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Abstract

Worker-managed firms (WMFs) represent a marginal proportion of total firms and aggregate employment in most countries. The bulk of firms in real economies is ultimately controlled by capital suppliers. Different theoretical explanations suggest that WMFs are prone to failure in competitive environments. Using a panel of Uruguayan firms based on social security records and including the entire population of WMFs over the period January 1997-July 2009, I present new evidence on worker managed firms´ survival. I find that the hazard of exit is 24%-38% lower for WMFs than for conventional firms. This result is robust to alternative estimation strategies based on semi-parametric and parametric frailty duration models that impose different distributional assumptions about the shape of the baseline hazard and allow to consider firm-level unobserved heterogeneity. The evidence suggests that the marginal presence of WMFs in market economies can hardly be explained by the fact that these organizations exhibit lower survival chances than conventional firms. This paper adds to the literature on labor-managed firms, shared capitalism and to the industrial organization literature on firm survival.

Keywords: labor-managed firms, capitalist firms, survival analysis.
JEL Codes: P13, P51, C41

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1. Introduction

Samuelson (1957) claims that in a perfectly competitive market it does not really matter who hires whom. In other words, it is irrelevant whether entrepreneurial functions are carried out either by capital or labor.[1] This statement seems to be at odds with the fact that most firms in the real-world are ultimately controlled by capital suppliers and that worker-managed firms (WMFs) represent a marginal proportion of total firms and aggregate employment in most countries.

Recent developments in economic theory have provided several competing explanations to account for these facts. One important concern in this debate is to determine whether the rarity of WMFs is explained by structural obstacles that impede their formation or by internal inefficiencies leading this type of firms to a higher rate of failure compared with conventional enterprises.

I provide an empirical assessment of the comparative survivability of WMFs and conventional firms (CFs) based on a long panel of Uruguayan firms. The study exploits social security administrative records containing monthly information on the total population of Uruguayan WMFs and their conventional counterparts in 112 3-digit sectors over the period January 1997-July 2009.

Cox model estimates indicate that the hazard of exit is 24%-38% lower for WMFs than for CFs. The main result is robust to alternative estimation strategies based on parametric frailty survival models that impose different distributional assumptions about the shape of the baseline hazard and allow to consider firm-level unobserved heterogeneity.

This paper adds to the literature on labor-managed firms (for the most recent review see Pencavel, 2012). Its main contribution relies on the fact that empirical work on the effect of workers´ control on firm survival is not frequent. Previous work comparing worker-managed firms and conventional firms has been mainly concerned with employment and

[1] The original argument goes back to Wicksell (1967) [1893].

wages adjustments, productivity and business cycle determinants of entry and exit.[2] While there is some evidence on the effect of unions and employee stock ownership plans (ESOPs) on firm survivability, this is to my knowledge one of the first studies on firm survival comparing conventional firms and firms fully controlled by their workforce. In contrast to previous descriptive research on worker-managed firms´ survivability, I rely on appropriate micro data for both types of firms and fully exploit available survival analysis techniques. Finally, the analysis of worker-managed firms, the most radical implementation of workplace democracy and profit-sharing, may also shed light on the potential effects of more limited participatory initiatives at the firm level. Thus, this paper also contributes to the growing body of recent literature on shared capitalism (Kruse et at, 2010; Bryson et at, 2012).

The rest of the paper is organized as follows. In section 2, I briefly discuss the theoretical literature relating worker control and firm performance and review previous empirical studies. In section 3, background information about Uruguayan WMFs is presented. In section 4, I describe the data and provide some descriptive statistics. Section 5 defines the basic concepts in survival analysis. Section 6 presents the results of the Cox model baseline estimates. Section 7 addresses the robustness of the results to alternative model specifications and estimation methods. Section 8 concludes.

2. Theoretical literature and previous evidence

According to Dow (2003), any theoretical explanation concerning the paucity of WMFs in real economies should rely on the identification of relevant physical and institutional asymmetries between capital and labor. The author points out that while human capital is not alienable, the ownership of non-human assets can be transferred from one person to another. This means that the crucial point to develop causal explanations regarding the rarity of WMFs rests on the inalienability of labor. Dow identifies three types of asymmetries that may be important to account for different survival prospects of WMFs compared with CFs.

2 See for instance Craig and Pencavel (1992; 1995), Doucouliagos (1995), Pencavel et al (2006), Perotin (2006) and Fakhfakh et al (2009).

First, there are *commodification asymmetries* involving the ability of members to trade control positions in markets (Dow, 2003, p236). In a conventional firm, shares of stock conferring voting rights can be transferred from one person to another without changing firm's physical assets. By contrast, it is impossible to transfer control rights in a WMF without replacing one person by another in the labor process. This is one potential explanation of why membership markets are rare and, hence, why assets in WMFs are usually owned by their workforce collectively. Under collective ownership, WMFs would make inefficient employment and investment decisions which in turn may negatively affect their survival chances compared with conventional firms (Ward, 1958; Furubotn, 1976).

The basic neoclassical model predicts that WMFs would not respond in the usual way to changes in the product price; instead, they would reduce the level of employment and output when the market price increases (Ward, 1958). The model assumes that WMFs maximizes revenue per worker rather than total profits. The theoretical foundations of this seminal model have been harshly criticized in the literature and the backward supply response of WMFs has not been empirically confirmed.[3] However, there is ample evidence that employment responses to demand shocks are less elastic in WMFs compared with conventional firms (Craig and Pencavel, 1992; Pencavel et al, 2006; Burdín and Dean, 2009). Employment smoothing may be costly for WMFs, specially in industries in which employment variability is high, even though it may also provide incentives for investments in training and firm-specific human capital (Levine and Parkin, 1994). Regarding investment decisions, WMFs would suffer from the so-called horizon problem (Furubotn, 1976). As worker-members have no claim on future investments´ returns after separation from their firm, the evaluation of investment projects will be truncated to the members´ expected employment horizon. Workers would prefer to distribute income in the current period instead of financing investments, unless the expected rate of return exceeds the workers' opportunity cost of the funds by an amount that depends inversely on their

[3] This result does not necessarily hold in the case of multiproduct WMFs and when the production process involves other variable inputs additional to labor. Moreover, it has been argued that the predicted adjustment of the employment level becomes totally unfeasible once the institutional features of WMFs are considered carefully. Particularly, worker-members will be reluctant to vote for the expulsion of incumbent members because they face similar probabilities of being selected for expulsion (see, for instance, Moene, 1989).

expected tenure within the firm (Gui, 1984). Therefore, WMFs would underinvest and would only carry out projects with short-run returns. Moreover, members of a WMF must supply financial resources as well as labor and, hence, they would invest their savings in an asset whose returns are highly correlated with the returns on their human capital. But this would be incompatible with the desire of risk-averse workers to maintain a diversified financial portfolio (Dow and Putterman, 2000).

Second, there are *commitment asymmetries* concerning the capacity of firm controllers to extend credible commitments to the suppliers of non-controlling factors. Dow argues that while giving control rights to the workforce facilitates the alignment of workers´ incentives within the firm, it also makes more difficult to offer credible guarantees of repayment to investors (see also Bowles and Gintis, 1994). As in WMFs the conflict of interest between managers and workers is eliminated, this type of firms would reduce supervision costs and elicit higher levels of effort combining profit sharing and mutual monitoring (Carpenter et al, 2009).[4] However, WMFs would face a disadvantage to attract capital as members may not act in the interest of the lender. They may decide to pay high wages, misuse the capital equipment or engage in risky projects. According to Dow, the net effect of these commitment problems toward labor and capital is to bias the allocation of control rights over firms against labor. While capitalist firms develop social conventions that would make the workplace conflict tolerable, WMFs – mainly composed by wealth-constrained workers- would have limited access to capital markets.

