sargan (over-identification) test in square brackets.

Table 7a
Estimates of the Wage Equation (excluding manufacturing WCs).

	Within group including industry	Within group without industry
Parameter estimates		
$\Delta \ln w_{it-1}$	0.659	0.654
	(0.004)	(0.005)
$\Delta \ln w_{it-1} * C_i$	0.06	0.097
	(0.017)	(0.018)
$\Delta \ln p_{it}$	0.031	0.027
	(0.006)	(0.006)
$\Delta \ln p_{it} * C_i$	0.121	0.08
	(0.035)	(0.042)
Implied effects		
Lagged wages change effect (CFs)	0.659	0.654
	(0.004)	(0.005)
Lagged wages change effect (WCs)	0.719	0.752
	(0.017)	(0.018)
Output price change effect (CFs)	0.031	0.027
	(0.006)	(0.006)
Output price change effect (WCs)	0.152	0.107
	(0.034)	(0.042)
Observations	860,129	700,356

Notes: Cluster-robust estimated standard errors allowing for intragroup serial correlation are in parentheses. In addition to the variables listed above, the estimates include yearly, sectoral and size dummies.

Table 7b
Estimates for the Employment Equation (excluding manufacturing WCs).

	Within group including industry	Within group without industry
Parameter estimates		
$\Delta \ln E_{it-1}$	0.835	0.830
	(0.002)	(0.003)
$\Delta \ln E_{it-1} * C_i$	−0.091	−0.081
	(0.032)	(0.036)
$\Delta \ln w_{it}$	−0.052	−0.061
	(0.002)	(0.003)
$\Delta \ln w_{it} * C_i$	0.079	0.084
	(0.013)	(0.015)
$\Delta \ln p_{it}$	0.007	0.008
	(0.004)	(0.005)
$\Delta \ln p_{it} * C_i$	−0.006	0.015
	(0.023)	(0.034)
Implied effects		
Lagged Employment change effect (CFs)	0.835	0.830
	(0.002)	(0.003)
Lagged Employment change effect (WCs)	0.744	0.749
	(0.032)	(0.036)
Wage change effect (CFs)	−0.052	−0.061
	(0.002)	(0.003)
Wage change effect (WCs)	0.027	0.023
	(0.013)	(0.015)
Output price change effect (CFs)	0.007	0.008
	(0.004)	(0.005)
Output price change effect (WCs)	0.002	0.023
	(0.023)	(0.034)
Sargan test	0.255	1.194
	(1)	(1)
	0.614	0.275
Observations	816,099	664,299

Notes: Cluster-robust estimated standard errors allowing for intragroup serial correlation are in parentheses. In addition to the variables listed above, the estimates include yearly, sectoral and size dummies. We report the value of the statistic, the degrees of freedom (in parentheses), and the *p*-value of the Sargan (over-identification) test in square brackets.

Table 8
Estimates of the Ratio Employees/Workers Equation.

	Only worker cooperatives		All producer cooperatives (WCs + OPCs)	
	OLS	Within group	OLS	Within group
Parameter estimates				
$\Delta \ln R_{it-1}$	0.790	0.766	0.823	0.807
	(0.034)	(0.032)	(0.019)	(0.02)
$\Delta \ln w_{it}$	−0.010	−0.087	−0.007	−0.058
	(0.04)	(0.049)	(0.016)	(0.023)
$\Delta \ln p_{it}$	−0.060	0.010	−0.027	−0.005
	(0.083)	(0.09)	(0.037)	(0.041)
Sargan test		0.531		1.409
		(1)		(1)
		0.466		0.235
Observations	4415	4303	13,049	12,586

Notes: Cluster–robust estimated standard errors allowing for intragroup serial correlation are in parentheses. In addition to the variables listed above, the estimates include yearly, sectoral and size dummies. We report the value of the statistic, the degrees of freedom (in parentheses), and the *p*-value of the Sargan (over-identification) test in square brackets.

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