Family firms, performance-related pay and the great crisis: evidence from the Italian case

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ABSTRACT

This paper analyses how Italian family firms have acted during the global great crisis in comparison to their nonfamily counterparts using a sample of almost 4,500 firms for 2007 and 2010. We study whether family control affects labour productivity, labour costs and competitiveness and how family and non-family firms have responded to the great crisis. Furthermore, we test whether the adoption of performance-related pay (PRP) for employees offers an efficacious strategy to mitigate the effects of the crisis. Quantile regression techniques have been used to test the heterogeneous role of PRP and its possible endogeneity has been taken into account in the empirical investigation. After the outbreak of the crisis, the distance in terms of the competitiveness of family firms (FFs) in relation to their nonfamily counterparts increased. However, we also find that family firms may take advantage of the adoption of incentive schemes, such as PRP, to encourage commitment and motivation from their employees more than nonfamily firms do. The positive role of PRP on labour productivity, coupled with a moderate influence of these schemes on wage premiums, enables them to regain competitiveness. In addition, for FFs located in industrial districts in which social rules prevail on formal rules, the adoption of PRP has exerted additional positive effects under hostile pressures, such as those characterizing the strong global crisis.

1. Introduction

Empirical research on the dispersion of productivity across firms has paid limited attention to the role of family firms (FFs), although a vast literature has shown that these firms are the predominant form of business worldwide (Westhead and Howorth, 2006). Furthermore, whether FFs are better performing in terms of labour efficiency than their non-family counterparts is still open to debate (Bart, et al. 2005; Barbera and Moores, 2013).

Different views and contrasting empirical findings have signalled a clear tension between two opposing perspectives. The first perspective signals the positive effects of being a FF, hypothesizing that FFs have more concentrated ownership and more incentives for active control of management (Demsetz and Lehn, 1985). It also suggests that owners who intend to pass their business to family members have a potentially longer-term horizon with respect to other shareholders and thus a greater propensity to invest in long-term projects, which could enhance productivity (Martikainen, et al. 2009). A second view underlines the predominance of negative effects, arguing that family owners are mainly interested in pursuing the private benefits of control and that FFs are often characterized by dynastic management, causing low quality leadership and labour inefficiency (Bloom and Van Reenen, 2007; 2011; Caselli and Gennaioli, 2013). To date, however, most of the available literature only refers to normal market conditions, whereas it could be relevant to analyse how the systematic differences between FFs and non-family firms (NFFs) may change in times of

crisis and whether FFs' potential disadvantages are amplified (supporting the inefficiency argument) or reverted (in line with the FFs resiliency hypothesis).

We contribute to the available literature analysing how FFs have performed in terms of labour productivity, labour costs and competitiveness during the great global crisis in comparison to their non-family counterparts. Additionally, we study how performance-based rewards, which are seen as one of the most important drivers of employees' behaviour (Bloom and Van Reenen, 2011) in the literature on labour productivity and human resource management practices (HRM), have differently affected the labour efficiency of FFs and NFFs.

To the best of our knowledge, this is the first attempt to shed light on a comparative analysis of the performances of family and non-family firms in Italy and the interplay of incentive pay before and during the crisis. No formal theory offers clear predictions on these issues, and the exploratory nature of the current study does not allow us to offer conclusive answers to our research questions. However, we propose an articulated body of ideas that supports the empirical investigation. In addition, we apply econometric methods to mitigate the problems undermining the identification of causal effects and obtain a number of useful insights.

The theoretical framework that provides clearer hypotheses for our study is offered by the socio-emotional wealth (SEW) theory. The SEW theory helps to explain why FFs behave distinctively and is founded on the notion that family principals make decisions that are not only driven by economic logic but also aim to preserve the stock of affect-related value that they derive from their family business (Gomez-Meja et al., 2007). While non-economic aims may also be present in NFFs, they are particularly important in FFs. Indeed, protecting SEW and its multiple dimensions, such as family control and identification with the firm, firm reputation, the perpetuation of the family dynasty and long-term social ties, may explain differences between FFs and NFFs, as well as across different FFs. In our study, we propose the SEW approach to address four research questions.

In the first step, we start by asking to what extent family ownership contributes to explaining firm differentials in productivity, compensation and competitiveness in the Italian economy, a country characterized by a very high proportion of family businesses, persistent interfirm productivity differentials and, since the second half of the 1990s, feeble productivity that collapsed in 2008 with the great crisis. We find that FFs suffer more from labour productivity and competitiveness gaps with respect to NFFs and that the presence of controlling families is not valuable for firm productivity.

In a second step, we question whether adverse shocks contribute to these differentials and study the influence of family and non-family corporate ownership on firm responses to a strong external shock, such as the great crisis. The results we obtain suggest that in cases of adverse shocks, FFs respond more slowly, likely because they often care more about their reputation among employees and avoid layoffs, thus obtaining reduced productivity.

Then, in a third step, we test whether this negative crisis effect may be mitigated by managerial strategies such as the adoption of *collective* and/or *individual* performance-related pay (PRP). From our database, we know that PRP schemes are based on both group and individual performance even though we have no separate information on these two types of PRP. The SEW view suggests the distinctiveness of human resource management (HRM), which includes PRP as a tool to enhance labour productivity. This view predicts differences between FFs and NFFs (Cruz et al. 2011). We empirically address this point and find that the incentives alignment mechanism, such as PRP, acts as an important moderating factor and that FFs adopting PRP schemes are better off.

Finally, we ask in a fourth step if embeddedness in a business ecosystem, such as an industrial district, affects these results. It is likely that when FFs operate in a context in which social norms, webs of relations and tacit rules prevail over formal rules, their desire to continue the family dynasty and preserve firm reputation in the community is an asset and not a liability (Naldi et. al. 2013). We investigate the relevance of these arguments, verifying whether the embeddedness of FFs in an industrial district enhances the efficacy of wage incentives.

To design our empirical strategy, we take into account that variations in strategies and performance among FFs may be large and even larger than the variations between family and non-family forms of organization (Bennedsen, Perez-Gonzalez & Wolfenzon, 2010; Chua et al. 2012). Potential sources of heterogeneity among FFs may be related to a variety of economic and non-economic goals and governance structures, such as the different degrees of involvement of family members in top management teams (Chua et al. 2012). Given these wide heterogeneities, we adopt quantile regression techniques to investigate whether heterogeneities *between* FFs and NFFs, and *within* FFs, contribute to explaining the wide dispersion of productivity and competitiveness recorded in the Italian economy. Also, when we introduce as key regressor a time varying variable (PRP), we take into account the potential biases due to unobserved factors that affect family (and nonfamily) firms by adopting a quantile regression model with fixed effects (Canay, 2011). Finally, we check for the possible

endogeneity of PRP by means of instrumental variable quantile regression techniques (Amemya, 1982; Abadie et al., 2002).

The Italian context is an ideal setting to verify whether the family organizational form plays a role in explaining heterogeneity in responses to strong adverse shocks. As said, Italy, characterized by the high prevalence of FFs, experienced a collapse of labour productivity in 2008, in contrast with other European economies that managed to maintain a stable level of labour efficiency (Bugamelli et al. 2018). Additionally, the Italian reforms in industrial relations, started with the proposal of 22 January 2009, strongly focused on restoring firm-level productivity growth by favouring firm-level wage bargaining and the diffusion of wage incentives, such as PRP, whose efficacy is analysed in this paper.

We study the Italian case by taking advantage of a unique source of firm-level data, the employer and employee survey (Rilevazione su Imprese e Lavoro, RIL) conducted by the National Institute for Public Policy Analysis (INAPP) in 2007 and 2010 on a representative sample of Italian firms operating in all private non-agricultural sectors.

The remainder of the paper is organized as follows. Section 2 discusses the related literature of our empirical analysis. Section 3 presents the data used and descriptive statistics. Section 4 describes the econometric framework employed and our estimation results. Section 5 concludes the paper.

2.Theoretical background

2.1 Overall literature-based conceptual framework

The four different steps structuring our study call for a unified and internally consistent theory that logically links them. As stated above, we intend to i) compare the economic performances of FFs and NFFs; ii) study whether these potential differences increase during crises; iii) show how incentive compensation strategies such as PRP may alleviate the FF productivity gap, especially in the group of firms that become worse off and iv) explore whether the specific business environment in which the family business is embedded, such as the industrial districts in the Italian case, influences the relationship between PRP and economic performance.

A short summary of the family firm literature indicates that family ownership involves potential benefits and costs, as widely discussed in a number of comprehensive overviews (see, among others, Anderson and Reeb, 2003, Bertrand and Schoar, 2006). Thus, FFs may exert opposite influences on firm productivity, as discussed by Barth et al. (2005). In terms of advantages, it is argued that concentrated ownership characterizing FFs reduces agency costs because large shareholders have the incentive and power to control and discipline their managers (Jensen and Meckling, 1976), thus

exerting a positive influence on productivity. Furthermore, owners who intend to pass their business on to family members may have a longer term horizon than other shareholders. Thus, concentrated ownership provides FFs the incentive and knowledge to focus on core competencies, ensuring that firm capabilities will evolve in a cumulative trajectory and enhancing the firm's competitive advantage (Le Breton-Miller and Miller, 2006). In terms of disadvantages, the limited diversification of risk due to concentrated ownership may discourage the adoption of new technology that entails more uncertain effects but that could boost productivity performance. In addition, owners of FFs are mainly oriented towards pursuing the private benefits of control that may be in clear contrast with the efficient management of the firm (Shleifer and Vishny, 1997).

Recently, Shukla et al. (2013) and Berrone et al. (2013) emphasized the importance of a new theoretical framework, SEW, that integrates specific aspects of FFs previously studied by various strands of literature, such as agency theories, institutional approaches, stewardship and stakeholder management views. This new theoretical framework has proven to be valuable for predicting differences in the strategic choices between FFs and NFFs (Naldi et al. 2013), and the research questions we propose can be supported by the SEW framework, as explained below.

First, the SEW model suggests that the distinctive trait of family principals is their desire to preserve socio-emotional wealth (Gomez-Meja et al. 2007), which is defined as the stock of affect-related value that they derive from their family business (Gomez-Meja et al., 2007) or, in other terms, the non-economic satisfaction derived from firm ownership (Berrone et al. 2012). Adopting a behavioural agency view and borrowing from prospect theory, the SEW approach indicates that for family principals, loss aversion regarding their socio-emotional *endowment* is more important than the desire to maximize future economic gains (Berrone et al. 2012). This means that FFs adopt rational behaviours that could lead to their economic under-performance with respect to non-family counterparts, as found in many empirical studies.

Multiple dimensions characterize SEW, such as the close identification of family owners with their firm (which often carry the family name), preservation of family control and influence over the business, also through dynastic succession, family image and community reputation, and the emotional attachment of firm members[1]. These different SEW priorities influence leadership style and likely shape owners' behaviours and outcomes. For instance, on the one hand, FFs prefer to invest in long-term projects because family owners are motivated by a desire to support the long-term continuity of their firm, thus increasing chances of firm survival (see, among others, Le Breton-Miller

[1] Berrone et al. (2012) suggest that SEW is composed of five interrelated dimensions, summarized under the FIBER label: family control and influence (F), identification with the firm (I), binding social ties (B), emotional attachment (E), and the renewal of family bonds (R). F refers to the utilities family members receive from exerting control and influence over the business.

& Miller, 2006). On the other hand, the dimension of family control and influence explains why principals may be reluctant to select non-family managers and prefer a top management team that is more protective of SEW, even though family management actions are decoupled from firm performance. This point is coherent with a number of studies according to which FFs are less productive than non-family-owned firms when their management regime is characterized by family members rather than by talented professional managers (Barth et al., 2005; Bloom and Van Reenen, 2007). In the first step of our analysis, we will verify that under the hypothesis that family principals are usually not driven by an economic logic but by a desire to preserve SEW, it is plausible to expect that FFs underperform compared to NFFs.

Second, firm responses to an economic crisis are also a function of how much importance the family owner places on reputation and the achievement of social aims apart from any economic gains. The SEW model incorporates the ideas discussed within the stakeholder and stewardship views (Davis et al. 1997) and explains that family members and family managers pursue aims benefiting all stakeholders and rationally behave as stewards of their employees to preserve SEW. The SEW dimensions including strong identification of family owners with the firm, the importance of firm image and interest in the firm's social responsibility are coherent with the social identity theory advocated by Block (2010). This identification renders family owners more interested in firm reputation and leads them to avoid actions such as deep job cuts that damage the image of the firm, leading to a greater reluctance to downsize in relation to NFFs, as found by Bassanini et al. (2013). However, in terms of productivity, this reluctance hampers restructuring processes and reduces efficiency. Partially in line with these hypotheses, Neckebrouck et al. (2017) show that owners may represent "good employers", at least as "financial" stewards of their employees, as indicated by the lower dividend pay-out and higher investments observed for a sample of Belgian FFs. On the other hand, according to the same authors, family owners are worse "organizational" stewards than non-family owners because they offer lower compensation, invest less in employee training, and exhibit higher voluntary turnover and lower labour productivity. Furthermore, the concept of "social recognition", very close to the idea of firm reputation and family image of the SEW model, explains why Italian FFs have been more reluctant to downsize during the 2008-2009 recession compared to NFFs, as shown by D'Aurizio and Romano (2013). Indeed, the former internalize more than the latter the social pressure exerted by the community of stakeholders residing in the geographical areas in which FFs are located.

In summary, it is plausible to expect from the discussion above that FFs underperform in times of crisis because they do not want to reduce jobs, and this choice negatively affects labour productivity compared to NFFs. Notice, however, that other studies question this safeguarding-jobs-

based explanation. For example, Lins et al. (2013), using a sample from 35 countries for 2008–2009, find that the under-performance of FFs is higher mainly because they cut investment more, relative to other firms, and take actions to preserve their control benefits. Therefore, this point deserves additional evidence to identify whether the ultimate reasons for the under-performance of FFs during a crisis can actually stem from FFs' aims of safeguarding jobs and preserving workers' commitment and loyalty.

Third, it is plausible to ask whether the negative effect of FFs during crises may be mitigated by managerial strategies such as the adoption of PRP. The rich survey of Bloom and Van Reenen (2011) has looked at the strategic role HRM plays in labour productivity, particularly performance-based rewards, such as PRP. The question in our analysis is also whether the potential beneficial effects of these pay schemes are contingent upon family and non-family aims and leadership style, as signalled by Firfiray et al. (2016).