Finally, there are also *composition asymmetries*, involving disparities in the characteristics of control groups, such as their size or the degree of heterogeneity in members‘ preferences. The problems faced by WMFs with an heterogeneous workforce have been pointed out notably by Hansmann (1996). WMFs may face higher costs of collective-decision making associated with democratic governance compared with conventional organizations. While capital suppliers unanimously support the maximization of profit, workers may have widely

[4] In contrast with the literature on incentive problems associated with team production and group-based compensation schemes (Alchian and Demsetz, 1972), available empirical evidence generally indicate that worker cooperatives outperform conventional firms in terms of productivity (Craig and Penvacel, 1995; Fakhfakh et at, 2012)

different attitudes toward effort, investment decisions, wage levels, job security and other workplace amenities.[5] For instance, the problem associated with the determination of the wage structure in WMFs with an heterogeneous workforce (in terms of ability) has motivated some theoretical models (Gui, 1987; Kremer, 1997; Abramitzky, 2008).[6] These models predict redistribution within WMFs which in turn may cause the outflow of high ability workers.[7] There is empirical support to the idea that the presence of skilled labor has a positive and significant effect on firm survival (Gimeno et al, 1997; Mata and Portugal, 2002; Geroski et al, 2010). Hence, the inability of WMFs to retain skilled labor may negatively affect their survival chances compared with conventional firms.[8]

In contrast to the extensive theoretical literature on the potential effects of workers´ participation on firm performance, empirical work studying the relationship between workers´ control and firm survival is very uncommon. Seminal studies on WMFs survival have usually lacked information on conventional firms. For instance, Perotin (1987) compared the characteristics of dying and surviving worker cooperatives in France during the period 1979-1982, based on a sample of 1000 cooperative firms collected in 1978-1979. The author performed an exploratory empirical analysis, testing mean differences of several firm-level characteristics between the two groups. Evidence of a shorter supply of capital funds was found among dying cooperatives. Ben Ner (1988) presented comparative demographic evidence of WMFs and conventional firms in UK during the period 1974-1986. He found that the hazard of exit is at least three times higher for conventional firms, even though the comparison did not control for other firm-level characteristics. Staber (1989) analyzed the lifespan of WMFs formed in Atlantic Canada between 1940 and 1947. The determinants of worker coops´ survival were estimated using a Cox-model and compared it with aggregate data on conventional firms in some industries. The author found

[5] However, it should be noted that investor may have different time horizons and time preference rates and these may result in conflicting investment decisions in capitalist firms (Pencavel, 2011).
[6] Abramitzky´s model refers to the Israeli Kibbutzim.
[7] Indeed, survey evidence indicates that WMFs usually prefer more egalitarian wage policies than conventional firms (see, for instance, Onaran, 1992; Bartlett et al, 1992).
[8] However, it must be pointed out that the trade-off between intra-firm redistribution and incentives suggested by these models has been challenged. For instance, there is an extensive literature arguing that inequality may be detrimental for firm performance if it increases perceptions of unfairness among workers and deters cooperation in the workplace (Akerlof and Yellen, 1990; Levine, 1991; Baron and Pfeffer 1994). The

that the pattern of age dependence is non-monotonic, i.e. survival chances of worker coops do not consistently improve with age. Perotin (2004) analyzed the hazard of exit of worker cooperatives, using data of 2,740 worker cooperatives created in France during the period 1977–1993. The empirical strategy of the study was based on non parametric estimates of the hazard function. Interestingly, the author compared worker coops created from scratch with those created either through rescues of failing firms or conversions from conventional firms. Perotin found that worker coops experience a "honeymoon" period in which the risk of closure is low. Results are compared with previous evidence for conventional firms, concluding that the honeymoon period is absent in general among French firms.

Close to the empirical approach adopted in this paper, Park et al (2004) studied the effect of employee ownership plans (ESOPs) on firm survival, relying on data from U.S. public companies.[9] The estimates were performed using a Weibull parametric model. The study found that employee ownership increases the probability of survival. The author suggested that the higher survival may be explained by the greater employment stability exhibited by these companies.[10]

3. Worker-managed firms in Uruguay

In Uruguay, WMFs are defined as firms legally registered as Producer Cooperatives in which the ratio between permanent employees and members does not exceed 20%. Despite the fact that WMFs are allowed to hire temporary employees in response to seasonal demand changes, they must fulfill this maximum level of hired workers to be entitled with certain tax advantages. In particular, WMFs are exempted from the employer payroll tax to social security. Finally, the law defines a minimum of six members in order to register a new cooperative firm.

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evidence based on linked employer-employee data is not conclusive (Winter-Ebmer and Zweimuller, 1999; Heyman, 2005; Lallemand et al, 2007; Martins, 2008; Grund and Westergaard, 2008).

[9] A related strand of research analyzes the relationship between unionization and closures (Freeman and Kleiner, 1992; Bryson, 2004; Di Nardo and Lee, 2004).

[10] However, this study identified employee-owned firms as those in which workers own 5% or more stock of the company. The fact that workers own less than 20% stock in 84% of the employee-owned firms in the sample raises the concern about the limited scope of workers´ control in these companies.

Even though certain key organizational features are predetermined by law, WMFs are free to decide upon a broad range of associational rules. Regarding their governance structure, WMFs have a General Worker Assembly that selects a Council (who usually selects the managers) to supervise the daily operations. Each member within the assembly has only one vote, regardless of her capital contribution to the firm. In Uruguay, WMFs are collectively owned by their workers. As is common in other countries, membership markets are extremely rare in Uruguay.[11] WMFs usually use two sources to finance their activities: bank loans and retained earnings. However, it must be pointed out that conventional firms in Uruguay are mostly controlled as closely held corporations. Capital markets have played a minimal role in the financing and capitalization of firms.

Previous studies have shown that Uruguayan WMFs exhibit a different adjustment process of wage and employment levels compared with conventional firms. Facing industry-specific and macroeconomic shocks, employment responses seem to be less elastic in WMFs than in conventional firms (Burdin and Dean, 2009; 2012).

4. Data and descriptive statistics

This study is performed using an unbalanced panel of Uruguayan firms, consisting of monthly firm-level observations over the period January 1997- July 2009. The data set is based on social security administrative records provided by *Banco de Previsión Social* (BPS), the public agency in charge of social security affairs in Uruguay. The dataset covers the entire population of firms registered as Producer Cooperatives and conventional firms in 112 3-digit sectors in which there was registered at least one Producer Cooperative during that period.

All private Uruguayan firms must transfer employees' social security contributions; when a new firm is registered as active in BPS files, an entry can be identified in the databases, while a firm cancellation indicates it is no longer active as such (i.e., a "failure"). Hence,

[11] Recent survey evidence indicates that less than 10% of Uruguayan WMFs are owned by their workforce through individual shares (Alves et al, 2012).

the date of entry and exit of each firm can be determined accurately.[12] In addition, the data set includes information regarding firms´ industry class (5 digits, ISIC, fourth revision), employment, and average wage, distinguishing this information for members and non-members in WMFs.[13]

Previous studies on Uruguayan WMFs have pointed out that not all firms registered as Producer Cooperatives should be considered as WMFs. Specifically, in many firms legally registered as Producer Cooperatives the majority of the workforce has no control over firm decisions as in conventional firms. Following the procedure adopted in previous studies (Burdín and Dean, 2009; 2012), I distinguish WMFs from the total population of producer cooperatives using information of the ratio between employees and members. I define WMFs as those firms registered as Producer Cooperatives in which this ratio is below 20%.[14] I drop observations on producer cooperatives in which the computed employee to member ratio is greater than 20%. Finally, following a common practice in studies on firm survival, left-censored firms (i.e. firms that were already active in January 1997) were also dropped.

Table 1 reports the basic information on the firm-level panel for the final sample. There are 29125 firms, including 223 WMFs (1% of total firms in the sample).[15] The number of firms´ failures is 15308, including 90 failures of WMFs.[16] "Failure" is a dummy variable which takes value 1 if the firm exits during the period and 0 for right-censored firms. It is worth noticing that the average failure rate is lower in WMFs (40.4%) than in CFs (53%). [17]

Regarding the characteristics of both types of firms, Table 2 presents the descriptive statistics. Both the size and sectoral composition of WMFs and CFs differ. Firm star up size

[12] Audretsch et al (1999) investigated the relationship between start up size and firm survival also using social security records from Italy.
[13] Unfortunately, information regarding other de-registrations motives is not available (e.g. mergers, takeovers).
[14] The employee to member ratio is measured at the entry date.
[15] All Tables and Figures are presented in the Appendix.
[16] The average exit time is 43 month (3.6 years). As there are right censored firms, this is just the average follow-up time and not average survival time.
[17] Table 1 also reports that there are approximately 15% of firms with time gaps (interval truncation). Temporal exits from the panel were not considered as failures.

is larger in WMFs than in CFs. While most CFs (84%) are classified as micro-enterprises (less than 6 workers)[18], WMFs (63%) are typically small firms (between 6 and 18 workers). This is due to the fact that the Uruguayan law determines that WMFs cannot be formed with less than six members. WMFs are highly concentrated in Services (49%) and CFs are more frequently located in Manufacturing, Transport and Other Sectors (Construction, Electricity and Retail Trade). The average firm wage at the entry date is higher in CFs than in WMFs. Birth and exit rates of WMFs and CFs during this period are presented in Figure I and II. The average birth and exit rate for WMFs is 10% and 7% respectively. In the case of CFs, 11% of firms enter and 11% of firms exit the market in a given year (when microenterprises are excluded the average birth and exit rates are 5.5% and 7.5% in that order).

In Figure III and IV, I plot non-parametric estimates of the survivor and hazard function, pooling all cohorts of newly formed firms during the period 1997-2009.[19] At first glance, WMFs seem to have a lower hazard rate than CFs. According to the Log-rank test, I reject the null hypothesis of equality of the survivor functions ($\chi_{(1)} = 10.1$).[20] The hazard exhibits an inverted U-shape for both WMFs and CFs, reaching a maximum around the second year of the firm lifespan and then decreasing with firm age. The pattern of greater vulnerability of young firms observed in the data seems consistent with the "liability of newness" argument developed in the organizational ecology and industrial organizational literature on firm survival (Jovanovic, 1982; Freeman et al, 1983; Geroski, 1995). [21]

[18] This size distribution is characteristic of Uruguayan firms. For instance, data from the National Statistical Institute indicate that 83% of Uruguayan firms employed less than 5 workers in 2010 (www.ine.gub.uy).
[19] In Figure V, I plot separate survivor functions for different cohorts of firms.
[20] Burdín and Dean (2010) obtained similar results comparing non parametric estimates of the hazard of exit for Uruguayan WMFs and CFs over the period 1996-2005.
[21] This literature recognizes that the risk of dying of an organization varies during its life course.The liability of newness phenomenon refers to the fact at the point of founding the risk of dying is highest and decreases with growing age of the organization. First, new organizations have not yet built a stable portfolios of clients. Second, learning of new roles and tasks takes time andd lead to inefficiencies. Third, as in most cases the new employees of a firm do not know each other when the firm is founded, trust among the organizational membbers has to be developed (see Stinchcombe, 1965).

5. Econometric framework

The variable of interest in the analysis of firm survival is the time elapsed between entry and exit.[22] The lifespan of each firm either can be fully observed (complete spell) or right-censored (incomplete spell). It is assumed that the length of this spell $t > 0$ is the realization of a random variable T with a cumulative distribution function (cdf) and probability distribution function (pdf) given by $F(t)$ and $f(t)$ respectively. $F(t)$ is also known as the failure function. The survivor function is defined as $S(t) \equiv 1 - F(t)$ and represents the probability of surviving beyond time *t*. More precisely, $P(T \leq t) = F(t)$, which implies for the survivor function that $P(T > t) = 1 - F(t) \equiv S(t)$. The pdf is the slope of the failure function such that, $f(t) = \lim_{\Delta t \to 0} \frac{P(t \leq T \leq t + \Delta t)}{\Delta t} = \frac{\partial F(t)}{\partial t} = -\frac{\partial S(t)}{\partial t}$.

The survivor function $S(t)$ and the failure function $F(t)$ both satisfy the properties of probabilities. $S(t)$ lies between 0 and 1 and is strictly decreasing in *t*, $S(t)$ is equal to one at the beginning of the spell and zero at infinity.[23] The hazard rate, $h(t)$, is defined as the instantaneous chance of failure at time *t*. More precisely, it is the conditional probability that the firm exits the market at time *t*, conditional on the fact that the firm has been active until *t*. Formally, $h(t) = \frac{f(t)}{1 - F(t)} = \frac{f(t)}{S(t)}$. Finally, the cumulative hazard rate, $H(t)$, is defined as the integral of the hazard rates over (0, t), such that $H(t) \equiv \int_0^t h(u)du$.[24]

The shape of the hazard function is in principle unknown so in order to investigate the effect of the status of WMF on the hazard of exit it is necessary to impose distributional assumptions concerning the shape of the hazard function over time. To avoid misspecification errors, I estimate a Cox proportional hazard model originally proposed by Cox (1972). The main advantage of this model relies on the fact that it is possible to

[22] This section draws on Jenkins (2005).

[23] Formally: i) $0 \leq S(t) \leq 1$, ii) $S(0) = 1$, iii) $\lim_{t \to \infty} S(t) = 0$, iv) $\partial S / \partial t < 0$.

[24] The only restriction on the hazard rate is that $h(t) \geq 0$. Note that $H(t) \geq 0$ and $\partial H(t) / \partial t = h(t)$.

estimate the relationship between the hazard rate and the covariates without making assumptions about the functional form of the baseline hazard.

The Cox model is specified as follows:

$$h(t \mid .) = h_0(t) \exp(\beta_1 COOP_i + \beta_2 X_i) \quad (1)$$

where $h_0(t)$ is the baseline hazard function, COOP is a dummy variable that takes value equal to one if the firm is a WMF and X is a vector of control variables (firm size and average wage at the entry date, cohort dummies, industry dummies). The coefficient of interest is β_1. The effect of a unit change in a covariate is to produce a constant proportional change in the hazard rate, i.e. the proportional hazard assumption.

6. Results

Table 3 reports the estimates of the baseline Cox-model. In Column (1), the estimation only controls for firm's star up size and average wage. More precisely, estimates include a dummy variable taking value of unity for those firms employing more than 19 workers, which is the employment level defining the boundary between micro-small and medium-large firms in Uruguay.[25] The firm average wage at the entry date is included as a rough proxy of the initial endowment of human capital within the firm. In Column (2), the estimates include 5 industry dummies in order to control for time-constant industry characteristics.

It has been argued that the environment at the time of birth largely determines the strategic choices of firms. Organizations founded in unfavorable times are unlikely to be close to their optimal structural configuration and may not be able to find the right kind of resources, make the correct organization specific investments, or design appropriate

[25] Larger firms may face cost advantages with respect to small firms. For instance, they may have better access to credit and labor markets which improve their survival prospects (Caves, 1998; Geroski, 1995; Audretsch and Mahmood 1995, Mata and Portugal 1994; Esteve et al, 2004).

organizational routines (Geroski et al, 2010). Furthermore, entrepreneurs who have entered self employment from unemployment exhibit higher exit rates than those who have entered from paid employment (Pfeiffer and Reize, 2000). Indeed, there is evidence pointing out that if the underlying motivation to start a new firm is linked to innovative projects, then better post-entry performance may be expected than if a new firm is started on the basis of a purely "defensive" motivation, such as the fear of becoming unemployed (Vivarelli and Audretsch, 1998; Santarelli and Vivarelli, 2007). The effect of founding conditions may be important in this setting as it is well known that WMFs exhibit higher formation rates in recessions (Perotin, 2006). Therefore, in Column (3) estimates also include 12 cohort dummies in order to control for macroeconomic conditions at the time of entry.[26]

Results indicate that WMFs exhibit higher survival chances than capitalist firms and the difference is highly significant in all specifications. According to estimates reported in Column (3) of Table 3, the hazard of dissolution is about 31% lower for WMFs than for CFs. [27] The included control variables have the expected effect. In line with the large IO literature on firm survival, there is a negative and significant relationship between initial firm's size and the hazard of exit (Caves, 1998; Geroski, 1995; Audretsch and Mahmood 1995, Mata and Portugal 1994; Esteve et al, 2004). Moreover, survival prospects are positively associated with the firm average wage at the time of entry. The estimated survivor and hazard functions - obtained from the Cox regression- are plotted in Figure VII.

To check the sensitivity of the results, additional estimates were performed defining star up size as the log of employment at the entry date. I also try controlling for current firm size (two dummy variables distinguishing micro-small, medium and large firms). I performed estimates including year fixed effects to control for current macroeconomic conditions. Estimates were also performed including 66 2-digit industry dummies. Additional estimates

[26] The inclusion of cohort dummies also ensures that the assumption that the true duration is independent of the starting and censoring time holds (Wooldridge, 2001: p696).