The dimension of emotional connection predicted by the SEW approach between family owners and their firm permeates the entire organization (Cennamo et al., 2012) and influences their HRM practices, such as wage incentive strategies (Cruz et al. 2011). Concerning crises, Bauweraerts (2013) found that family involvement plays a positive role, likely because the importance given to SEW during previous stable periods provides FFs with a competitive advantage in terms of a less formalistic view of the organization. This attitude has enhanced flexibility to cope with unexpected events such as the global financial crisis.

However, FFs are normally less likely to adopt incentive pay because this type of payment is less important according to the SEW framework. As known, agency theory predicts that the adoption of PRP may produce both incentive and sorting effects, making incumbent workers more productive but also attracting the most able workers from outside (Lazear, 2000). Concerning this second effect, the SEW model argues that family owners are interested in the compatibility of hired workers "with the organization's core philosophy and a poor compatibility is difficult to remedy upon selection" (Cruz et al., 2011, p.189). The reliance on the 'person-organization' fit as opposed to the 'person-job' fit does not need competence requirements and does not call for wage incentives to select employees with greater abilities. In addition, when employees enjoy greater employment security, they may prefer their more protected position at the cost of lower earnings. Finally, HRM competences in designing reward systems to motivate incumbent workers are important and require professional practices. In FFs, which are typically smaller and have fewer resources than NFFs, the high-level technical competences needed to implement incentive systems are often not affordable. Hence, as documented by some empirical studies, FFs show a lower tendency to rely on formalized recruitment systems and performance appraisals (Cruz et al., 2011). However, there will be circumstances under

which a pay policy based on implicit and non-monetary incentives may not be enough to guarantee satisfactory firm performance and firm survival, especially during adverse shocks. Indeed, the SEW view does not reject the argument that FFs adopt business strategies driven by economic motives. As suggested by Shukla et al. (2014, p.107), "there is a tipping point between the opposite forces of economic and affective motivations, and FFs are able to realize when it is absolutely imperative to use an economic frame of reference to make a decision as opposed to an affect driven decision". Of course, the opportunity to introduce a PRP scheme could equally affect FFs and NFFs, but for FFs, this opportunity would be particularly interesting because they can exploit the importance of family firms' social relationships, i.e., the reciprocal bonds within family businesses that the SEW view calls the dimension of 'binding social ties' (Berrone et al., 2012). This could work both for FFs implementing collective bonuses and for FFs that decide to introduce only individual pay incentives. As for collective bonuses, by embedding some aspects of social capital theory (Arregle et al., 2007), the SEW view suggests that family organizational capital is founded on a climate of industrial relations that encourages loyalty, cooperative attitudes, self-control and fairness. Thus, if collective PRP bonuses in NFFs may induce employees to free-ride on the efforts of others and thus reduce productivity (Prendergast, 1999), in FFs, the characteristics of social capital (Coleman, 1990; Bubolz, 2001) allow families to operate more as a team. This is particularly true when the SEW aims are more oriented towards a "sense of belonging" rather than towards control (Cennamo et al. 2012, p. 1155). In such a context, family business SEW priorities influence organizational aspects such as trust formation and strengthen relational trust; hence, the actions of family owners towards stakeholders are more altruistic and less calculative. We suggest that these attitudes induce reciprocity and cooperative behaviour from their employees.

Regarding individual bonuses, the literature on incentives (Lazear, 2000) shows that in the presence of heterogeneous workers, individual PRP schemes favour positive sorting effects; i.e., they help attract high-ability employees, who are expected to positively influence firm efficiency and prefer contingent rather than fixed rewards. Chrisman et al. (2017, p.120) pointed out that in normal circumstances, FFs suffer from adverse selection. This means that higher quality employees systematically sort themselves out of the labour market for FFs because these firms often pursue non-economic goals and favour family employees. In such a case, non-family employees will expect that they will not be adequately compensated. Thus, it is likely that the best workers will apply to work in NFFs, where their opportunities for higher wages and career advancement are less limited. However, if FFs decide to adopt PRP, they send a signal about their priorities, suggesting their intention to attract highly skilled workers. By contrast, in NFFs, which have no biases in favour of a group of employees, the problem of attracting the best workers is less severe, and the benefits of PRP

are not great as they are in FFs. Consequently, as suggested by Chrisman et al. (2017), it is likely that PRP schemes increase the productivity of FFs more than that of NFFs.

In summary, under great uncertainty in market demand and potential losses that might call into question the survival of the firm, FFs may be induced to adopt a decision, such as collective and individual PRP, that is motivated more by economic rationale than by affective utility[2]. In such a case, thanks to the greater efforts made by employees who share a sense of belonging (solution to the free riding problem), or thanks to individual PRP, which signals firm intention to attract highly skilled workers, we can observe a positive reversal in in FF performance when compared with NFFs.

Concerning the specific link of PRP with the crisis, we recall that in the personnel economic literature, few studies analyse the possibility of firm liquidation and its implied incentives for workers instead of managers. Two opposite views are raised. Generally, if a company is facing a crisis, workers may lose their jobs. In the first view, the perception of job insecurity during such a downsizing process involves prolonged uncertainty and may have detrimental consequences for employees' attitudes and performance (Hartley et al. 1991). These behavioural consequences have been confirmed by the meta-analysis of Sverke et al. (2002) that indicates that perceptions of threats to continued employment have important empirical negative associations with employees' job attitudes toward their organizations.

It can be also conjectured that these negative effects occur because the risk of firm bankruptcy is perceived to be completely exogenous and unambiguously reduces incentives. The second view, modelled in a theoretical framework by Krakel and Nienen (2015), shows that in a severe crisis scenario and when the probability of collective dismissal is endogenously determined by workers' choices concerning effort, workers perceive that firm liquidation can only be avoided if they are successful and the survival threshold that avoids firm termination is met. Hence, in a poor economic situation, in which a firm has a likelihood of liquidation, employees try to guarantee the firm survival rather than give up or free ride. In such a case, there is a team problem that could be better tackled by FFs thanks to the family organizational capital, as discussed above.

The embeddedness in business ecosystems would affect these results because the team problem and effort responses to PRP during a crisis may be more often characterised by complementary reactions to PRP when FFs operate in an industrial district as discussed below.

[2] Notice that in the Italian two-tiered bargaining regime, under positive demand shocks, firms may distribute PRP wage premiums linked to firm results at the second level of bargaining. This wage component is *added* to the base wage, set in the first level, and could be zero when firms do not gain positive results. Thus, risk-averse employees may also accept these agreements, because employees do not take any extra risks. Firms, on their part, especially if they have experienced a high degree of volatility in the past, would be more willing to adopt PRP schemes as a strategy to obtain higher employee performance and successful outcomes.

Indeed, as fourth dimension, the SEW approach by incorporating institutional theory view also underlines the importance of the alignment of corporate and societal values for FFs (Berrone et al., 2014), which sustains the dimension of family image and contributes to explaining how business contexts influence the effectiveness of incentive schemes such as PRP. Naldi et al. (2013) have shown that the preservation of SEW may be conditioned by the firm environment. They found that different environmental conditions influence the way SEW-preserving mechanisms affect firm results. Their estimates for the Italian case show that when FFs are embedded in specific business ecosystems, such as an industrial district, SEW represents an asset. For instance, a family CEO in these business contexts prefers to recruit people from the local labour market who share the same values and cultural heritage (Becattini, 1990). Thus, the preservation of SEW, which involves a concern for reputation and a long-term perspective, might increase collaboration and reciprocity within FFs operating in industrial districts. This occurs because in these local communities, the employees of FFs are less likely to respond with actions oriented to 'gaming' the compensation system than are employees of NFFs.

Lazonick (2005) pointed out that in the industrial districts, the alignment of interests and aims among family CEOs, employees and the rest of the local community emerges from the specific social conditions of the FFs operating in those contexts[3]. The regional concentration of small FFs encourages a vertical specialization and strong links between users and suppliers along the industry's supply chains. Not only are firms owned and managed by the same people, but very often in the industrial districts, former craft and skilled workers spin off from firms in which they were employed and become entrepreneurs. In addition, the regional collective institutions (local governments, universities and other public research centres) strongly support this local economy and share its entrepreneurial view.

During a crisis and when the weakest firms fire part of their workforce, dynamic adjustment mechanisms may be facilitated by labour mobility that is relatively strong in industrial districts. In these areas, the costs of switching firms following displacement are relatively low because workers are specialized within various phases of production of the same *specific industry* and possess 'industry-specific' skills. The high mobility of skilled labour across firms is the base for the accumulation of specific contextual knowledge and the diffusion of technological externalities (Becattini, 2002; Brusco, 1982). The globalization and the diffusion of ICT even strengthened these effects because in a market and technological setting subject to frequent and rapid change, the creation

3 Few studies provide empirical evidence on employment dynamics in districts, as noticed by Muscio and Scarpinato (2007), although the district literature has shown the key role of human capital in districts' competitiveness. The authors have documented that, over the period 1991–2001, Italian district firms offered (at least before the crisis) better labour conditions in terms of labour opportunity and wage levels.

of a specific production identity, the process of integrating contextual knowledge and reciprocal learning may even be more valuable (Dei Ottati, 2017)[4]. Since industrial districts are forms of business organization characterized by the prevalence of small companies, usually family owned, the positive aspects triggered by the implementation of PRP in FFs discussed above could be amplified in these areas. The agency problem of the adverse selection of FFs, which are less capable of recruiting the best possible workforce than NFFs are, may be mitigated by wage incentives. PRP schemes signal to potential employees of FFs that performance, and not kinship, will be rewarded. After an adverse shock, when some companies go into crisis and respond by dismissing employees, firms that perform better may absorb these redundancies, and PRP schemes may produce positive sorting effects. In industrial districts, which typically are systems that allow social and economic mobility, significant positive productivity gains may be obtained by FFs.

Based on the discussion thus far, first, the SEW framework allows us to verify whether FFs, given the greater importance attached to non-economic goals discussed above, underperform in terms of productivity when compared to NFFs. Implicit contracts and strong social relations with their employees allow FFs to pay lower wages, but their lower labour costs might not offset their productivity gap with respect to NFFs. Therefore, FFs also underperform in terms of competitiveness when compared to NFFs.

Second, we want to analyse whether the negative gap of FFs in terms of economic performance (productivity and competitiveness) amplifies during the recent crisis. This is because the interest in preserving the family image and family members' identification with the family name makes FFs more reluctant to restructure and downsize.

Third, collective and individual PRP schemes might reduce the negative gap in productivity between FFs and NFFs. This is because the implementation of these schemes in FFs could benefit from family organizational social capital, accumulated within a climate of industrial relations that encourages loyalty, cooperative attitudes, self-control and fairness and simultaneously reduces free riding from the employee side when collective incentives schemes are implemented. Furthermore, individual PRP incentives might favour positive sorting effects and mitigate the adverse selection that normally affects recruitment in FFs. Notice that the adoption of PRP schemes causes an increase in labour costs in both FFs and NFFs. This is a corollary of the reasoning developed above and a prediction for the potential effects of PRP on labour costs. Furthermore, the reluctance of FFs to

[4] "In a market and technological setting subject to frequent and rapid change, it is vital to be part of an environment that is rich in knowledge where information, including non-codified information, circulates by virtue of socio-economic interaction. Such an environment facilitates reciprocal learning and the creation of a specific production culture and identity" (Dei Ottati, 2017, p. 274). The biomedical, mechanical engineering, leather tanning and footwear, and sportswear districts (Mirandola, Reggio Emilia, Santa Croce sull'Arno, Montebelluna), are notable examples of Italian districts that have adapted to the new context.

dismiss workers negatively affects their possibility to reduce labour costs during the crisis. However, our conjecture is that the influence of PRP on FFs' productivity is effective only if it counterbalances these negative effects on labour costs and positively boosts competitiveness more than it does in NFFs.

Finally, we investigate whether the embeddedness of FFs in an industrial district enhances the efficacy of PRP because of the stronger alignment of the firm and societal values. This process could even amplify the positive sorting effects mentioned above and reduce adverse selection problems in the labour market for FFs. Therefore, the favourable influence of PRP on productivity and competitiveness, predicted above for family owned firms, should increase in these areas.

2.2 Family firms, heterogeneity and quantile regression

The economic literature has widely discussed differences in the rate of technology adoption, exposure to international markets and organizational routines that affect the basis of firms' capabilities and behaviour as factors underlying the marked heterogeneity across firms (Teece et al. 1994; Becker, 2004; Dosi et al. 2012). However, in recent years, increasing attention has been paid by the family business literature to those additional sources of heterogeneity that lead to different capabilities and decisions of FFs, with negative and positive implications for overall firm performance (see Bertrand and Schoar, 2006, for a review). The mix of economic and non-economic goals discussed within the SEW framework help us to better explain why the *within*-FF heterogeneity becomes relevant when attempting to distinguish FF performance from that of NFFs. Additionally, the different ways FFs prioritize the multiple SEW dimensions have great importance, so that "family firms represent a highly heterogeneous group", as emphasized by Cennamo et al. (2012, p. 1166). For instance, some SEW dimensions are not always valuable for firms' competitive advantage, especially when they mean retaining control and the renewal of family bonds to the firm through dynastic succession; by contrast, other dimensions such as the enjoyment of family influence over the firm, reputation and family image may be valuable dimensions. From a related perspective, Pittino et al. (2018) recently showed that varieties of entrepreneurial orientation among FFs are conditioned by different degrees of belongingness and self-identity that tie family and non-family members to ownership, "regardless of the presence of enforceable property rights" (Pittino et al. 2018). In more general terms, the different weights given by family owners to economic and non-economic goals and, within the non-economic goals, to different dimensions of SEW make FFs a much more heterogeneous group than NFFs, other firm characteristics being equal, i.e., size, sector, workforce composition. These considerations also lead many authors to avoid studying FFs as a single

homogenous group to be contrasted with NFFs in comparative studies (Cennamo et al., 2012; Chua et al., 2012).

Unfortunately, both the mix of economic/non-economic factors relevant to the firm's decision making and the importance given to the different dimensions of SEW are not observable characteristics in our empirical investigation because we only have information on family ownership and management of the firm (that is, we have a binary variable for FFs). In addition, our binary variable for FFs is not time varying, and in the first two steps of our empirical analysis, we cannot exploit the short panel data structure of the database. Therefore, we try to restore heterogeneity among the FF group by assuming that other firm characteristics being equal, the distribution of labour productivity, labour costs and competitiveness is shaped by the different importance FFs place on SEW and single SEW dimensions.

Quantile regression is a useful tool for studying the effect of being FFs along the distribution of performance. First, we study the effect of being FFs along labour productivity, labour costs and competitiveness distributions to determine whether potential negative gaps in performance between FFs and NFFs emerge more frequently among the highest performing firms or only amid the poor performers. Should a greater disadvantage emerge among the highest performing firms, we would conclude that there are probably not bundles of SEW dimensions in Italy that allow FFs to perform better and simultaneously reduce the gap with NFFs. In addition, a larger gap in the upper tail of the performance distribution would mean that the dominance of FFs among the population of Italian firms, is a serious obstacle to the overall improvement of productivity and competitiveness in the national economy. Second, we investigate whether changes in the gaps observed along these distributions occur after the outburst of the crisis. Finally, we analyse whether the introduction of PRP shows different impacts depending on the position of FFs along the same distributions. In this case, the time-varying nature of PRP allows us to use a quantile regression model with fixed effects (Canay, 2011).

3. Data and Descriptive Statistics

3.1 Data

The empirical analysis is based on micro-level data drawn from the Employer and Employee Surveys (RIL) conducted by the National Institute for Public Policy Innovation (INAPP) for the years 2007 and 2010 on a representative sample of partnerships and limited liability firms operating in the

non-agricultural private sector[5]. The INAPP-RIL surveys collect a unique set of information about employment composition, personnel organization, industrial relations and other workplace characteristics. In 2010, the survey also obtained information about corporate governance, ownership/control and management structure. This information enables us to distinguish between FFs, in which a single family holds the majority of shares or has direct control of the firm, and NFFs, in which the majority of shares are not owned by a single family[6].

Each wave of the RIL questionnaire collects information about whether a firm-level bargaining agreement has been adopted. Such firm-level agreements in Italy cover, among other issues, PRP (i.e., wage bonuses linked to the enterprise's performance). Since the presence of some type of PRP scheme (collective and/or individual) is an item with a good response rate in the RIL questionnaire, we created our variable of interest as a dummy variable, i.e., the presence/absence of PRP[7].

In addition, we have a large set of firm-level information concerning firm size and firm strategies (hiring, innovation and export), the composition of the labour force by occupation (executives, blue-collar workers and white-collar workers), gender, type of contract (fixed-term/permanent) and training activities. We also control for the sectors and regions (NUTS 1) and use the industrial district dummy variable as a proxy of the specific business context, as discussed in the previous section.

To link the information above to indicators of firm efficiency and competitiveness, a sub-sample of the RIL dataset was merged with balance-sheet information from the AIDA archives. The AIDA data provide information on our dependent variables, that is, the (log of) valued added per employee and the (log of) labour costs per employees. From their difference, it is possible to compute an indicator of competitiveness[8].

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[5] The availability of information for only two years is a limitation of our research. Nevertheless, our data make it possible to have short panel data and go beyond cross-sectional analysis. Moreover, the two years at our disposal allow us to consider periods before and during the crisis. Thus, our investigation takes into account all changes that occurred within this interval.

[6] The FF group may be divided into two sub-groups: firms in which a single family holds the majority of shares and family members run the firm (FMs) and firms in which a single family holds the majority of shares and external professional managers run the firm (FNMs). In our sample, FMs account for more than 90% of total FFs. The results we obtain for firms with family management are not significantly different from those obtained for the whole group of FFs (these results are available upon request). Thus, we decided to maintain only the main distinction between family and non-family firms.

[7] The literature focusing on relationships between incentive schemes and economic performances identifies other human resource management practices (HRMP) that complement PRP. For instance, Bloom and van Reenen (2011) consider self-managed teams, performance feedback, job rotation, regular meetings, and training besides the incentive pay. In our case, the RIL questionnaire only reports information with good response rates for PRP and training. Notice also that investigation on complementarities of HRMP poses important challenges on both economic and econometric terms (Bloom and van Reenen, 2011, p. 1724) and calls for a deeper investigation which is beyond the scope of this paper.

[8] Labour costs include taxes on labour and represent a standard measure for calculating competitiveness.

We have also drawn from AIDA archives data on past firms' sales (period 1998-2005). Following Devicienti et al. (2018, p.180), we calculated the standard deviation of eight years of firms' sales as a proxy of volatility and uncertainty on the product market. We consider the volatility at the firm level and transform this information into a dummy variable that equals 1 when the firm experienced volatility above the median volatility of the correspondent *two-digit Nace* sector and 0 otherwise[9]. This dummy variable is the instrument used in the instrumental variable quantile regression (Abadie et al, 2002), introduced as a robustness check (see Appendix B.2 and B.3 for more details).

With regard to sample selection, we excluded firms with fewer than five employees to retain only those productive units characterized by a minimum level of organizational structure, for which it makes sense to test the role of PRP. Furthermore, we excluded firms that experienced mergers and acquisitions in the previous three years to limit the analysis to enterprises whose ownership and control structure remained unchanged during the observation period. Therefore, the sample that we used in the first specifications was an unbalanced panel of approximately 4,476 firms for 2007 and 4,336 for 2010.

Detailed definitions of all variables mentioned above are reported in Table A1 (Appendix A)

3.2 Descriptive statistics

Table 1 shows descriptive statistics for FFs and NFFs before and after the outbreak of the crisis.

Over the period 2007-2010, on average, FFs were less successful in terms of labour productivity, paid lower wages, and their competitiveness indicator (ln (P/LC)) was more unfavourable. In addition, FFs employed fewer executives and white-collar employees, made less use of training, were less active than non-family enterprises in product innovation, and, with regard to their workforce, had a lower proportion of men and a higher percentage of fixed-term contracts.

However, our major interest is to investigate the disparities in the responses of FFs and NFFs to the global financial recession. We start with our key variable, the diffusion of PRP.

Insert Table 1

It appears that the incidence of agreements on PRP was modest before the crisis and that a smaller fraction of FFs adopted these schemes (8%) in relation to NFFs (26%). These differences are in line with other evidence and confirm that in FFs, which are typically smaller and have fewer resources than NFFs, recourse to high-level technical competence for implementing incentive systems is often not affordable (Cruz et al. 2011). In 2010, these different propensities towards PRP were still remarkable and reflected the different possibilities of bearing the high cost of implementation of these

[9] Devicienti et al. (2018) construct measures of the economic volatility faced by firms and unions based on past sales at the sectoral level, whereas we use data for past sales at the firm level.

schemes, especially in times of crisis. However, likely as result of the reform proposal of 22 January 2009 that designed new rules for wage setting to amplify the importance of the variable component of wages, both groups slightly increased their recourse to PRP (9% and 29% in FFs and NFFs, respectively). Interestingly, these changes were accompanied by an increasing proportion of trained employees, which increased in FFs from 20% in 2007 to approximately 25% in 2010. A significant increase of trained employees was also recorded in NFFs (from 28% to 35%). Furthermore, we observe a slight decline of fixed-term contracts in FFs from 10% in 2007 to 9% in 2010 and in NFFs from 9% to 7%, respectively. These tendencies towards training and fixed-term contracts confirm that in Italy, as in other European countries, during the crisis, firms try to protect the human capital embodied in skilled blue-collar and white-collar workers. These organizational changes are confirmed by other employee characteristics. For both groups of firms, we observe slight changes in the structure of the workforce in terms of occupational categories. The need to retain human capital led to an increase of shares of executives and white-collar employees and a parallel decline of blue-collar employees. These results are in line with the evidence obtained by the ESCB's Wage Dynamics Network (WDN) for Italian firms with more than 20 employees (D'Amuri et al., 2013).

For firm productivity, the major change observed after the crisis was the greater reduction of labour productivity in the FF group (in log from 10.80 in 2007 to 10.75 in 2010), whereas for NFFs, labour productivity was stagnant (the reduction in log was from 11.02 in 2007 to 11.00 in 2010). These tendencies were coupled with a general substantial sluggishness of real labour costs. As a result, the decline of competitiveness (ln (P/LC)) demonstrated by FFs before and after the outbreak of the crisis was slightly higher (from 0.43 in 2007 to 0.38 in 2010) in relation to NFFs (from 0.47 to 0.44).

The strong decline of process and product innovation recorded in both groups of enterprises is remarkable. However, for the year 2010, the number of FFs and NFFs that weathered the crisis by relying on international markets increased, thus demonstrating the role of the increase in the number of exporting (family and nonfamily) firms as a strategic response to compensate for the contraction of domestic demand.

Concerning the longitudinal structure of our dataset, Table 2 shows the summary statistics of between and within variation for both dependent variables and our key regressor, that is, PRP. Although the variation across firms is always more important than the within variation, the latter is not negligible and supports our choice to use a fixed-effects method when our variable of interest is PRP.

Insert Table 2

4. Econometric strategy and results

4. 1 Methods

To investigate econometrically the role of family ownership and PRP across productivity, labour costs and competitiveness distributions before and during the great crisis, we proceed in four steps.

In the first and second steps, we estimate the factors behind the (log of) value added per employee $\ln\left(\frac{P}{L}\right)_{i,t}$ by using the following equation:

$$(1)\ ln\left(\frac{P}{L}\right)_{i,t} = \alpha \cdot ln\left(\frac{K}{L}\right)_{i,t} + \beta \cdot D_{FF,i,t} + \gamma\ Crisis + \delta\ D_{FF,i,t} \cdot Crisis + \vartheta \cdot F_{i,t} + \mu_s + \gamma_j + \varepsilon_{i,t} \quad t = 2007,2010$$

where subscripts *i* and *t* are firms and years, respectively, $\ln\left(\frac{K}{L}\right)_{it}$ is the (log of) physical capital per employee, and D_{FF} represents a dummy variable that takes the value of 1 if the firm is owned and/or controlled by a family and zero otherwise. *Crisis* is a dummy variable taking the value 1 for the year 2010 and 0 otherwise, whereas $Crisis \cdot D_{FF}$ is an interaction term. The parameter associated with D_{FF} indicates whether firms owned/controlled by a family are more or less productive than NFFs are. Put differently, the coefficient associated with D_{FF} may be interpreted as the labour productivity gap between the two categories of firms, whereas the interaction term $Crisis \cdot D_{FF}$ captures potential changes in this gap during the crisis. The vector F_{it} denotes controls for workforce composition and other firms' characteristics discussed in section 3.1 (for more details, see Table A.1 in the Appendix). The parameter μ_s denotes sector-specific fixed effects, γ_j denotes regional (NUTS1_level) fixed effects for macro-areas, and ε_{it} is an error term capturing the idiosyncratic component of labour productivity.

We replicate this strategy when the dependent variables are labour costs $\left(\frac{LC}{L}\right)_{it}$ and the gap between labour productivity and labour costs, $\ln\left(\frac{P}{LC}\right)_{i,t}$:

$$(2)\ ln\left(\frac{LC}{L}\right)_{i,t} = \alpha' \cdot ln\left(\frac{K}{L}\right)_{i,t} + \beta' \cdot D_{FF,i,t} + \gamma'\ Crisis + \delta' D_{FF,i,t} \cdot Crisis + \vartheta' \cdot F_{i,t} + \mu_s + \gamma_j + \varepsilon_{i,t} \quad t = 2007,2010$$

$$(3)\ \ln\left(\frac{P}{LC}\right)_{i,t} = \alpha'' \cdot ln\left(\frac{K}{L}\right)_{i,t} + \beta'' \cdot D_{FF,i,t} + \gamma''\ Crisis + \delta'' D_{FF,i,t} \cdot Crisis + \vartheta'' \cdot F_{i,t} + \mu_s + \gamma_j + \varepsilon_{i,t} \quad t = 2007,2010$$

where subscripts *i, t* and the control variables included in the right-hand side of equations (2) and (3) are the same as those used for labour productivity.

In the econometric framework formalized above, we rely mainly on quantile regression (QR) methods and maintain OLS estimations as a benchmark to explore whether FFs show different behaviour compared to NFFs along the different points of the productivity, labour cost and competitiveness distributions. As discussed in section 2.2, firm characteristics (labour force composition, size, sector of economic activity, innovation and export) being equal, the presence of unobservable factors such as managerial capabilities and a different mix of economic and noneconomic (SEW) goals for FFs justify the analysis of relationships of interest across conditional quantiles rather than conditional means. In particular, we use a Koenker and Basset (1978) estimator to verify i) whether the gap between FFs and NFFs ($\beta \cdot D_{FF,i,t}$) differs along quantiles of productivity, labour costs and competitiveness distributions (see H1) and ii) whether this gap changed during the crisis ($\delta\ D_{FF,i,t} \cdot Crisis$) over different quantiles (see H2).

In the third step, we explore the effect of PRP along the distributions of the same dependent variables by distinguishing the sub-group of FFs from that of NFFs. Using the same notation introduced above, we estimate the following equations:

$$(4)\ ln\left(\frac{P}{L}\right)_{i,t} = \alpha \cdot ln\left(\frac{K}{L}\right)_{i,t} + \beta \cdot PRP_{i,t} + \gamma\ Crisis + \delta\ PRP_{,i,t} \cdot Crisis + \vartheta \cdot F_{i,t} + \mu_s + \gamma_j + \varepsilon_{i,t} \quad t = 2007,2010$$

$$(5)\ ln\left(\frac{LC}{L}\right)_{i,t} = \alpha' \cdot ln\left(\frac{K}{L}\right)_{i,t} + \beta' \cdot PRP_{i,t} + \gamma'\ Crisis + \delta' PRP_{i,t} \cdot Crisis + \vartheta' \cdot F_{i,t} + \mu_s + \gamma_j + \varepsilon_{i,t} \quad t = 2007,2010$$

$$(6)\ \ln\left(\frac{P}{LC}\right)_{i,t} = \alpha'' \cdot ln\left(\frac{K}{L}\right)_{i,t} + \beta'' \cdot PRP_{,i,t} + \gamma''\ Crisis + \delta'' PRP_{i,t} \cdot Crisis + \vartheta'' \cdot F_{i,t} + \mu_s + \gamma_j + \varepsilon_{i,t} \quad t = 2007,2010$$

where PRP is a dummy variable indicating whether an incentive pay scheme is adopted, the interaction term *($Crisis \cdot PRP$)* aims to capture whether the effect of PRP changed during the crisis (H3), and *F* is a vector that includes other controls for firm characteristics and workforce composition. In this case, the time-varying nature of PRP leads us to take into account all time-invariant unobserved factors at the firm level that could bias the PRP coefficient. Therefore, we perform quantile fixed-effects estimates and apply the technique elaborated by Canay (2011), in which the unobserved individual heterogeneity is proxied by additive fixed effects that capture time-invariant firm characteristics (for more details, see Appendix B.1).