[27] I check the empirical plausibility of the proportional hazard assumption by means of graphical methods (Cleves et al, 2008). This assumption seems to be satisfied by the data (Figure VI). According to the test based on the Schoenfeld residuals for the variable *Coop*, I do not reject the proportional hazard assumption. However, the proportional hazard assumption is rejected when the global test of the model is considered (Table 4). For this reason, in the next section I analyze the sensitivity of the results providing additional estimates of parametric models that do not rely on the PH assumption.

excluded firms with time gaps in their records. Finally, to check whether the result is not driven by the way I identified WMFs, I estimated the Cox model comparing conventional firms with all firms registered as Producer Cooperatives. Neither of these modifications alter the basic results.[28]

However, the observed difference in firm turnover between WMFs and CFs may simply reflect industry differences in demand volatility. Indeed, non parametric estimates of survival and hazard functions differ across industries (see Figure VIII). For instance, survival rates are lower for construction and retail trade firms compared with transport and manufacturing firms. Therefore, in Column (1) of Table 5, I present the results of additional estimates of the baseline Cox model, excluding construction and retail trade firms. I exclude these sectors because the presence of WMFs is comparatively low. The results are very similar compared with baseline estimates. The hazard ratio is 0.68 (exp(-0.38)). This means that even excluding firms located in high firm turnover sectors the hazard of exit is 32% for WMFs than for CFs. [29]

In Column (2)-(4) of Table 5, I report the results of separate estimates for Manufacturing, Transport and Services. While in Manufacturing and Transport the hazard of exit is not significantly different, in the Service sector the hazard of exit of WMFs is 53% lower compared with CFs. Thus, the better performance of WMFs in the Service sector explains the aggregate results obtained in the baseline estimates. This is consistent with fact that firms in the services sector have lower physical capital requirements compared to other sectors. Moreover, the performance of service firms may be highly dependent on the quality of human resource management. According to theoretical explanations sketched in section 2, this is precisely the kind of economic environment in which WMFs may outperform conventional firms (see, for instance, Bowles and Gintis, 1994; Dow, 2003).

[28] All these additional estimates are available from the author upon request.
[29] It is worth noticing that during this period the Uruguayan law forbade the formation of WMFs in Retail Trade.

7. Robustness checks

To examine the robustness of the results, I perform additional estimates considering the following issues: i) differences in the size composition of both types of firms, ii) differences in tax regimes, iii) unobserved heterogeneity and alternative parametric specifications of the hazard function. Results are summarized in column (1)-(5) of Table 7.

Size composition

One important concern regarding the estimates presented in the previous section refers to the different size composition of both groups of firms. As explained in section 4, the Uruguayan law defines that WMFs must be formed with at least six workers. This formal rule seems to be enforced reasonably well: on average only 18% of WMFs can be defined as micro-enterprises. By contrast, 85% of CFs star up with less than six workers (see Table 2). It is a well known stylized fact in the firm survival literature that survival chances positively depend on firm size (Caves, 1998; Audretsch and Mahmood; 1994; Bartelsman et al., 2005). Therefore, results presented in the previous section may be an artifact of the different size composition of both types of firms. Column (1) of Table 7 reports the estimates of the Cox model excluding micro-enterprises.[30] It is worth considering that in this case estimates are performed with 201877 observations (i.e. 16% of the original sample). Despite this dramatic loss of information, results remain qualitatively unchanged: WMFs exhibit higher survival chances than CFs. The difference is highly significant and the magnitude of the effect is close to the one obtained in the baseline estimates including micro-enterprises.

Differences in tax regimes

As in most countries, WMFs in Uruguay benefit from a favorable tax treatment. Specifically, they are exempted from the employer payroll tax (i.e. employer contributions to the pensions system) for the fraction of the wage bill corresponding to members (this

[30] It is worth observing, from Table 2, that after the exclusion of micro-enterprises the size distribution of WMFs and CFs is very similar.

exemption does not hold for hired workers in WMFs).[31] One may argue that the superior performance WMFs in terms of survivability may simply be a by-product of this favorable tax regime. Interestingly, during this period there was considerable variability in payroll tax rates across industries and over time, including sub-periods of zero tax rate in specific sectors (Manufacturing, Transport). In addition, the Uruguayan Constitution establishes further tax exemptions in sectors in which WMFs and conventional firms compete, such as in the provision of educational services. Table 6 provides a detailed description of the evolution of tax rates by sectors between 1997 and 2009.

Using the information on the 5-digit industry classification and the wage bill of each firm (distinguishing members and employees in WMFs), I construct a measure of the firm-specific tax burden at each point in time. I define the empirical tax rate faced by firm *i* at time *t* as the total payroll tax bill divided by the total wage bill and, hence, given by $T_{it} = \frac{Taxbill_{it}}{W_{it}}$. This variable intends to control for differences in non-wage labor costs faced by both types of firms.

Results are presented in Column (2) of Table 7. The effect of the tax burden on the hazard of exit is positive and highly significant. The condition of being a WMF still has a negative effect on the hazard compared with CFs. However, the magnitude of the effect is smaller compared with previous estimates: the hazard rate is about 24% lower for WMFs than for CFs.

Unobserved heterogeneity and parametric specification of the hazard

The Cox model allows to estimate the effect of covariates without making assumptions about the pattern of duration dependence of the hazard. Although this procedure minimizes specification errors, it produces less efficient estimates compared to the "correct" parametric model. Moreover, previous estimates assumed that all differences between firms were captured by observed explanatory variables. This may bias coefficient's estimates and

[31] Uruguayan WMFs are also fully exempt from the corporate income tax (IRAE). However, the corporate tax rate is quite low in Uruguay (25%). Available estimates indicate that the corporate income tax represents on

overestimate the negative duration dependence of the hazard function, i.e., the duration dependence of the hazard may be less negative when unobserved heterogeneity is present (Jenkins, 2005). Therefore, I consider a generalization to allow for unobserved firm-specific effects ("frailty"). A frailty model defines the hazard to be [32]:

$$h(t_i \mid x_i, \alpha_i) = \alpha_i h(t_i \mid x_i) \tag{2}$$

where α_i is some unobserved-observation specific effect. The effect α_i is known as frailty and indicates that firms in the population are heterogeneous due to factors that remain unobserved. It is assumed that α_i has mean one and variance θ, where θ is estimated from the data. The relationship between the hazard and survivor function is such that

$$S(t_i \mid x_i, \alpha_i) = \{S(t_i \mid x_i)\}^{\alpha_i} \tag{3}$$

where $S(t_i \mid x_i)$ is the survival function for a standard parametric model. The unconditional survival function is obtained by integrating the unobservable α_i. We assume that α_i follows a gamma distribution. If α_i has a pdf $g(\alpha_i)$, then the unconditional survivor function is such that

$$S_\theta(t_i \mid x_i) = \int_0^\infty \{S(t_i \mid x_i)\}^{\alpha_i} g(\alpha_i) d\alpha_i \tag{4}$$

where,
$$g(\alpha_i) = \frac{\alpha_i^{1/\theta - 1} \exp(-\alpha_i / \theta)}{\Gamma(1/\theta)\theta^{1/\theta}} \tag{5}$$

Finally, combining (4) and (5), the following expression is obtained:

$$S_\theta(t_i \mid x_i) = \left[1 - \theta \ln\{S(t_i \mid x_i)\}^{\alpha_i}\right]^{-1/\theta} \tag{6}$$

---

average 1% of firm revenue in Uurguay (Gonzalez and Montero, 2008).

[32] The formal exposition draws heavily on Cleves et al (2008).

The frailty model is the standard parametric model with the addition of one new parameter, θ.[33] Assuming a Weibull distribution of the hazard with gamma-distributed heterogeneity, the survivor function can be written as follows:

$$S_\theta(t_i \mid x_i) = \left[1 - \theta \exp(\beta_0 + x_j \beta_x) t_j^p)\right]^{-1/\theta} \tag{7}$$

Estimates of this model are reported in Column (3) of Table 7. Results remain unchanged: WMFs exhibit a lower hazard than CFs. [34] The estimated parameter $1 < \hat{p} < 2$ in the Weibull model indicates that the hazard is increasing over time at a decreasing rate. This pattern of duration dependence is not consistent with the shape of the hazard reported in Figure II. Considering the potential misspecification of the hazard, Column (4) reports the estimates of the frailty model assuming a log-logistic distribution of the hazard. Results are qualitatively similar. The status of WMF is positively associated with longer survival times.[35] As the estimated parameter $\hat{\gamma} < 1$, the log-logistic hazard increases and then decreases which in turn is consistent with the pattern described by Figure II.

Finally, Column (5) presents the estimates of a Generalized Gamma Model.[36] Apart from the coefficient β, this model involves the estimation of two additional parameters, κ and σ. The gamma model presents two main advantages. First, this model possesses a highly flexible hazard function, allowing a large number of possible shapes. Second, this distribution includes as special cases the Weibull model ($\kappa = 1$), the Exponential model ($\kappa = 1, \sigma = 1$) and Log-Normal model ($\kappa = 0$). The fact that these parametric models are nested allows the use of the Gamma model for searching the appropriate parametric specification for the data. Results are reported in Column (5) of Table 7. The status of

[33] It is worth noting that $S_\theta(t_i \mid x_i)$ reduces to $S(t_i \mid x_i)$ as θ goes to zero.

[34] The Wald test for $H_0 : \ln(p) = 0$ for which the test statistic is 17.98 leads to rejection of null hypothesis of constant hazard.

[35] The log-logistic model has no Proportional Hazard interpretation. The effect of the covariates must be interpreted in terms of survival time and not in terms of the hazard (Accelerated Failure Time metric). Therefore, the magnitude of the effect cannot be compared with the one obtained in the Cox PH model.

[36] As the Log-logistic model, the Gamma model is defined in the AFT metric.

WMF has a positive effect on survival time. The estimate of the coefficient of interest $\hat{\beta}^{COOP} = 0.459$ indicates that the status of WMF increases the expected value of $\ln(t)$ by 0.459, i.e. for a firm predicted to fail at $t = 1$, the status of WMF would delay the predicted time of failure to $\exp\{\ln(1) + 0.459\} = 1.582$.

The confidence interval for $\hat{\kappa}$ is [-0.002 0.102] indicates that the log-normal model ($H_0 : \kappa = 0$) is not precluded as the appropriate specification of the hazard. The Wald test for $H_0 : \kappa = 1$ leads to a strong rejection of the Weibull model ($\chi_{(1)} = 1289.55$) . The result of the Wald test for $H_0 : \kappa = 1, \sigma = 1$ also allows to discard the Exponential model ($\chi_{(1)} = 2035.34$), reinforcing the conclusion that the hazard is not constant over time. Hence, the log-normal model seems to be the most appropriate parametric specification for the data. It is worth observing the log-normal model (as well as the as the log-logistic model) is consistent with the inverted U-shaped hazard observed in the data. [37]

8. Discussion and conclusions

Based on a long micro-panel of Uruguayan firms, I conduct a survival analysis comparing WMFs and CFs. In contrast to the theoretical "pessimism" regarding the viability of workers´ control in market economies, I find that WMFs exhibit lower hazard rates (longer survival times) than CFs. This finding remains robust to the exclusion of micro-enterprises, to the exclusion of high firm turnover sectors in which WMFs are less frequently observed and to alternative estimation strategies based on semi-parametric and parametric frailty models. Moreover, this result does not seem to be driven by the differential tax regime applied to WMFs in Uruguay.

However, there are a number of issues that deserve further analysis. First, survival may be a crude measure of firm performance, specially in the case of a WMF. Workers may continue

[37] The Generalized Gamma and the Log-Normal model are also preferred among several parametric models according to the Akaike Information Criterion (see Table 8).

to run the firm in order to secure their jobs even if from a social point of view it might be better to dissolve the firm and reallocate labor and physical assets to more productive firms.

Unfortunately, information from social security records does not allow us to analyze the correlation between survival and firm performance indicators properly. As proxies of firm performance, Table 9 reports the average wage and employment growth rate of dying and surviving firms during the period, distinguishing WMFs and CFs. Wage and employment growth rates are higher for surviving firms compared with dying firms in both types of firms (the difference is not significant for wage growth in the case of WMFs). Hence, firm survival seems to be positively correlated with employment and wage growth. Moreover, a recent survey comparing WMFs and CFs in Uruguay provides mixed evidence regarding the comparative performance of both types of firms (Alves et at, 2012). On one hand, this study reveals that WMFs employ less supervisors compared with CFs and rely more on mutual monitoring among co-workers, suggesting that workers´ control may be associated with potential gains in technical efficiency. WMFs are also more likely to introduce organizational innovations such as team work, job rotation and worker involvement initiatives. In addition, there are no significant differences regarding the average firm wage and the propensity to develop R&D activities within firms. On the other hand, WMFs are less capital-intensive and exhibit lower value-added per worker and investment rates than conventional firms. In addition, there is some evidence that access to credit market is a more severe restriction for WMFs. However, these performance indicators were measured in 2009, i.e. a period in which the Uruguayan economy experienced high growth and very low unemployment rates. Hence, it is difficult to compare those cross-section results with the ones obtained in this longitudinal firm-level study. For instance, the period analyzed in this paper includes four years (1999-2002) in which Uruguay faced a deep economic crisis (the unemployment rate raised to 20% during 2002). As alternative employment opportunities for worker-members are scarce during economic downturns, it seems plausible to conjecture that WMFs would be more reluctant to close than conventional investors. This may partly explain the large difference in survival prospects in favor of WMFs found in this paper. Moreover, this suggests that one should be cautions to extrapolate the results to other states of the economy.

Second, results may partially reflect self-selection of both WMFs into industries and workers into organizational forms. It may be the case that WMFs firms are not randomly sorted into industries or, in other words, they enter in industries in which they might face better survival prospects. Workers may be also self-selected into organizational forms according to unobservable characteristics that might also affect firm survival. As Chiappori and Salanié (2002) point out, the combination of unobserved heterogeneity and endogenous matching of agents to contracts is bound to create selection biases on the parameters of interest. For instance, cooperatives may be able to attract ideologically motivated workers (Elster, 1989). Obviously, this selection problem is a potential threat to the identification of the effect of interest common to all studies on WMFs based on observational data (Kremer, 1997: p13). However, recent experiments in team production in which subjects are randomly assigned to "democratic" and conventional workplaces (in democratic workplaces the group is allowed to determine their compensation scheme by voting) also suggest positive incentive effects associate with worker control (Mellizo et al, 2011). Finally, I only consider the dissolution of WMFs as a measure of organizational failure. Given the fact that WMFs may also degenerate into capitalist firms (Ben Ner, 1984), it will be important to compare the determinants of both types of events.

Notwithstanding these issues, the evidence presented in this paper suggests that the marginal share of WMFs in the population of firms and aggregate employment in Uruguay can hardly be explained by the fact that these organizations exhibit a higher hazard of failure than conventional firms. On the contrary, the analysis indicates the importance of focusing the attention on both the obstacles face by workers at the formation stage of a WMF and the growth constraints faced by incumbent WMFs.

Appendix

Table 1. Descriptive survival statistics

		per-firm			
	Total	Mean	Min	Median	Max
All firms					
No. of firms	29125				
(Final) Exit time		45.651	1	35	150
Firms with gap	4546				
Time on gap if gap	70974	10.924	1	5	138
Time at risk	1258606	43.214	1	32	150
Failures	15308	0.526	0	1	1
CFs					
No. of firms	28821				
(Final) Exit time		45.634	1	35	150
Firms with gap	4520				
Time on gap if gap	70668	10.929	1	5	138
Time at risk	1244542	43.182	1	32	150
Failures	15177	0.527	0	1	1
WMFs					
No. of firms	223				
(Final) Exit time		46.175	1	38	145
Firms with gap	14				
Time on gap if gap	118	6.941	1	6	26
Time at risk	10179	45.646	1	38	145
Failures	90	0.404	0	0	1

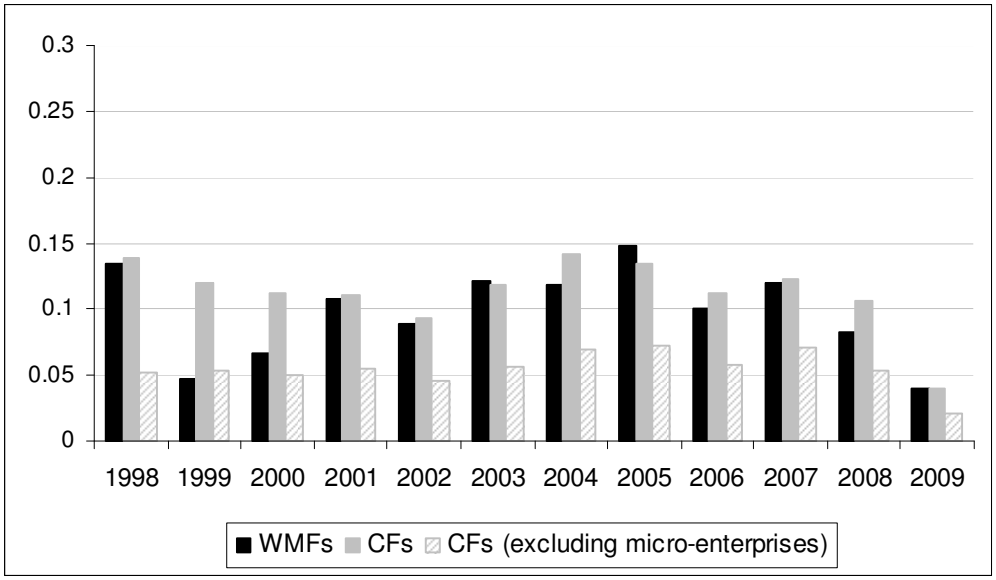
Source: Authors' calculation using data from the Banco de Previsión Social.