To test the fourth hypothesis discussed in section 2, which refers to the effects of PRP in industrial districts, we simply add an interaction term *($Crisis \cdot PRP \cdot District$)* and respective combinations of lower-level effects (*($Crisis \cdot District$)* and *($PRP \cdot District$)*) to equations (4)-(6).

Finally, the issue of potential endogeneity is taken into account. It may be argued that the adoption of PRP requires high-quality personnel policies and is more likely to be affordable for top-performing firms with high-level efficiency. Thus, higher-productivity firms may have a higher probability of adopting a PRP scheme, and potential self-selection problems might emerge.

With respect to our estimation strategy, we use two methods: i) the Quantile Treatment Effect Estimator of Abadie et al. (2002) (IVQR_AAI) and ii) the traditional Two-Stages Least Absolute Deviation Estimator (IVQR_2 LAD) of Amemya (1982). A detailed explanation of these two methods is reported in Appendix B.2 and B.3, respectively.

4.2 Results

4.2.1 Family ownership and economic outcomes

Table 3 reports the pooled OLS and quantile regression results for equation (1).

Insert Table 3

To begin with mean regressions, we note that a negative correlation between family ownership and labour productivity is amplified during the crisis. In particular, OLS estimates indicate that FFs suffer from a labour productivity gap of almost 12%, whereas the crisis contributed to this difference with an additional impact of approximately 7% (see the OLS coefficient associated with the interaction term *Family firms*$\cdot Crisis$). OLS regressions for labour costs (equation 2) indicate a negative estimate for the dummy *Family Firms* (8.6%), although no significant effect is associated with the interaction term *Family firms*$* Crisis$. Focusing on equation (3), OLS estimates for competitiveness, reported in Table 5, suggest that the gap of FFs in relation to NFFs becomes negative and significant with the crisis, as shown by the coefficient associated with the interaction term *Family Firms*Crisis*, whereas no direct significant impact is exerted by family ownership (see the coefficient for *Family Firms*). Specifically, in 2010, a -0.05 in log value is the difference of FFs in terms of competitiveness. This figure exceeds the unadjusted Ln(P/LC) *difference-in-difference* (*family-nonfamily_2010 minus family-nonfamily_2007*), implicitly deduced from Table 1, and thus signals that FFs were seriously hit by the 2008 crisis[10].

Our interpretation is that FFs, which usually do not want to breach the implicit contract with their employees because their reputation is at stake (Block, 2010), avoid opting for layoffs in the case of adverse shocks, with the consequence of side effects on labour productivity. This interpretation does not always hold for FFs in all countries, as we discussed in section 2.1. For example, Lins et al.

[10] By taking the competitiveness indicator (Ln(P/LC)) from Table 1, we see that the decline for FFs from 0.43 to 0.38 *minus* the decline for NFFs from 0.47 to 0.44 is -0.05-(-0.03)=-0.02. Family involvement contributed to this average value by -0.05, whereas it is likely that other firm characteristics counterbalanced this negative influence.

(2013) investigated family firm performance during the 2008-2009 crisis in 35 countries and found that their under-performance is due to preserving private benefits of control and cutting investments rather than reducing the dismissal of workers. For this reason, we provide additional evidence, based on Italian family firms, to support the conjecture that FFs preserve implicit contracts with their employees and restructure less during the crisis. Following Lins et al. (2013), we study differences between FFs and NFFs in terms of aggregated (firm level) labour costs, employment and net employment growth rates before and during the crisis[11]. Table A.2, in the Appendix, shows that compared to NFFs, FFs employ fewer workers on average (- 7.8%) and bear lower costs for labour (-16.4%) in normal times; however, these figures do not change (i.e., the negative gap does not amplify) during the crisis. In addition, we observe a reversal of the net employment growth rate, the indicator that captures the effects of the restructuring and downsizing of firms during the crisis. Although net changes in employment are slightly more favourable for NFFs (that is, a negative gap of -3.6% is observed between FFs and NFFs), the opposite holds during the crisis, when a positive difference of 13.8% emerges between the same two groups. On average, FFs tend to dismiss fewer workers than NFFs during the crisis[12].

To complete the picture presented by the OLS estimates, we note some controversial results for two control variables for women and innovation. The negative estimates associated with women are coherent with other studies that find that female employees, on average, prefer activities that allow greater flexibility between job and family, have lower interdependence with other workers, are less involved in participative work forms (Zwick, 2004), and appear less responsive to incentives. Notice also the non-significant results of process and product innovations on labour productivity, which could be due to the probable high correlation between export and innovation propensities, all of which are included as control variables in our estimates[13].

Going beyond a mere conditional mean model and turning to the quantile regressions, we obtain meaningful results. For labour productivity, Table 3 reveals that the coefficient associated with the FF dummy confirms the insight obtained with OLS estimates but also suggests that the point estimates

[11] We have no information to test behavior in the pursuit of private benefits of control and investment cuts, an aspect that is out of the scope of the current investigation. Instead, we can evaluate the effects of the crisis on labour costs, employment and net employment growth (NEG). The latter has been identified according to the standard procedure we find in literature (Davis and Haltiwanger, 1992; Boeri, 1996), that is $NEG=(E_t - E_{t-1}) / [(E_t + E_{t-1})/2]$, where E is employment. In our case, we calculated NEG between 2006 and 2007 and between 2009 and 2010.

[12] The conditional mean of the predicted value of the net employment growth rate (see the NEG formulation in the previous footnote) is slightly positive in 2007 (0.80% for NFFs and 0.77% for FFs) and, of course, negative in 2010 (-1.42% for NFFs and -1.27% for FFs). In any case, it is less worse for FFs.

[13] The coefficient of Export is significant with the expected sign in both the productivity and competitiveness equations.

differ widely across the various quantiles[14]. The best performers demonstrate a major penalty in terms of labour productivity (LP) when owned by families (-21.4%), whereas for the group located at the median position and at the 10th percentile, the penalties of FFs in relation to NFFs are significantly lower (-9.3% and -8.5%, respectively).

With regard to labour costs, we note that the best performers in terms of labour productivity (Q90) pay low wages (-8%) in relation to the corresponding NFFs (see Table 4). However, for this quantile (Q90), the distance in LC estimates of FFs from NFFs is not significantly different from that recorded by the firms located at the bottom of the distribution (the coefficient associated with FFs for the Q10 is -10.8%)[15]. As a result, we find that FFs located at the top of the distribution present a significant gap in terms of competitiveness (ln (P/LC) of -12.7 points in log values in relation to NFFs. This gap is significantly higher than that recorded by firms located in the nearest position (Q75), for which the penalty of FFs in relation to NFFs is significantly lower (-7.5 in log values)[16] (see Table 5). By contrast, for FFs located at the bottom of the distribution no negative gap concerning competitiveness has been found.

Insert Tables 4 and 5

In sum, heterogeneities are more marked for labour productivity, whereas for labour costs, likely as a result of more uniform and compressed wage strategies, differentials between FFs and NFFs across the different quantiles are less evident. Therefore, the best-performing FFs, those with high labour productivity and competitiveness, likely have a better mix of SEW dimensions that renders them high performant within the group of family firms, as we conjectured in section 2.2, but at the same time they are more distant in terms of the same performances from their NFF peers. In other words, corporate ownership (FFs vs NFFs) may be an important source of heterogeneity and the best performers seem to contribute more to this heterogeneity as they are more penalized than firms located at the bottom of productivity and competitiveness distributions. These results, in conformity with what found by Barbera and Moores (2013) and Firfiray et al. (2016), suggests that as FFs grow in size and obtain higher economic performances with respect to smaller FFs, also record a higher gap in terms of labour productivity with respect to their NFF counterparts. Especially Barbera and Moores (2013), demonstrated that differences in the efficient use of inputs between FFs and NFFs may explain this evidence. As discussed above, the binding social ties and genuine concern for

[14] For the coefficients associated with FFs, we find that Q50 vs. Q90 and Q10 vs. Q90 are significantly different at the 0.01 level.
[15] The differences of the quantile coefficients for FFs are only significantly different at the 0.05 level for Q10 vs Q50.
[16] As shown by Table 5, the quantile coefficients associated with FFs for Q10 vs. Q90 and Q75 vs. Q90 are significantly different at the .01 level and at the 0.10 level, respectively.

employee welfare make the output contribution of labour much more important than returns on capital in FFs. Therefore, a best-performing FF that necessarily introduces more capital than low performer FF in its production organisation, suffers more from lower output contribution of capital, compared to the output contribution of capital in NFFs. This explanation for the best performers and heterogeneity among FFs adds to that we discussed on different performances between FFs and NFFs, i.e., elements of SEW that shape managerial orientations, firm strategies and differences in the efficient use of inputs are likely behind the weaker productivity and competitiveness of FFs compared to NFFs.

However, the crisis shows a much less clear-cut impact along the distributions of economic outcomes discussed above. Our results from quantile regressions reported in Tables 3, 4 and 5 signal that only the FFs located on the median and those just below the median (25th percentile) suffered more from the crisis in terms of both productivity and competitiveness. Therefore, the OLS results are basically driven by firms with an intermediate level of performance. By contrast, for FFs located at the top of outcome distributions, the largest negative gaps they already show before the crisis in productivity (-0.214) and competitiveness (-0.127) do not further worsen during the crisis[17].

4.2.2. Performance-related pay, family ownership and the crisis

As seen, the attention given by FFs to reputation and trust-related relationships with employees may restrain some FFs from intensive downsizing during adverse times and may lead to labour hoarding. This choice is undertaken at the cost of reducing labour productivity and enlarging their competitiveness gap during crises. How can they fill this gap? Are high-road approaches to managerial strategies an efficient way to survive and close the distance from firms owned by outsiders and run by professional managers? How do FFs use these strategies, such as PRP, to face a crisis? We attempt to answer these questions below.

In this section, the relationship between PRP and our dependent variables is investigated by performing the quantile fixed-effect regression proposed by Canay (2011). As discussed previously, this technique enables us to disentangle the differentiated impact of PRP across the distributions for both subsamples of FFs and NFFs from other sources of observed and unobserved heterogeneity at the firm level (see Tables 6 and 7).

Insert Tables 6 and 7

[17]This evidence does not fully confirm for the whole outcome distributions our conjecture of the poor performance of FFs, which worsens during the crisis due to their reluctance to downsize. Further research is needed on this issue, also supported by longer data series, to obtain conclusive results.

Given our focus on the role of PRP with a main concern for the year of crisis, we present only the related estimated coefficients for PRP, the variable *Crisis* (that is, Year 2010) and their interaction. We do not comment on the results for the other covariates included in our empirical models (these results are available on request).

Similar to the specifications presented in Tables 3-5, we report the results for the conditional mean function, obtained through the standard within estimator (FE), as a benchmark. The findings for the FFs subsample indicate that the FE coefficient for PRP has the expected sign but is not significant, whereas we find that PRP plays a positive and statistically significant role in productivity along the whole distribution, as signalled by the quantile coefficients (Table 6). The remarkable differences underlined in the literature between mean and quantile regressions can explain this apparent incongruity (Cameron and Trivedi, 2010). Normally, quantile (and median) regressions are more robust to outliers, rely on approaches that avoid assumptions about the parametric distribution of regression errors and are especially suitable for heteroskedastic data.

Concerning the economic interpretation, the result obtained with the quantile regression is in accordance with the hypotheses of a vast body of related literature on PRP that has shown that these contingent rewards generate beneficial effects in the form of higher effort and work quality, higher commitment and incentives to firm-specific human capital, greater workforce cooperation in facing organizational changes, lower labour turnover and longer average tenure (Prendergast, 1999). Interestingly, these efficiency arguments apply for FFs but not for NFFs (see Table 7). This finding supports the hypothesis that only family-involved firms, in terms of both ownership and active management, tend to exploit some of the advantages of incentive pay schemes, which in our case include both collective and individual bonuses. As discussed in section 2.1, economic theory is ambiguous on their impacts, especially if these schemes involve collective bonuses that may induce employees to free-ride on the efforts of others and cut productivity. By contrast, the implementation of PRP in FFs may present some advantages given that family businesses feature socio-emotional values and more identity than non-kinship firms do (Gómez-Mejía et al., 2007). Furthermore, in FFs, interpersonal relationships show more stability and a shared social network (Nahapiet & Ghoshal, 1998). These trust-related relationships help to reduce the opportunistic behaviour that may arise in firms ruled by professional managers and owned by nonfamily principals. In addition, FFs might benefit from positive sorting effects of PRP that solve structural problems of adverse selection intrinsic to the specific nature of family owned firms and their priority to preserve SEW.

It is relevant to note that the crisis significantly affects the labour efficiency of FFs, with a range of values along the distribution from -5.6% (Q75) to -9.2% (Q10) as indicated by the coefficients associated with the dummy *Crisis* (see Table 6, Panel A). However, our results also suggest that the

crisis does not decrease the positive relationship between PRP and the labour productivity of FFs. For all but the median quantile (Q50), the coefficients associated with the interaction term *PRP*Crisis* are not significantly different from 0, thus confirming that the crisis did not attenuate the positive relationship between PRP and the labour efficiency of FFs. This can also be deduced by the positive algebraic sum of the significant coefficients for PRP and *PRP*Crisis* in quantile regression (see panel A of Table 6). Thus, for instance, for the best performers (Q90) in 2010, the association of PRP with productivity was quite close to the value +8.5% (the estimated coefficient for PRP).

The gains in competitiveness FFs obtained from PRP in all quantiles deserve attention (Table 6, Panel C). Notably, these gains are invariant with the outbreak of the crisis. Indeed, with the exception of firms in the Q50 and Q75 positions, the role of PRP in 2010 is not significantly different from the positive mean value, which is + 0.052 points in log value. Notice also that the coefficient for the best performers (0.049) is not significantly different from that obtained for the firms in Q75 (0.058) and Q50 (0.052). This finding implies that FFs that link pay to performance may encourage motivation and elicit more effort from their employees, with a gain in competitiveness amounting to +0.05 points in log values that exactly offsets the losses suffered from the crisis (see Table 5, the coefficient associated with *Family Firms *Crisis* in the OLS column). This gain allows FFs to partially recover the gap in relation to their NFF counterparts, as we conjectured in our conceptual framework.