Table 2. Descriptive statistics of firm-level variables

	1997-1999		*2000-2002*		*2003-2005*		*2006-2009*		*Total*	
	CFs	WMFs	CFs	WMFs	CFs	WMFs	CFs	WMFs	CFs	WMFs
Firm star up size (in logs)	0.72	2.42	0.81	2.24	0.78	2.13	0.76	2.02	0.76	2.22
	(0.90)	(0.74)	(0.95)	(1.19)	(0.91)	(0.90)	(0.93)	(0.84)	(0.92)	(0.95)
Star up average wage (in logs)	8.34	7.44	8.24	7.62	7.96	7.46	8.29	7.55	8.21	7.51
	(0.92)	(1.35)	(0.96)	(1.31)	(0.93)	(1.16)	(0.90)	(1.39)	(0.94)	(1.29)
Tax burden	0.086	0.023	0.081	0.014	0.075	0.006	0.075	0.005	0.081	0.013
	(0.049)	(0.042)	(0.053)	(0.031)	(0.049)	(0.014)	(0.028)	(0.016)	(0.049)	(0.030)
Manufacturing	27.85	13.52	25.43	27.19	27.44	16.7	23.98	25.05	26.69	19.76
Transport	13.52	9.06	10.48	11.04	13.8	8	13.67	5.57	12.82	8.78
Services	25.72	54.07	28.94	50.88	26.72	44.16	33.88	45.57	27.71	48.9
Other sectors	32.91	23.35	35.14	10.89	32.04	31.15	28.47	23.81	32.78	22.56
Micro firms	85.35	3.5	82.53	24.31	84.2	25.09	84.64	25.64	84.26	18.96
Small firms	12.1	80.5	14.56	50.69	13.23	59.47	12.2	58.1	13.03	62.77
Medium firms	2.5	11.68	2.74	21.64	2.43	15.44	2.98	16.26	2.6	16.17
Large firms	0.05	4.32	0.17	3.36	0.15	0	0.19	0	0.12	2.1

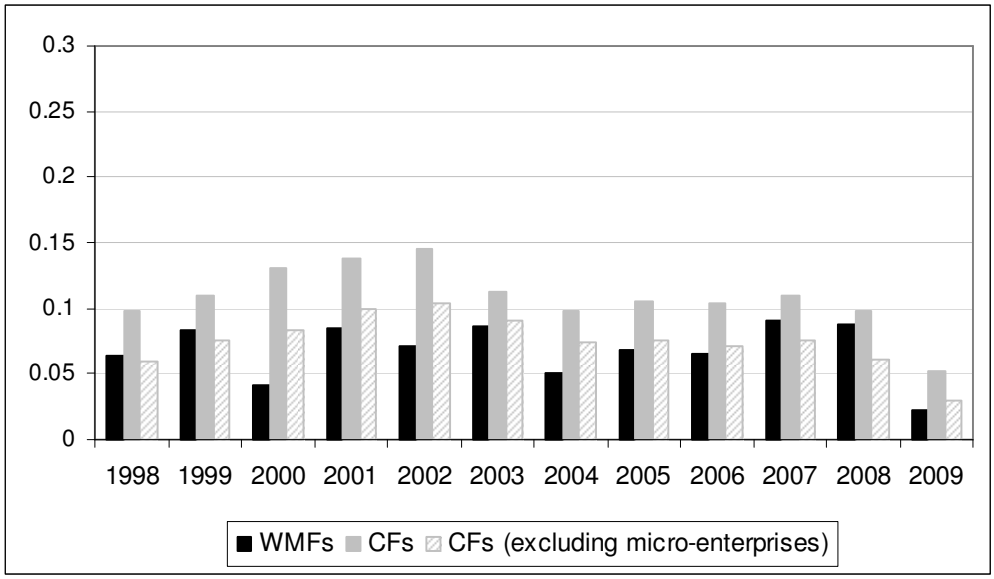
Notes: Firms are classified in four categories according to their star up size; micro (less than 6 workers), small (between 6 and 19), medium (20 and 100) and large (more than 100 workers). The category ''Other Sectors" includes Construction, Electricity and Retail Trade. Standard deviations in parentheses. Source: Authors' calculation using data from the Banco de Previsión Social.

Figure 1. Birth rates of WMFs and CFs. Period 1998-2009



Notes: Annual birth rates calculated as the number of entering firms divided by the total number of firms in the previous year. Source: Authors' calculation using data from the Banco de Previsión Social.

Figure 2. Exit rates of WMFs and CFs. Period 1998-2009



Note: Annual exit rates calculated as the number of exiting firms divided by the total number of firms in the previous year. Source: Authors' calculation using data from the Banco de Previsión Social.

Figure 3. Kaplan-Meier survival estimate

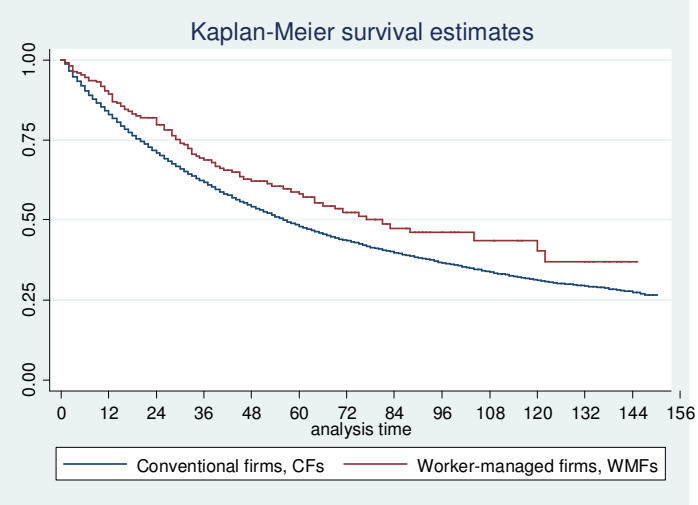


Figure 4. Smoothed hazard estimate

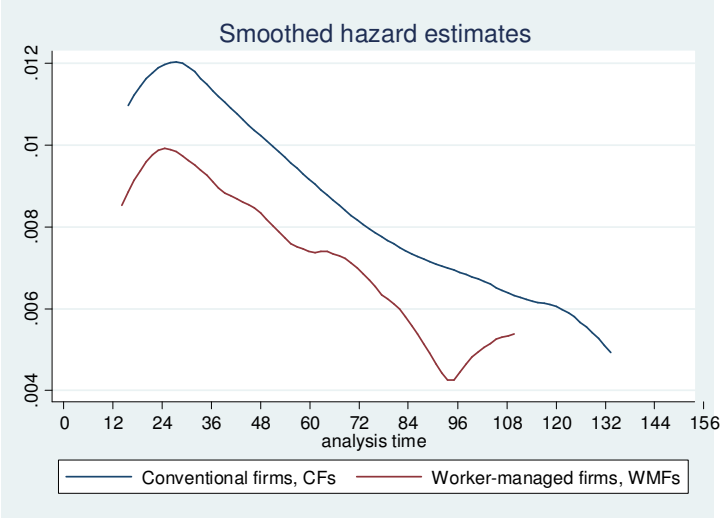
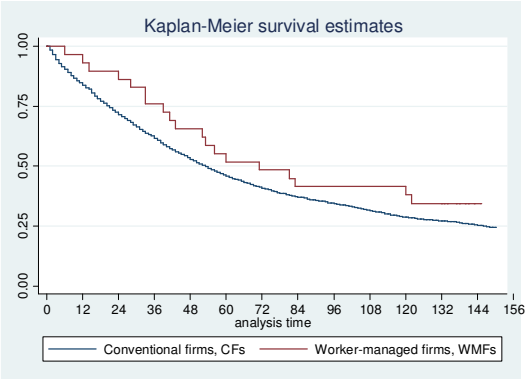
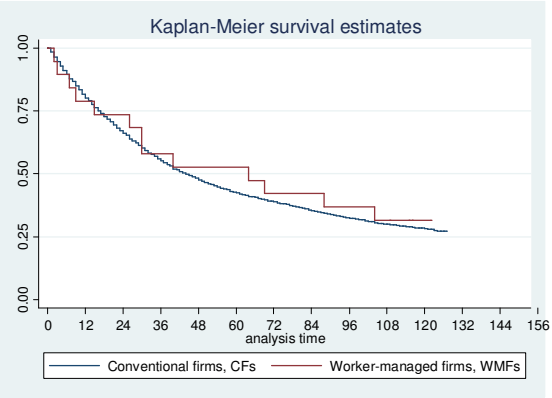


Figure 5. Survivor function of WMFs and CFs by firm cohorts

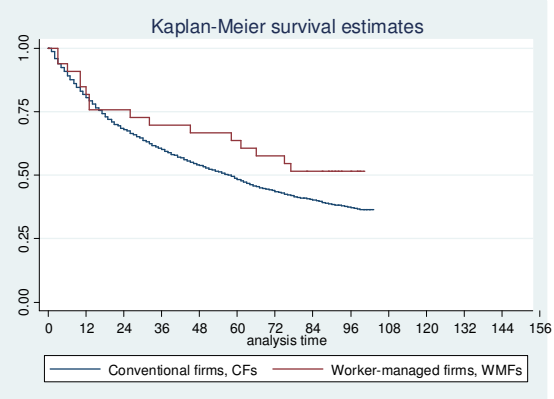
Cohorts 1997-1998



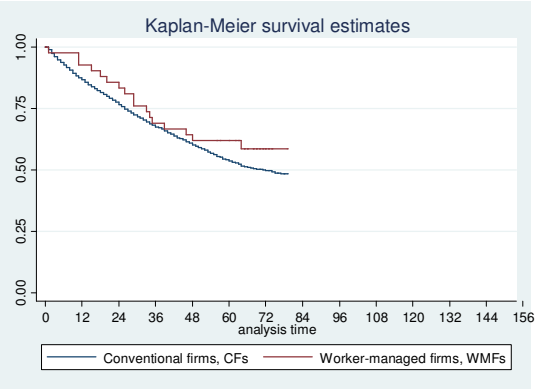
Cohorts 1999-2000



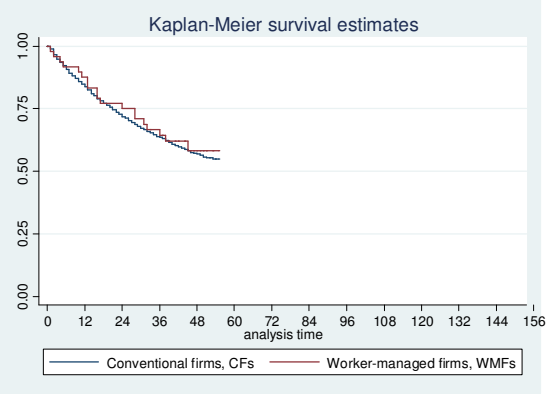
Cohorts 2001-2002



Cohorts 2003-2004



Cohorts 2005-2006



Cohorts 2007-2008-2009

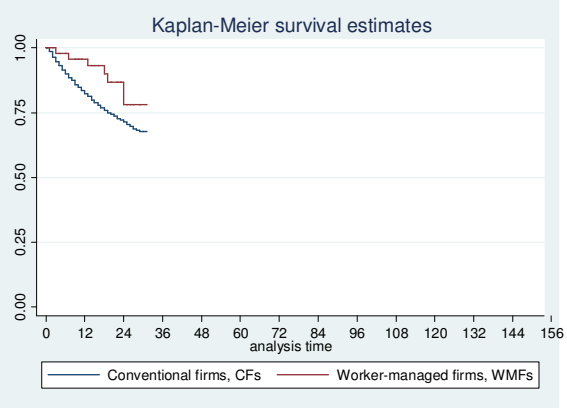


Figure 6. Graphical check of the Proportional Hazard assumption

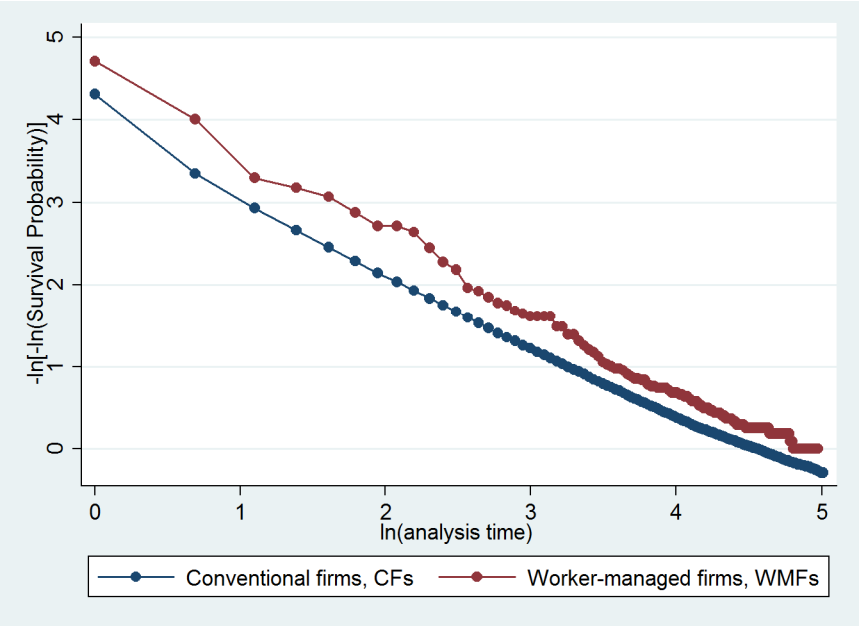


Table 3. Cox Model estimates

	(1)	*(2)*	*(3)*
Coop	-0.399	-0.385	-0.376
	(0.107)***	(0.109)***	(0.110)***
Firm star up size	-0.114	-0.115	-0.109
	(0.052)**	(0.053)**	(0.053)**
Firm star up wage	-0.16	-0.154	-0.176
	(0.009)***	(0.009)***	(0.009)***
Hazard ratio	**0.671**	**0.680**	**0.687**
Industry fixed effects	No	Yes	Yes
Cohort fixed effects	No	No	Yes
Observations	1245207	1245207	1245207

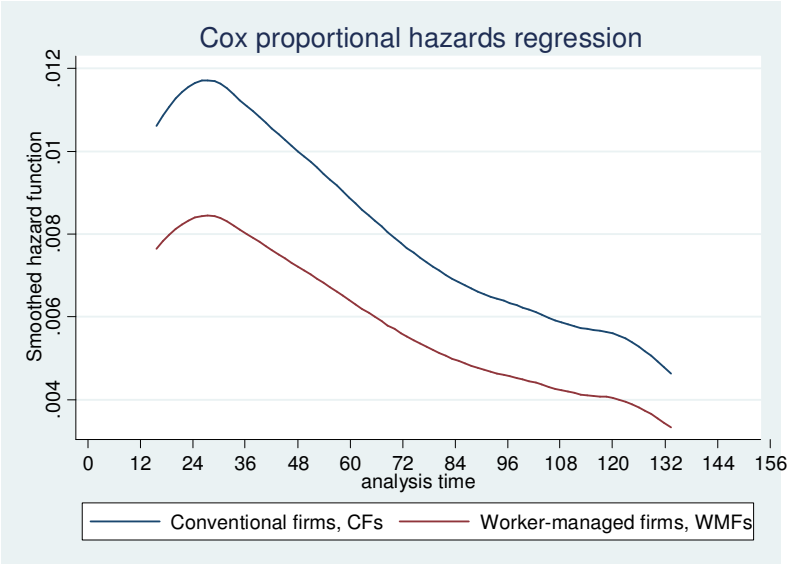
Notes: Star up size defined as a dummy variable taking value of unity for those firms employing more than 19 workers. Firm star up wage defined as the log of firm average wage measured at the entry date. In column (2) and (3), estimates include 5 industry dummies (distinguishing Manufacturing, Electricity, Retail Trade, Construction, Transport and Services). The hazard ratio is obtained computing $\exp(\beta^{coop})$. Robust standard errors in parentheses. * Statistically significant at .10 level; ** at the .05 level; *** at the .01 level

Table 4. Test of proportional hazard assumption

	Chi-square	p-value
Coop	0.07	0.7978
Firm star up size	0.00	0.9688
Firm star up wage	35.05	0.0000
Sectoral dummies		
Electricity	3.58	0.0584
Construction	13.82	0.0002
Retail trade	55.13	0.0000
Transport	0.40	0.5253
Services	6.41	0.0113
Cohort dummies		
1998	31.12	0.0000
1999	39.94	0.0000
2000	53.18	0.0000
2001	62.93	0.0000
2002	26.75	0.0000
2003	7.03	0.0080
2004	16.95	0.0000
2005	25.91	0.0000
2006	27.57	0.0000
2007	19.64	0.0000
2008	14.67	0.0001
2009	2.78	0.0954
Global test	231.43	0.0000

Notes: Test based on Schoenfeld residuals. Rejection of the null hypothesis indicate a deviation from the proportional hazard assumption.