Endogeneity

The positive effects of PRP on productivity, labour costs and competitiveness are also confirmed by quantile regressions that take into account treatment effect techniques to tackle the likely endogeneity of PRP (see Appendix B.2 and B.3). Tables A.3 and A.4 in the Appendix show that PRP, instrumented by lagged sales volatility, positively affects productivity, labour cost and competitiveness only in the group of FFs. Table A.5 shows the relevance of the instrument (High Sales Volatility) in the first stage of the Instrumental Variable 2 Stages Least Absolute Deviation regression (IVQR_2 LAD).

4.2.3 Performance-related pay, family firms and industrial districts

As hypothesized in section 2.1, an additional factor that may contribute to the positive role of PRP on labour productivity and competitiveness, in accordance with the approach based on SEW, is the business context in which FFs operate. One typical characteristic of the Italian economy is the geographical concentration of specialized firms that are agglomerated in industrial districts. For FFs operating in these business contexts, the performance gap with respect to NFFs may revert, as shown by Naldi et al. (2013). This occurs because the preservation of SEW positively influences the alignment of the firm's aims with those of the local community, fostering adherence to the norms of

conduct and tacit rules prevailing in the district. Under these circumstances, we expect that the implementation of PRP schemes, especially in times of crises, may produce prompt and positive responses if firms' objectives and business practices properly fit the requirements of the local environment. On the one hand, sorting effects might be more effective because FFs in industrial districts may resort to labour supply pools where workers likely have the required industry-specific skills and share the same entrepreneurial values. On the other hand, as already discussed in section 2.1, the wage policy induces high-powered incentives. Indeed, it is likely that during a crisis, employees' efforts are strategic complements (rather than substitutes). In a local community, team cooperation is more intense, and the probability of collective dismissal is more likely perceived as endogenously determined by workers' effort choices. Hence, to decrease the probability of firms' termination in a bad economic situation, it is likely that workers operating in an industrial district choose to put forward more effort in response to PRP than they would in other settings.

To test the role of industrial districts in explaining the effectiveness of our key regressor, PRP, we perform additional estimates, reported in Table 8. We introduce a dummy variable (*Distr*) that takes the value 1 when the firm operates in an industrial district and 0 otherwise. Then, we interact this variable with PRP and/or the year of the crisis (*Year 2010*). Interestingly, the interaction term *PRP*Crisis*Distr* shows a positive and significant impact on labour productivity for both the FE coefficient for the mean regression (0.175) and for the majority of conditional quantile coefficients (whose values range from 0.129 to 0.168). This positive influence adds to that recorded for the main effect of PRP and fully confirms our conjecture that incentive pay is particularly favourable for FFs in times of crisis. The latter is always positive and significant along the productivity distribution (for PRP, the quantile coefficients range from 0.097 to 0.118). By contrast, our results make it clear that is not the district in itself that exerts a significant effect on firm productivity in adverse times, as shown by the negative term *Crisis*Distr,* but the adoption of PRP in an industrial district. Thus, we obtain evidence that complements the findings of Naldi et al. (2013). According to these authors, the district location of FFs induces greater commitment and the achievement of higher financial performance, measured by returns on sales. In our case, we find that FFs facing adverse shocks may improve labour productivity if they operate in industrial districts and resort to specific HRM strategies that involve pay for performance, such as PRP. The findings above are confirmed by quantile regressions concerning competitiveness (Panel C of Table 8).

As we conjectured for the fourth step of our analysis (see section 2.1) and coherently with previous results, the interaction term *PRP*Crisis*Distr* persists in being nonsignificant or even negative for NFFs (Table 9) and indicates that resorting to PRP in times of crisis benefits only firms

whose family owners and family CEOs are able to align the firm's aims with those of the local community.

Insert Tables 8 and 9

Conclusions

This paper focused on how corporate ownership may contribute to the dispersion of productivity and competitiveness across industrial structures by enlarging the gap in economic performances between family and nonfamily firms. Although these gaps increase in times of crisis, FFs may adopt specific human resource management strategies, such as incentive pay schemes (PRP), that help them to partially reduce these penalizations.

Specifically, the major changes observed after the crisis consist of the greater reduction, on average, of labour productivity in the FF group and a general substantial sluggishness of real labour costs in both subsamples. As a related result, we observe that after the outbreak of the crisis, the distance in terms of competitiveness of FFs with respect to their NFF counterparts increased. These results are less clear-cut along the productivity and competitiveness distributions because they hold only for firms located on the median or just below the median (25^{th} percentile).

Second, we tested the role of performance-related pay schemes in both subsamples (FFs and NFFs). We verified that these schemes are efficacious in FFs (but not in NFFs), even though this efficacy does not increase during the crisis, as we hypothesized. However, for FFs located in industrial districts in which social rules prevail over formal rules, the adoption of PRP exerted additional positive effects during the crisis. Therefore, conditioned on the location in industrial districts, our conjectures on positive and specific effects of PRP on FFs' performances are fully confirmed.

The different role of PRP in FFs and NFFs is a puzzling issue. The positive influence of PRP should be universal because in both groups of firms, these schemes may have an incentive effect in *aligning* the interests of owners with those of their employees. Instead, we have found that PRP schemes are useful management strategies only for FFs, which can utilize these schemes to catch up to NFFs. One interpretation of our result is that family business may present some advantages, especially when FFs feature socio-emotional value and more identity than non-kinship firms (Gómez-Mejía et al., 2007). There may be 'instrumental motives' according to which the interests of other stakeholders, such as employees, are a tool to maximize the interests of family principals. FFs have a higher propensity to adopt proactive stakeholder engagement activities because they intend to preserve and enhance their SEW (Cennamo et al. 2012). The adoption of incentives is perceived as a proactive stance towards employees and a positively valued dimension of FF aims (Kellermans et al. 2012). In addition, FFs that offer compensation linked to the enterprise's economic performance may

use this wage policy to attract workers who come from a local labour market; these workers, who share the same cultural heritage and value system as the family CEOs and family principals as often occurs in the Italian industrial districts, may reveal more productive than other workers, outside the local community. The positive effects of PRP in boosting productivity and competitiveness could be amplified, as they are in our case. In sum, the efficiency-enhancing role of PRP, coupled with a moderate influence of these schemes on wage premiums, enables FFs to regain competitiveness and reduce their under-performance even under hostile pressures, such as those involved in the strong global crisis.

Our study has some limitations. A first type of limitation refers to statistical information. Longitudinal panel data including more years would enable greater consideration of causality and the potential endogeneity of PRP. Another main limitation concerns the lack of detailed statistical information on different types of PRP schemes, at the group and individual levels. In addition, psychometric instruments should be useful to measure SEW dimensions. Unfortunately, the RIL employer and employee surveys do not have data that permit consideration of these relevant issues. A second type of limitation concerns theory. Although some work has been done, there is no unique formal and corroborated theory that offers clear predictions about the specific impact of the compensation strategies of family and non-family business in times of crisis.

Although our study basically remains an exploratory analysis, it offers contributions to two different lines of research. First, it adds evidence to the literature on FFs and to the field based on the SEW framework by providing results on the role of incentive payments to employees as a response to mitigate the crisis effect, an area quite unexplored to date. Second, it enriches the literature on heterogeneity and the dispersion of productivity across firms by showing the role played by FFs, particularly in times of crisis, and suggesting the importance of removing a "distorted homogeneous view" of family firms (Chua et al., 2012).

The topic of our paper, which has been overlooked in the related literature, also has managerial implications. Although Italy appears to be special case in Europe due to the prevalence of family-owned and family-managed firms, there are similarities in terms of two-tier bargaining systems in this country and other Continental EU countries. These similarities suggest that it could be interesting to explore whether the relationships between PRP and competitiveness also hold for other EU countries, especially those characterized by ownership concentration in family hands.

Concerning political implications, we suggest that for an economy characterized by the prevalence of small family businesses, which show a low propensity to rely on formalized recruitment systems and performance appraisals, the implementation of wage incentive schemes calls for new encouragement and economic stimulus to enhance their diffusion. After the severe effects of the

global financial and economic crisis, PRP schemes requiring high costs of implementation that small firms cannot afford call for new political interventions to promote their diffusion. These measures could represent a valid response to improve enterprise results in a country characterized by one of the worst performances in productivity growth and competitiveness.

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Table 1 Descriptive statistics

	Total Sample				Family Firms				Non-Family Firms			
	2007		2010		2007		2010		2007		2010	
	Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev
PRP	0.12	0.32	0.14	0.34	0.08	0.27	0.09	0.29	0.26	0.44	0.29	0.45
Ln (P/L)	10.85	0.55	10.81	0.55	10.80	0.51	10.75	0.52	11.02	0.64	11.00	0.59
Ln(LC/L)	10.42	0.37	10.42	0.37	10.37	0.35	10.37	0.36	10.55	0.41	10.56	0.36
Ln(P/LC)	0.44	0.39	0.39	0.38	0.43	0.35	0.38	0.36	0.47	0.48	0.44	0.44
Ln(K/L)	9.99	1.52	10.22	1.71	9.98	1.45	10.24	1.65	10.05	1.73	10.18	1.89
Workforce caracteristics												
% new hirings	0.13	0.16	0.09	0.15	0.13	0.16	0.10	0.16	0.13	0.15	0.09	0.13
% executives	0.04	0.09	0.05	0.10	0.03	0.08	0.04	0.08	0.09	0.13	0.09	0.14
% white collars	0.38	0.30	0.39	0.29	0.35	0.30	0.36	0.29	0.47	0.30	0.48	0.30
% blue collars	0.58	0.33	0.56	0.32	0.62	0.31	0.60	0.30	0.44	0.35	0.43	0.35
% women	0.34	0.28	0.35	0.27	0.33	0.28	0.34	0.27	0.36	0.26	0.37	0.26
% fixed term contracts	0.10	0.15	0.08	0.14	0.10	0.16	0.09	0.14	0.09	0.14	0.07	0.12
% trained workers	0.22	0.34	0.27	0.37	0.20	0.33	0.25	0.36	0.28	0.35	0.35	0.38
Firms characteristics												
Process innov	0.45	0.50	0.40	0.49	0.45	0.50	0.39	0.49	0.44	0.50	0.43	0.50
Product innov	0.57	0.50	0.46	0.50	0.57	0.50	0.44	0.50	0.59	0.49	0.50	0.50
Export	0.20	0.40	0.34	0.47	0.20	0.40	0.35	0.48	0.21	0.41	0.31	0.46
Size: 5 < n of employees<15	0.40	0.49	0.42	0.49	0.44	0.50	0.47	0.50	0.24	0.43	0.26	0.44
Size: 15 ≦n employees < 50	0.37	0.48	0.36	0.48	0.38	0.48	0.36	0.48	0.37	0.48	0.36	0.48
Size: 50 ≦ n employees < 250	0.19	0.40	0.18	0.39	0.16	0.37	0.15	0.36	0.30	0.46	0.30	0.46
Size: n of employees ≧250	0.03	0.18	0.03	0.17	0.02	0.13	0.02	0.13	0.09	0.29	0.08	0.28
Regions (NUTS1)												
North West	0.34	0.47	0.33	0.47	0.33	0.47	0.32	0.47	0.38	0.49	0.38	0.49
North East	0.27	0.44	0.27	0.44	0.27	0.44	0.26	0.44	0.29	0.45	0.29	0.45
Centre	0.20	0.40	0.20	0.40	0.21	0.40	0.21	0.40	0.20	0.40	0.20	0.40
South	0.19	0.39	0.19	0.39	0.20	0.40	0.21	0.41	0.13	0.33	0.13	0.34
Sectors												
Textile, Wearing Apparel, Food	0.14	0.35	0.14	0.34	0.15	0.36	0.15	0.35	0.10	0.31	0.10	0.30
Other Manufacturing, Mining, Utilities	0.33	0.47	0.34	0.47	0.34	0.47	0.34	0.47	0.28	0.45	0.33	0.47
Constructions	0.11	0.31	0.11	0.31	0.12	0.33	0.13	0.34	0.05	0.22	0.05	0.21
Trade, hotels, restaurants	0.15	0.35	0.12	0.32	0.15	0.35	0.13	0.33	0.15	0.36	0.09	0.29
Transportation and communication	0.05	0.21	0.07	0.25	0.02	0.15	0.06	0.24	0.12	0.33	0.10	0.30
Intermediation and other business	0.09	0.29	0.13	0.33	0.09	0.29	0.10	0.30	0.11	0.32	0.23	0.42
Education, health and private social	0.14	0.35	0.10	0.30	0.13	0.33	0.10	0.30	0.18	0.38	0.10	0.30
Observations	4476		4336		3473		3401		983		918	

Sorce: RIL-AIDA data; Note: descriptive statistics are performed with no sampling weights

Table 2 Between and within variation of outcome variables and PRP

Family Firms					Non-Family Firms				
Variable		Mean	Std. Dev.	Observations	Variable		Mean	Std. Dev.	Observations
Ln (P/L)	overall	10.779	0.516	N = 4312	Ln (P/L)	overall	11.014	0.618	N = 1343
	between		0.428	n = 2774		between		0.415	n = 806
	within		0.180	T-bar = 1.55443		within		0.209	T-bar = 1.66625
Ln(LC/L)	overall	10.373	0.348	N = 4312	Ln(LC/L)	overall	10.555	0.389	N = 1343
	between		0.222	n = 2774		between		0.260	n = 806
	within		0.120	T-bar = 1.55443		within		0.139	T-bar = 1.66625
Ln(P/LC)	overall	0.407	0.356	N = 4312	Ln(P/LC)	overall	0.459	0.463	N = 1343
	between		0.217	n = 2774		between		0.303	n = 806
	within		0.137	T-bar = 1.55443		within		0.164	T-bar = 1.66625
PRP	overall	0.104	0.306	N = 4243	PRP	overall	0.272	0.445	N = 1319
	between		0.274	n = 2751		between		0.366	n = 800
	within		0.125	T-bar = 1.54235		within		0.183	T-bar = 1.64875

Table 3 OLS and Quantile Regressions: Family firms and Labor Productivity

	Simultaneous Quantile estimates					OLS
	Q10	Q25	Q50	Q75	Q90	
Family firms	-0.085***	-0.085***	-0.093***	-0.146***	-0.214***	-0.118***
	(0.025)	(0.020)	(0.021)	(0.027)	(0.043)	(0.024)
Crisis (Year 2010)	-0.026	-0.018	-0.021	-0.072**	-0.042	-0.040*
	(0.047)	(0.028)	(0.036)	(0.034)	(0.064)	(0.024)
Family firms* Crisis	-0.061	-0.052*	-0.069**	-0.04	-0.05	-0.069***
	(0.055)	(0.031)	(0.034)	(0.036)	(0.069)	(0.026)
Ln(K/L)	0.075***	0.093***	0.109***	0.123***	0.142***	0.115***
	(0.008)	(0.005)	(0.004)	(0.005)	(0.007)	(0.006)
% new hirings	0.001	0.014	0.041	0.052	0.026	0.032
	(0.052)	(0.048)	(0.045)	(0.050)	(0.102)	(0.052)
% white collars	-0.499***	-0.709***	-1.083***	-1.084***	-1.289***	-0.955***
	(0.137)	(0.145)	(0.125)	(0.142)	(0.229)	(0.137)
% blue collars	-0.826***	-1.075***	-1.489***	-1.614***	-1.965***	-1.418***
	(0.132)	(0.136)	(0.117)	(0.134)	(0.219)	(0.132)
% women	-0.442***	-0.441***	-0.417***	-0.338***	-0.292***	-0.396***
	(0.050)	(0.034)	(0.036)	(0.037)	(0.049)	(0.036)
% fixed-term contracts	-0.03	-0.110*	-0.082	-0.014	0.177*	0.013
	(0.077)	(0.060)	(0.053)	(0.066)	(0.106)	(0.061)
% trained workers	0.102***	0.053***	0.058***	0.038**	0.032	0.055***
	(0.031)	(0.019)	(0.021)	(0.018)	(0.026)	(0.020)
Process innovation	0.039*	0.016	0.005	-0.013	0.016	0.008
	(0.024)	(0.018)	(0.015)	(0.017)	(0.033)	(0.016)
Product innovation	0.018	0.015	0.005	-0.003	-0.058*	-0.005
	(0.022)	(0.016)	(0.014)	(0.016)	(0.034)	(0.016)
Export	0.02	0.047***	0.054***	0.062***	0.070**	0.049***
	(0.023)	(0.016)	(0.013)	(0.020)	(0.029)	(0.016)
15<n of employees<100	0.111***	0.074***	0.014	-0.042**	-0.112***	0.002
	(0.024)	(0.014)	(0.013)	(0.018)	(0.029)	(0.018)
99<n of employees<250	0.167***	0.116***	0.053***	-0.038*	-0.142***	0.031
	(0.027)	(0.019)	(0.018)	(0.020)	(0.029)	(0.021)
n of employees>249	0.103*	0.063**	0.009	-0.097**	-0.199***	-0.045
	(0.054)	(0.029)	(0.035)	(0.038)	(0.048)	(0.038)
Constant	10.417***	10.712***	11.238***	11.453***	11.895***	11.101***
	(0.144)	(0.146)	(0.126)	(0.138)	(0.214)	(0.151)
NUTS1_level Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sector Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R_2/PseudoR_2	0.154	0.166	0.177	0.197	0.215	0.279
Observations	5308					

Notes: Clustered-Robust (OLS) and bootstrap standard errors with 100 replications (Quantile Regression) in parentheses. Workers categories: omitted variable % executives. Firm's size: omitted variable 5<n of employees<16.

Quantile coefficients for Family Firms: Q50 vs Q90 and Q10 vs Q90 are significantly different at .01 level.

*** significant at .01 level; ** significant at .05 level; *significant at .10 level

Table 4 OLS and Quantile Regressions: Family firms and Labor Costs

	Simultaneous Quantile estimates					OLS
	Q10	Q25	Q50	Q75	Q90	
Family firms	-0.108***	-0.097***	-0.060***	-0.064***	-0.080***	-0.086***
	(0.021)	(0.011)	(0.011)	(0.013)	(0.020)	(0.015)
Crisis (Year 2010)	-0.025	-0.020	-0.012	-0.017	-0.039	-0.014
	(0.031)	(0.016)	(0.014)	(0.018)	(0.028)	(0.013)
Family firms* Crisis	0.023	0.012	-0.021	-0.017	-0.006	-0.020
	(0.035)	(0.019)	(0.016)	(0.021)	(0.029)	(0.015)
Ln(physical capital per employee)	0.034***	0.032***	0.030***	0.033***	0.032***	0.039***
	(0.005)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
% new hirings	-0.08	-0.02	-0.003	0.007	0.002	-0.029
	(0.057)	(0.047)	(0.035)	(0.030)	(0.076)	(0.035)
% white collars	-0.527***	-0.767***	-1.032***	-1.226***	-1.266***	-0.957***
	(0.087)	(0.103)	(0.079)	(0.086)	(0.170)	(0.104)
% blue collars	-0.843***	-1.105***	-1.369***	-1.568***	-1.636***	-1.307***
	(0.074)	(0.098)	(0.069)	(0.077)	(0.161)	(0.100)
% women	-0.467***	-0.476***	-0.453***	-0.438***	-0.419***	-0.459***
	(0.032)	(0.024)	(0.022)	(0.017)	(0.028)	(0.024)
% fixed-term contracts	-0.281***	-0.191***	-0.119**	-0.099**	0.017	-0.108**
	(0.062)	(0.062)	(0.047)	(0.040)	(0.081)	(0.043)
% trained workers	0.035**	0.039***	0.037***	0.043***	0.042**	0.040***
	(0.017)	(0.012)	(0.012)	(0.014)	(0.018)	(0.013)
Process innovation	0.006	-0.009	-0.018*	-0.007	-0.027	-0.021**
	(0.015)	(0.011)	(0.010)	(0.010)	(0.018)	(0.010)
Product innovation	0.021	0.01	0.000	-0.004	-0.001	0.009
	(0.014)	(0.010)	(0.010)	(0.010)	(0.017)	(0.010)
Export	0.021	0.009	0.009	0.002	0.003	0.020**
	(0.014)	(0.012)	(0.009)	(0.011)	(0.016)	(0.009)
15<n of employees<100	0.114***	0.077***	0.050***	0.019	-0.024	0.043***
	(0.016)	(0.013)	(0.010)	(0.012)	(0.016)	(0.011)
99<n of employees<250	0.195***	0.152***	0.098***	0.055***	0.01	0.102***
	(0.014)	(0.011)	(0.010)	(0.013)	(0.020)	(0.012)
n of employees>249	0.170***	0.147***	0.114***	0.021	-0.053*	0.063**
	(0.034)	(0.021)	(0.016)	(0.019)	(0.029)	(0.024)
Constant	10.695***	11.127***	11.538***	11.844***	12.077***	11.380***
	(0.098)	(0.102)	(0.084)	(0.090)	(0.181)	(0.114)
NUTS1_level Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sector Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R_2/PseudoR_2	0.251	0.248	0.242	0.234	0.231	0.351
Observations	5340					

Notes: Clustered-Robust (OLS) and bootstrap standard errors with 100 replications (Quantile Regression) in parentheses. Workers categories: omitted variable % executives. Firm's size: omitted variable 5<n of employees<16.

Quantile coefficients for Family Firms: Q10 vs Q50 are significantly different at .05 level.

*** significant at .01 level; ** significant at .05 level; *significant at .10 level

Table 5 OLS and Quantile Regressions: Family firms and Competitiveness

	Simultaneous Quantile estimates					OLS
	Q10	Q25	Q50	Q75	Q90	
Family firms	0.031*	0.013	-0.017	-0.075***	-0.127***	-0.030
	(0.017)	(0.014)	(0.015)	(0.023)	(0.033)	(0.020)
Crisis (Year 2010)	-0.024	0.000	-0.004	-0.051	-0.043	-0.027
	(0.030)	(0.020)	(0.023)	(0.032)	(0.055)	(0.020)
Family firms* Crisis	-0.031	-0.044**	-0.050**	-0.009	-0.027	-0.050**
	(0.034)	(0.019)	(0.024)	(0.033)	(0.057)	(0.021)
Ln(physical capital per employee)	0.030***	0.046***	0.066***	0.090***	0.114***	0.076***
	(0.005)	(0.003)	(0.002)	(0.004)	(0.006)	(0.005)
% new hirings	0.122***	0.060*	0.036	0.064	0.063	0.064*
	(0.034)	(0.031)	(0.030)	(0.041)	(0.061)	(0.038)
% white collars	-0.092	-0.042	-0.005	-0.047	-0.146	-0.046
	(0.089)	(0.052)	(0.052)	(0.098)	(0.272)	(0.082)
% blue collars	-0.1	-0.098*	-0.068	-0.160*	-0.37	-0.158**
	(0.088)	(0.051)	(0.050)	(0.089)	(0.253)	(0.080)
% women	0.058*	0.022	0.068***	0.087***	0.093**	0.064**
	(0.032)	(0.019)	(0.017)	(0.024)	(0.046)	(0.028)
% fixed-term contracts	0.023	0.061	0.083**	0.109**	0.11	0.121***
	(0.055)	(0.043)	(0.034)	(0.048)	(0.087)	(0.043)
% trained workers	0.029*	0.022**	-0.005	0.01	0.028	0.015
	(0.017)	(0.010)	(0.013)	(0.018)	(0.030)	(0.016)
Process innovation	0.042***	0.027***	0.019*	0.024*	0.026	0.028**
	(0.013)	(0.009)	(0.010)	(0.013)	(0.024)	(0.013)
Product innovation	0.004	-0.002	0.002	-0.02	-0.041*	-0.015
	(0.014)	(0.010)	(0.009)	(0.014)	(0.024)	(0.013)
Export	0.040**	0.020*	0.044***	0.040**	0.066***	0.030**
	(0.017)	(0.012)	(0.011)	(0.016)	(0.023)	(0.014)
15<n of employees<100	0.02	-0.009	-0.031***	-0.073***	-0.140***	-0.041***
	(0.018)	(0.010)	(0.011)	(0.018)	(0.030)	(0.014)
99<n of employees<250	0.021	-0.005	-0.057***	-0.115***	-0.238***	-0.071***
	(0.019)	(0.011)	(0.011)	(0.016)	(0.025)	(0.016)
n of employees>249	0.036	-0.021	-0.088***	-0.139***	-0.272***	-0.110***
	(0.034)	(0.022)	(0.024)	(0.029)	(0.056)	(0.034)
Constant	-0.273**	-0.199***	-0.256***	-0.162	0.079	-0.234**
	(0.110)	(0.065)	(0.055)	(0.099)	(0.268)	(0.094)
NUTS1_level Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sector Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R_2/PseudoR_2	0.030	0.050	0.080	0.111	0.146	0.119
Observations	5308					

Notes: Clustered-Robust (OLS) and bootstrap standard errors with 100 replications (Quantile Regression) in parentheses.
Competitiveness is measured as Ln(Labour Productivity)- Ln(Labour costs).
Workers categories: omitted variable % executives. Firm's size: omitted variable 5<n of employees<16.
Quantile coefficients for Family Firms: Q10 vs Q90 and Q75 vs Q90 are significantly different at .01 level and at 0.10 level respectively.
*** significant at .01 level; ** significant at .05 level; *significant at .10 level

Table 6 Quantile fixed effects, Family firms

Panel A Dep. Var. : Ln (labour productivity)						
	Q10	**Q25**	**Q50**	**Q75**	**Q90**	**FE**
PRP	0.067**	0.064***	0.068***	0.082***	0.085***	0.068
	(0.034)	(0.017)	(0.000)	(0.017)	(0.030)	(0.047)
Crisis	-0.092***	-0.092***	-0.086***	-0.056***	-0.077***	-0.086***
	(0.013)	(0.007)	(0.000)	(0.007)	(0.013)	(0.014)
PRP*Crisis	-0.058	-0.029	-0.016***	-0.032	-0.012	-0.016
	(0.045)	(0.023)	(0.002)	(0.027)	(0.049)	(0.040)
Work.Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Firm Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Macro-regions	Yes	Yes	Yes	Yes	Yes	Yes
Sectors	Yes	Yes	Yes	Yes	Yes	Yes
Constant	9.340***	9.503***	9.479***	9.496***	9.557***	9.479***
	(0.117)	(0.051)	(0.000)	(0.049)	(0.111)	(0.266)
Pseudo R2	0.589	0.699	0.797	0.811	0.729	
N of firms (panels)	2655					
N of Obs	4009					
Panel B Dep. Var. : Ln (Labour Costs)						
	Q10	**Q25**	**Q50**	**Q75**	**Q90**	**FE**
PRP	0.018	0.021***	0.009***	0.022***	0.007	0.009
	(0.013)	(0.007)	(0.000)	(0.007)	(0.011)	(0.030)
Crisis	-0.042***	-0.039***	-0.033***	-0.016***	-0.023***	-0.033***
	(0.007)	(0.004)	(0.000)	(0.004)	(0.007)	(0.009)
PRP*Crisis	-0.012	-0.020*	-0.008***	-0.023**	-0.007	-0.008
	(0.021)	(0.011)	(0.000)	(0.011)	(0.017)	(0.026)
Work.Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Firm Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Macro-regions	Yes	Yes	Yes	Yes	Yes	Yes
Sectors	Yes	Yes	Yes	Yes	Yes	Yes
Constant	9.435***	9.478***	9.457***	9.484***	9.580***	9.457***
	(0.048)	(0.028)	(0.000)	(0.029)	(0.060)	(0.170)
Pseudo R2	0.652	0.740	0.814	0.817	0.741	
N of firms (panels)	2661					
N of Obs	4031					
Panel C Dep. Var. : Ln (Labour productivity)- Ln (Labour Costs)						
	Q10	**Q25**	**Q50**	**Q75**	**Q90**	**FE**
PRP	0.046**	0.042**	0.052***	0.058***	0.049*	0.052
	(0.022)	(0.017)	(0.000)	(0.010)	(0.026)	(0.037)
Crisis	-0.057***	-0.054***	-0.055***	-0.026***	-0.033***	-0.055***
	(0.012)	(0.005)	(0.000)	(0.006)	(0.010)	(0.011)
PRP*Crisis	-0.013	-0.008	-0.007***	-0.024*	-0.024	-0.007
	(0.034)	(0.017)	(0.001)	(0.015)	(0.033)	(0.031)
Work.Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Firm Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Macro-regions	Yes	Yes	Yes	Yes	Yes	Yes
Sectors	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.043	0.090**	0.054***	0.075**	0.164**	0.054
	(0.095)	(0.044)	(0.000)	(0.035)	(0.071)	(0.206)
Pseudo R2	0.414	0.548	0.671	0.667	0.538	
N of firms (panels)	2655					
N of Obs.	4009					

Notes: Robust (panel data model) and boostrapped standard errors with 100 replications (QR) in parentheses.
*** significant at .01 level; ** significant at .05 level; *significant at .10 level.
Workers' characteristics include: shares of blue, white-collars and executives; shares of fixed term contracts, trained workers and women.
Firm characteristics include: firm's size, capital intensity (Ln(K/L); share of new hirings; product and process innovation; export.
Results for all control variables included in both labour force and firm characteristics are available upon request.