Figure 7. Hazard functions of WMFs and CFs



Notes: Cox regression post estimation

Figure 8. Survivor and hazard function by sectors

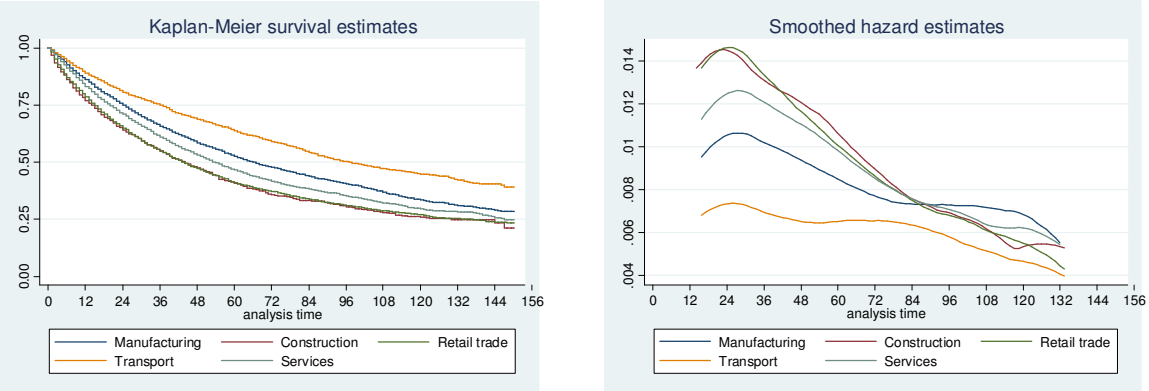


Table 5. Cox Model estimates (within industries)

	(1)	(2)	(3)	(4)
	All firms (excluding Construction and Retail Trade)	Manufacturing	Transport	Services
Coop	-0.38	0.072	0.023	-0.757
	(0.118)***	-0.189	-0.28	(0.188)***
Firm star up size	-0.07	-0.059	0.101	-0.045
	(0.06)	(0.098)	(0.266)	(0.082)
Firm star up wage	-0.173	-0.173	-0.238	-0.158
	(0.011)***	(0.020)***	(0.030)***	(0.015)***
Industry fixed effects	Yes	-.-	-.-	-.-
Cohort fixed effects	Yes	Yes	Yes	Yes
Observations	853911	329009	159560	347972

Notes: Star up size defined as a dummy variable taking value of unity for those firms employing more than 19 workers. Firm star up wage defined as the log of firm average wage measured at the entry date. In column (1), estimates include 5 industry dummies (distinguishing Manufacturing, Electricity, Retail Trade, Construction, Transport and Services). Robust standard errors in parentheses.
* Statistically significant at .10 level; ** at the .05 level; *** at the .01 level

Table 6. Employer payroll tax rate by sector

Period	*General tax rate*	*Total and partial tax exemptions*
1997	12.5%	0% - Education
		6.25%- Manufacturing
1998	12.5%	0%- Education
		6.25%- Manufacturing
1999	12.5%	0%- Education
		6.25%- Manufacturing
2000	12.5%	0%- Education
		6.25%- Manufacturing, Freight transport by road (from October 2000)
2001	12.5%	0%- Education
		6.25%- Manufacturing, Freight transport by road (until May 2001)
		0%- Urban and suburban passenger land transport, Manufacturing, Freight transport by road (from June 2001)
2002	12.5%	0%- Education, Taxicabs (from May 2002), Urban and suburban passenger land transport , Manufacturing, Freight transport by road
2003	12.5%	0%- Education, Taxicabs, Urban and suburban passenger land transport, Manufacturing, Freight transport by road
2004	12.5%	0%- Education, Taxicabs, Urban and suburban passenger land transport , Manufacturing, Freight transport by road
2005	12.5%	0%- Education, Taxicabs, Urban and suburban passenger land transport , Manufacturing, Freight transport by road
2006	12.5%	0%- Education, Taxicabs, Urban and suburban passenger land transport , Manufacturing, Freight transport by road
2007	7.5%	0%- Education,
	(from July 2007)	0%- Taxicabs, Manufacturing, Freight transport by road (until June 2007)
		0%- Urban and suburban passenger land transport
2008	7.5%	0%- Education
		0%- Urban and suburban passenger land transport
2009	7.5%	0%- Education
		0%- Urban and suburban passenger land transport

Source: Bucheli and Vigna (2006)

Table 7. Robustness checks

	(1)	(2)	(3)	(4)	(5)
Coop	-0.484	-0.279	-0.551	0.443	0.459
	(0.139)***	(0.122)**	(0.158)***	(0.129)***	(0.131)***
Firm star up size	-0.019	-0.227	-0.172	0.138	0.163
	-0.059	(0.060)***	(0.078)**	(0.064)**	(0.064)**
Log(wage)	-0.243	-0.19	-0.306	0.247	0.249
	(0.025)***	(0.009)***	(0.015)***	(0.012)***	(0.011)***
Tax burden		1.783			
		(0.290)***			
Hazard ratio	**0.616**	**0.757**	**0.576**	**-.-**	**-.-**
κ					0.0502
					(0.026)
σ					1.526
					(0.014)
P			1.228		
			(0.014)		
γ				0.836	
				(0.008)	
θ			1.411	0.178)	
			(0.059)	(0.029)	
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	201877	1230206	1245207	1245207	1245207

Notes: Star up size defined as a dummy variable taking value of unity for those firms employing at least 19 workers. Firm star up wage defined as the log of firm average wage measured at the entry date. Estimates include 5 industry dummies (distinguishing Manufacturing, Electricity, Retail Trade, Construction, Transport and Services). In column (1), estimates exclude firms with less than 6 workers at the entry date. The hazard ratio is obtained computing $\exp(\beta^{coop})$. In Column (4)-(5), the effect of the covariates must be interpreted in terms of survival time and not in terms of the hazard (Accelerated Failure Time metric). Robust standard errors in parentheses. * Statistically significant at .10 level; ** at the .05 level; *** at the .01 level

Table 8. Comparison of AIC values for several parametric models

	Log Likelihood	k	c	AIC
Exponential	-36624.369	20	1	73290.738
Weibull	-36476.983	20	2	72997.966
Gompertz	-36198.806	20	2	72441.612
Log-normal	-35953.675	20	2	71951.35
Log-logistic	-36063.463	20	2	72170.926
Generalized Gamma	-35952.202	20	3	71950.404

Notes: k is the number of model covariates and c the number of model-specific distributional parameters. $AIC = -2\ln L + 2(k + c)$

Table 9. Employment and wage growth rates. Dying and surviving firms

	Dying firms	Surviving firms	t-stat (i)	t-stat (ii)
Employment growth (12 month change)	-0.368	0.075	(48.87)***	
WMFs	-0.323	0.025	(3.73)***	(10.6)***
CFs	-0.368	0.076	(48.71)***	
Employment growth (6 month change)	-0.233	0.037	(46.45)***	
WMFs	-0.193	0.017	(3.10)***	(5.90)***
CFs	-0.233	0.038	(46.27)***	
Wage growth (12 month change)	-0.259	0.051	(35.57)***	
WMFs	-0.072	0.072	(1.26)	3.01***
CFs	-0.26	0.051	(35.52)***	
Wage growth (6 month change)	-0.262	0.028	(39.52)***	
WMFs	-0.177	0.042	(1.48)	2.43**
CFs	-0.261	0.028	(39.53)***	

Notes: Wages are defined as the firm wage bill divided by total employment and measured as pesos uruguayos deflacted by the official Consumer Price Index (IPC). Employment and wage growth rates are defined as annual and six-month changes in employment and wages respectively (in log form) such that, $\Delta \ln E_{it} = \ln E_{it} - \ln E_{it-k}$ and $\Delta \ln w_{it} = \ln w_{it} - \ln w_{it-k}$. (i) Test for differences between dying and surviving firms. (ii) Test for difference between surviving WMFs and CFs.

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