Table 7 Quantile fixed effects, Non-Family firms

Panel A Dep. Var. : Ln (labour productivity)						
	Q10	**Q25**	**Q50**	**Q75**	**Q90**	**FE**
PRP	-0.051	-0.019	-0.004***	0.01	0.049	-0.004
	(0.045)	(0.017)	(0.000)	(0.016)	(0.041)	(0.060)
Crisis	-0.044	-0.022*	-0.011***	0.022	0.005	-0.011
	(0.033)	(0.012)	(0.000)	(0.014)	(0.031)	(0.030)
PRP*Crisis	0.016	0.003	-0.004	-0.011	-0.029	-0.004
	(0.059)	(0.022)	(0.004)	(0.024)	(0.061)	(0.053)
Work.Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Firm Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Macro-regions	Yes	Yes	Yes	Yes	Yes	Yes
Sectors	Yes	Yes	Yes	Yes	Yes	Yes
Constant	10.311***	10.432***	10.478***	10.512***	10.521***	10.478***
	(0.193)	(0.083)	(0.001)	(0.058)	(0.158)	(0.446)
Pseudo R2	0.455	0.595	0.693	0.656	0.590	
N of firms (panels)	787					
N of Obs	1232					
Panel B Dep. Var. : Ln (Labour Costs)						
	Q10	**Q25**	**Q50**	**Q75**	**Q90**	**FE**
PRP	0.060***	0.063***	0.081***	0.061***	0.088***	0.081**
	(0.015)	(0.007)	(0.001)	(0.008)	(0.021)	(0.040)
Crisis	-0.018	-0.020***	0.005***	0.000	0.019	0.005
	(0.014)	(0.007)	(0.000)	(0.009)	(0.018)	(0.020)
PRP*Crisis	-0.034	-0.034***	-0.040***	-0.022*	-0.070**	-0.04
	(0.022)	(0.012)	(0.002)	(0.013)	(0.028)	(0.034)
Work.Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Firm Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Macro-regions	Yes	Yes	Yes	Yes	Yes	Yes
Sectors	Yes	Yes	Yes	Yes	Yes	Yes
Constant	10.322***	10.330***	10.339***	10.367***	10.519***	10.339***
	(0.091)	(0.035)	(0.001)	(0.033)	(0.099)	(0.287)
Pseudo R2	0.564	0.652	0.709	0.674	0.613	
N of firms (panels)	791					
N of Obs	1241					
Panel C Dep. Var. : Ln (Labour productivity)- Ln (Labour Costs)						
	Q10	**Q25**	**Q50**	**Q75**	**Q90**	**FE**
PRP	-0.091*	-0.066**	-0.061***	-0.091***	-0.081***	-0.101***
	(0.051)	(0.026)	(0.012)	(0.000)	(0.011)	(0.025)
Crisis	-0.021	-0.001	-0.016	-0.021***	0.017	0.017
	(0.025)	(0.023)	(0.012)	(0.000)	(0.012)	(0.022)
PRP*Crisis	0.043	0.009	0.018	0.043***	0.027	0.033
	(0.044)	(0.047)	(0.018)	(0.001)	(0.018)	(0.031)
Work.Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Firm Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Macro-regions	Yes	Yes	Yes	Yes	Yes	Yes
Sectors	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.037	-0.131	0.05	0.037***	0.025	0.006
	(0.374)	(0.128)	(0.063)	(0.001)	(0.051)	(0.126)
Pseudo R2	0.393	0.514	0.612	0.558	0.472	
N of firms (panels)	787					
N of Obs.	1232					

Notes: Robust (panel data model) and boostrapped standard errors with 100 replications (QR) in parentheses.
*** significant at .01 level; ** significant at .05 level; *significant at .10 level.
Workers' characteristics include: shares of blue, white-collars and executives; shares of fixed term contracts, trained workers and women.
Firm characteristics include: firm's size, capital intensity (Ln(K/L); share of new hirings; product and process innovation; export.
Results for all control variables included in both labour force and firm characteristics are available upon request.

Table 8 Quantile fixed effects, Family firms and industrial districts

Panel A Dep. Var. : Ln (labour productivity)						
	Q10	**Q25**	**Q50**	**Q75**	**Q90**	**FE**
PRP	0.099***	0.097***	0.105***	0.110***	0.118***	0.105*
	(0.036)	(0.027)	(0.000)	(0.020)	(0.034)	(0.063)
PRP*Crisis	-0.130***	-0.087**	-0.101***	-0.101***	-0.083	-0.101*
	(0.050)	(0.034)	(0.001)	(0.027)	(0.055)	(0.057)
PRP*Distr	-0.066	-0.061*	-0.058***	-0.031	-0.055	-0.058
	(0.094)	(0.035)	(0.004)	(0.031)	(0.070)	(0.113)
PRP* Crisis *Distr	0.166	0.135***	0.168***	0.129***	0.164*	0.175**
	(0.113)	(0.042)	(0.015)	(0.041)	(0.098)	(0.084)
Distr* Crisis	-0.099***	-0.049***	-0.053***	-0.032***	-0.062***	-0.053**
	(0.027)	(0.015)	(0.000)	(0.012)	(0.023)	(0.024)
Crisis (Year2010)	-0.060***	-0.072***	-0.066***	-0.042***	-0.056***	-0.066***
	(0.015)	(0.008)	(0.000)	(0.009)	(0.015)	(0.017)
Constant	9.325***	9.489***	9.455***	9.480***	9.480***	9.455***
	(0.087)	(0.053)	(0.000)	(0.052)	(0.052)	(0.304)
Pseudo R2	0.589	0.699	0.797	0.811	0.729	
N of firms (panels)	2655					
N of Obs	4009					
Panel B Dep. Var. : Ln (Labour Costs)						
	Q10	**Q25**	**Q50**	**Q75**	**Q90**	**FE**
PRP	0.037*	0.034***	0.031***	0.025***	0.014	0.031
	(0.021)	(0.012)	(0.001)	(0.009)	(0.021)	(0.041)
PRP*Crisis	-0.061*	-0.043***	-0.049***	-0.027*	-0.003	-0.049
	(0.036)	(0.016)	(0.002)	(0.014)	(0.026)	(0.037)
PRP*Distr	-0.028	-0.031**	-0.044***	-0.007	-0.014	-0.044
	(0.025)	(0.014)	(0.005)	(0.009)	(0.021)	(0.063)
PRP* Crisis *Distr	0.075*	0.044**	0.081***	0.011	-0.002	0.081
	(0.040)	(0.020)	(0.007)	(0.017)	(0.033)	(0.052)
Distr* Crisis	-0.018	-0.018**	-0.029***	-0.014**	-0.007	-0.029*
	(0.012)	(0.008)	(0.003)	(0.007)	(0.014)	(0.017)
Crisis (Year2010)	-0.038***	-0.031***	-0.023***	-0.010*	-0.019*	-0.023**
	(0.009)	(0.005)	(0.000)	(0.006)	(0.011)	(0.011)
Constant	9.427***	9.492***	9.448***	9.478***	9.565***	9.448***
	(0.044)	(0.027)	(0.005)	(0.027)	(0.056)	(0.170)
Pseudo R2	0.652	0.740	0.814	0.817	0.741	
N of firms (panels)	2661					
N of Obs	4031					
Panel C Dep. Var. : Ln (Labour productivity)- Ln (Labour Costs)						
	Q10	**Q25**	**Q50**	**Q75**	**Q90**	**FE**
PRP	0.068**	0.078***	0.062***	0.061***	0.033	0.062
	(0.029)	(0.019)	(0.003)	(0.010)	(0.030)	(0.050)
PRP*Crisis	-0.097*	-0.062***	-0.053***	-0.053***	-0.022	-0.053
	(0.050)	(0.021)	(0.001)	(0.018)	(0.048)	(0.045)
PRP*Distr	-0.014	-0.047**	-0.003	0.016	0.082	-0.003
	(0.050)	(0.023)	(0.002)	(0.021)	(0.055)	(0.075)
PRP* Crisis *Distr	0.134*	0.098***	0.088***	0.082**	-0.028	0.096
	(0.074)	(0.029)	(0.011)	(0.033)	(0.081)	(0.063)
Distr* Crisis	-0.048*	-0.025**	-0.023***	-0.020**	-0.016	-0.023
	(0.025)	(0.011)	(0.002)	(0.010)	(0.022)	(0.020)
Crisis (Year2010)	-0.039***	-0.042***	-0.045***	-0.018**	-0.027**	-0.045***
	(0.014)	(0.007)	(0.001)	(0.007)	(0.012)	(0.013)
Constant	-0.081	0.067	0.037***	0.053*	0.138*	0.037
	(0.093)	(0.044)	(0.002)	(0.030)	(0.076)	(0.205)
Pseudo R2	0.414	0.548	0.671	0.667	0.538	
N of firms (panels)	2655					
N of Obs.	4009					

Notes: Robust (panel data model) and boostrapped standard errors with 100 replications (QR) in parentheses.
*** significant at .01 level; ** significant at .05 level; *significant at .10 level.
Both firm and workers characteristics included as control variables (see Table 5)
Results for all control variables included in both labour force and firm characteristics are available upon request.

Table 9 Quantile fixed effects, Non-Family firms and industrial districts

Panel A Dep. Var. : Ln (labour productivity)						
	Q10	**Q25**	**Q50**	**Q75**	**Q90**	**FE**
PRP	-0.065	-0.007	-0.011***	0.03	-0.003	-0.011
	(0.062)	(0.023)	(0.004)	(0.019)	(0.048)	(0.081)
PRP*Crisis	0.152**	0.029	0.054***	-0.002	0.066	0.054
	(0.071)	(0.028)	(0.009)	(0.035)	(0.080)	(0.065)
PRP*Distr	0.018	-0.047	-0.017***	-0.062**	0.041	-0.017
	(0.076)	(0.031)	(0.003)	(0.028)	(0.070)	(0.125)
PRP* Crisis *Distr	-0.253**	-0.087*	-0.114***	-0.013	-0.180*	-0.114
	(0.116)	(0.050)	(0.015)	(0.048)	(0.106)	(0.114)
Distr* Crisis	0.038	-0.046*	-0.046***	-0.061**	-0.035	-0.046
	(0.064)	(0.025)	(0.001)	(0.026)	(0.057)	(0.060)
Crisis (Year2010)	-0.063*	0.007	0.005***	0.047**	0.015	0.005
	(0.038)	(0.019)	(0.002)	(0.020)	(0.041)	(0.035)
Constant	10.411***	10.519***	10.525***	10.546***	10.558***	10.525***
	(0.181)	(0.071)	(0.001)	(0.058)	(0.181)	(0.449)
Pseudo R2						
N of firms (panels)	787					
N of Obs	1232					
Panel B Dep. Var. : Ln (Labour Costs)						
	Q10	**Q25**	**Q50**	**Q75**	**Q90**	**FE**
PRP	0.069***	0.074***	0.081***	0.061***	0.082***	0.081
	(0.020)	(0.008)	(0.002)	(0.013)	(0.026)	(0.053)
PRP*Crisis	0.002	-0.022	-0.020***	-0.011	-0.059	-0.02
	(0.031)	(0.018)	(0.004)	(0.018)	(0.037)	(0.043)
PRP*Distr	-0.045	-0.035**	-0.019***	-0.01	-0.008	-0.019
	(0.032)	(0.016)	(0.003)	(0.016)	(0.055)	(0.082)
PRP* Crisis *Distr	-0.048	-0.021	-0.038***	-0.027	-0.024	-0.038
	(0.048)	(0.026)	(0.005)	(0.026)	(0.080)	(0.075)
Distr* Crisis	0.006	0.001	-0.017***	-0.008	-0.007	-0.017
	(0.029)	(0.012)	(0.002)	(0.014)	(0.034)	(0.040)
Crisis (Year2010)	-0.033*	-0.021**	0.011***	0.002	0.022	0.011
	(0.018)	(0.009)	(0.002)	(0.010)	(0.021)	(0.023)
Constant	10.311***	10.355***	10.353***	10.366***	10.499***	10.353***
	(0.075)	(0.035)	(0.004)	(0.036)	(0.098)	(0.291)
Pseudo R2						
N of firms (panels)	791					
N of Obs	1241					
Panel C Dep. Var. : Ln (Labour productivity)- Ln (Labour Costs)						
	Q10	**Q25**	**Q50**	**Q75**	**Q90**	**FE**
PRP	-0.058	-0.054***	-0.102***	-0.079***	-0.127***	-0.102
	(0.049)	(0.018)	(0.003)	(0.014)	(0.033)	(0.068)
PRP*Crisis	0.039	0.035	0.082***	0.032	0.075**	0.082
	(0.061)	(0.026)	(0.004)	(0.024)	(0.036)	(0.055)
PRP*Distr	-0.022	-0.034	0.010***	-0.008	0.022	0.01
	(0.059)	(0.025)	(0.003)	(0.021)	(0.049)	(0.105)
PRP* Crisis *Distr	-0.045	-0.03	-0.074***	-0.021	-0.027	-0.083
	(0.086)	(0.041)	(0.010)	(0.038)	(0.067)	(0.096)
Distr* Crisis	-0.031	-0.032	-0.021***	-0.054**	-0.068	-0.021
	(0.053)	(0.025)	(0.003)	(0.021)	(0.044)	(0.051)
Crisis (Year2010)	0.016	-0.002	-0.013***	0.038**	0.028	-0.013
	(0.030)	(0.019)	(0.001)	(0.015)	(0.025)	(0.029)
Constant	-0.028	0.076	0.066***	0.022	0.043	0.066
	(0.150)	(0.061)	(0.003)	(0.050)	(0.122)	(0.378)
Pseudo R2						
N of firms (panels)	787					
N of Obs.	1232					

Notes: Robust (panel data model) and boostrapped standard errors with 100 replications (QR) in parentheses.
*** significant at .01 level; ** significant at .05 level; *significant at .10 level.
Both firm and workers characteristics included as control variables (see Table 5)
Results for all control variables included in both labour force and firm characteristics are available upon request.

APPENDIX A

Table A.1 Description of the Variables

Variable	Definition
PRP	Dummy variable that equals 1 if the firm adopts a PRP scheme, 0 otherwise.
FF	A dummy variable that equals 1 if the firm is owned and or controlled by a family (FF) and 0 otherwise (NFF)
Ln (P)	Log of value-added per employee (source AIDA) deflated by the value added deflator (source ISTAT)
Ln (LC/L)	Log of Labour cost per employee (source AIDA) deflated by the consumer price index for blue and white collar workers (source ISTAT)
Ln (P/LC)	Proxy of competitiveness of the firms
Ln (K/L)	Log of capital stock per employee (source AIDA) deflated by the investment deflator (source ISTAT)
% executives	Percentage of managers and supervisors on total workers
% white collars	Percentage of white collar workers on total workers
% blue collars	Percentage of manual workers on total workers
% females	Percentage of women on total workers
% fixed-term contracts	Percentage of fixed-term workers on total workers
% new hirings	Number of hired workers on total workers in the previous year
% trained workers	Percentage of trained workers on total workers
Process Innovation	Dummy variable that equals 1 if the firm adopted process innovations in the last three years, 0 otherwise
Product Innovation	Dummy variable that equals 1 if the firm originated new products in the last three years, 0 otherwise
Foreign market	Dummy variable that equals 1 if the firm exported in the last three years, 0 otherwise
North- West	Dummy variable that equals 1 if the firm is localised in North-Western regions, 0 otherwise
North-East	Dummy variable that equals 1 if the firm is localised in North-Eastern regions, 0 otherwise
Centre	Dummy variable that equals 1 if the firm is localised in Central regions, 0 otherwise
South	Dummy variable that equals 1 if the firm is localised in Southern regions, 0 otherwise
Industrial Districts (Distr)	Dummy variables that equals 1 if the firm is localised in an industrial district as defined by Istat (2001).
Sectors	Dummy variable that equals 1 if the firm is localised in sector shown in table1, 0 otherwise

Table A.2 Restructuring of labour forces during the crisis in family and non-family firms (OLS)

	Log (Labour Costs)	Log(Employees)	Net Employment Growth
Family firms	-0.164***	-0.078***	-0.036***
	(0.023)	(0.021)	(0.010)
Crisis (Year 2010)	-0.015	-0.003	0.009
	(0.021)	(0.022)	(0.016)
Family firms* Crisis	-0.013	0.009	0.138***
	(0.024)	(0.024)	(0.021)
Work.Charact.	Yes	Yes	Yes
Firm Charact.	Yes	Yes	Yes
Macro-regions	Yes	Yes	Yes
Sectors	Yes	Yes	Yes
Constant	13.775***	2.398***	0.095**
	(0.138)	(0.102)	(0.045)
N of Obs	5291	5291	4855
R2	0.831	0.841	0.52

Table A.3 IV Quantile Regressions: Effects of PRP on Productivity, Labour Costs and Competitiveness in Family Firms

Panel A Dep. Var. : Ln (labour productivity)						
	IVQR_AAI					IV_2LAD
	Q10	Q25	Q50	Q75	Q90	τ=50
PRP	0.427***	0.323***	0.226*	0.279***	0.404**	0.513***
	(0.084)	(0.083)	(0.130)	(0.094)	(0.194)	(0.072)
Crisis(Year2010)	-0.095	-0.009	-0.014	-0.002	-0.002	-0.151***
	(0.205)	(0.112)	(0.103)	(0.126)	(0.178)	(0.018)
Work.Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Firm Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Macro-regions	Yes	Yes	Yes	Yes	Yes	Yes
Sectors	Yes	Yes	Yes	Yes	Yes	Yes
Constant	9.437***	9.764***	10.250***	10.563***	10.129***	11.085***
	(1.015)	(1.071)	(1.319)	(1.372)	(1.927)	(0.191)
Pseudo R2						0.179
N of Obs	2441					2372
Panel B Dep. Var. : Ln (Labour Costs)						
	IVQR_AAI					IV_2LAD
	Q10	Q25	Q50	Q75	Q90	τ=50
PRP	0.253***	0.245***	0.203***	0.244***	0.285***	0.133***
	(0.095)	(0.080)	(0.060)	(0.085)	(0.087)	(0.044)
Crisis(Year2010)	0.041	0.067	0.050	0.040	0.044	-0.036***
	(0.123)	(0.093)	(0.086)	(0.099)	(0.106)	(0.013)
Work.Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Firm Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Macro-regions	Yes	Yes	Yes	Yes	Yes	Yes
Sectors	Yes	Yes	Yes	Yes	Yes	Yes
Constant	10.477***	10.433***	10.667***	11.022***	11.185***	11.397***
	(0.485)	(1.664)	(0.927)	(1.159)	(1.324)	(0.111)
Pseudo R2						0.229
N of Obs	2454					2383
Panel C Dep. Var. : Ln (Labour productivity)- Ln (Labour Costs)						
	IVQR_AAI					IV_2LAD
	Q10	Q25	Q50	Q75	Q90	τ=50
PRP	0.501***	0.349**	0.324**	0.399***	0.433**	0.300***
	(0.172)	(0.139)	(0.130)	(0.117)	(0.178)	(0.058)
Crisis(Year2010)	-0.085	-0.064	-0.077	-0.100	-0.105	-0.095***
	(0.141)	(0.126)	(0.109)	(0.107)	(0.200)	(0.016)
Work.Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Firm Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Macro-regions	Yes	Yes	Yes	Yes	Yes	Yes
Sectors	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-2.300***	-1.947*	-1.255	-1.385	-1.359	-0.23
	(0.883)	(1.043)	(1.631)	(2.025)	(1.913)	(0.140)
Pseudo R2						0.100
N of Obs.	2441					2372

Notes: IVQR_AAI is the Quantile Treatment Effect Estimator of Abadie et al. (2002); IV_2LAD is the traditional Two-Stages Least Absolute Deviation Estimator of Amemya (1982).

Workers' characteristics include: shares of blue, white-collars and executives; shares of fixed term contracts, trained workers and women.

Firm characteristics include: firm's size, capital intensity (Ln(K/L); share of new hirings; product and process innovation; export.

Results for all control variables included in both labour force and firm characteristics are available upon request.

.*** significant at .01 level; ** significant at .05 level; *significant at .10 level.

Boostrapped standard errors with 100 replications in parentheses.

Table A.4 IV Quantile Regressions: Effects of PRP on Productivity, Labour Costs and Competitiveness in Non-Family Firms

Panel A Dep. Var. : Ln (labour productivity)						
	IVQR_AAI					**IV_2LAD**
	Q10	**Q25**	**Q50**	**Q75**	**Q90**	**τ=50**
PRP	0.231	0.199	0.180	0.152	0.151	0.809***
	(0.251)	(0.136)	(0.151)	(0.135)	(0.247)	(0.207)
Crisis(Year2010)	-0.033	-0.018	0.024	0.014	-0.084	-0.051
	(0.253)	(0.116)	(0.142)	(0.163)	(0.250)	(0.040)
Work.Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Firm Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Macro-regions	Yes	Yes	Yes	Yes	Yes	Yes
Sectors	Yes	Yes	Yes	Yes	Yes	Yes
Constant	10.573***	12.048***	12.228***	11.706***	11.044***	13.633***
	(0.935)	(0.605)	(1.037)	(1.258)	(1.290)	(0.446)
Pseudo R2						0.213
N of Obs	2441					746
Panel B Dep. Var. : Ln (Labour Costs)						
			IVQR_AAI			**IV_2LAD**
	Q10	**Q25**	**Q50**	**Q75**	**Q90**	**τ=50**
PRP	0.260	0.215*	0.175**	0.111	0.068	0.364***
	(0.182)	(0.122)	(0.074)	(0.086)	(0.099)	(0.122)
Crisis(Year2010)	0.067	0.032	0.029	0.021	0.038	-0.006
	(0.122)	(0.074)	(0.055)	(0.050)	(0.092)	(0.019)
Work.Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Firm Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Macro-regions	Yes	Yes	Yes	Yes	Yes	Yes
Sectors	Yes	Yes	Yes	Yes	Yes	Yes
Constant	11.616***	11.761***	11.787***	12.295***	12.302***	12.619***
	(0.564)	(0.443)	(0.372)	(1.034)	(1.276)	(0.233)
Pseudo R2						0.275
N of Obs	2454					749
Panel C Dep. Var. : Ln (Labour productivity)- Ln (Labour Costs)						
			IVQR_AAI			**IV_2LAD**
	Q10	**Q25**	**Q50**	**Q75**	**Q90**	**τ=50**
PRP	0.287	0.174	0.156	0.124	0.075	0.471***
	(0.218)	(0.151)	(0.115)	(0.120)	(0.189)	(0.181)
Crisis(Year2010)	-0.025	0.013	-0.041	0.007	-0.022	-0.038
	(0.109)	(0.094)	(0.087)	(0.111)	(0.232)	(0.029)
Work.Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Firm Charact.	Yes	Yes	Yes	Yes	Yes	Yes
Macro-regions	Yes	Yes	Yes	Yes	Yes	Yes
Sectors	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.353	0.253	0.333	0.171	0.022	0.763**
	(0.325)	(0.671)	(0.435)	(0.625)	(0.724)	(0.310)
Pseudo R2						0.098
N of Obs.	2441					746

Notes: IVQR_AAI is the Quantile Treatment Effect Estimator of Abadie et al. (2002); IV_2LAD is the traditional Two-Stages Least Absolute Deviation Estimator of Amemya (1982).

Workers' characteristics include: shares of blue, white-collars and executives; shares of fixed term contracts, trained workers and women.

Firm characteristics include: firm's size, capital intensity (Ln(K/L); share of new hirings; product and process innovation; export.

Results for all control variables included in both labour force and firm characteristics are available upon request.

.*** significant at .01 level; ** significant at .05 level; *significant at .10 level.

Boostrapped standard errors with 100 replications in parentheses.

Table A.5. IV Quantile Regressions 2_LAD: First Stage (Probit Model)

Dependent Variable: PRP	Family Firms	Non-Family Firms
High Sales Volatility (1/0)	0.256***	0.176
	(0.096)	(0.136)
Crisis(Year2010)	0.130	0.077
	(0.083)	(0.122)
Ln(physical capital per employee)	-0.296	-0.119
	(0.346)	(0.607)
% new hirings	-2.519***	-0.531
	(0.549)	(0.705)
% white collars	-2.231***	-0.137
	(0.452)	(0.678)
% blue collars	-0.461**	-0.541*
	(0.200)	(0.299)
% women	-1.365***	-1.680**
	(0.447)	(0.788)
% fixed-term contracts	0.219**	0.420***
	(0.093)	(0.158)
% trained workers	0.019	0.017
	(0.030)	(0.045)
Process innovation	-0.088	0.057
	(0.101)	(0.123)
Product innovation	0.042	0.111
	(0.117)	(0.115)
Export	0.134	-0.176
	(0.087)	(0.141)
15<n of employees<100	0.715***	0.704**
	(0.140)	(0.278)
99<n of employees<250	1.232***	1.347***
	(0.159)	(0.290)
n of employees>249	1.722***	1.824***
	(0.308)	(0.442)
Constant	-0.472	-1.682**
	(0.512)	(0.853)
NUTS1_level Dummies	Yes	Yes
Sector Dummies	Yes	Yes
Observations	2358	741

Notes: bootstrapped standard errors with 100 replications in parentheses.
*** significant at .01 level; ** significant at .05 level; *significant at .10 level.

APPENDIX B

B.1

One may formalize the Canay technique to the productivity equation as:

$$(\beta^{\tau}, \gamma^{\tau}, \delta^{\tau}, \boldsymbol{\theta}^{\tau}) = argmin \sum \rho_{\tau} \cdot \left(ln\left(\widehat{\frac{P}{L}}\right)_{i,t} - \beta \cdot D_{FF,i,t} - \gamma\, Crisis - \delta\, D_{FF,i,t} \cdot Crisis - \boldsymbol{\theta} \cdot \boldsymbol{X}_{i,t} \right)$$

where $ln\left(\widehat{\frac{P}{L}}\right)_{i,t}$ is now a dependent variable generated from a previous step in which we calculated the individual fixed effects α_i in a conditional mean regression (that is, a panel data structure of equation 1) and get $ln\left(\widehat{\frac{P}{L}}\right)_{i,t} = ln\left(\frac{P}{L}\right)_{i,t} - \alpha_i$, by assuming that this fixed effects do not vary over quantiles. $\boldsymbol{X}_{i,t}$ is a matrix including now $F_{i,t}, \mu_s and\ \gamma_j$.We also repeated equation (4) for labour costs $\left(\widehat{\frac{LC}{L}}\right)_{it}$ and competitiveness $ln\left(\widehat{\frac{P}{LC}}\right)_{i,t}$.

B.2

The IVQR_AAI estimator is based on a binary endogenous variable and a binary instrument[18]. Thus, we transform the past sales volatility of the firm into a dummy variable that equals 1 when the firm experienced volatility above the median volatility and 0 otherwise. The volatility of sales at the firm level recorded in the past (over the 1998-2005 period) may be a valid instrument because it is a proxy for uncertainty. As already discussed in section 2.1, the rationale is that unstable market conditions, captured by sales volatility, increase the probability of decentralized agreements that typically include PRP. This hypothesis receives support in the Italian case, where PRP is most widely adopted by Italian companies as a strategy for adapting their wage to variable and uncertain external pressures (see the EIRO report, 1997). However, using more than a one-year lag for this instrument, it is plausible to assume that it is orthogonal to labour productivity as well as the other two dependent variables observed years later. Thus, our instrument is expected to randomly affect sample firms and influence the probability that firms will introduce PRP.

Following Abadie et al. (2002), the conditional quantile treatment effect for compliers can be estimated consistently by the following weighted quantile regressions:

$$(\beta_{IV}^{\tau}, \boldsymbol{\delta}_{IV}^{\tau}) = argmin \sum W_{i,t}^{AAI} \cdot \rho_{\tau} \cdot \left(ln\left(\frac{P}{L}\right)_{i,t} - \beta \cdot PRP_{i,t} - \boldsymbol{\delta} \cdot \boldsymbol{X}_{i,t} \right)$$

$$W_{i,t}^{AAI} = 1 - \frac{PRP_{i,t} \cdot (1 - SV_{i,t})}{1 - Pr(SV = 1 | \boldsymbol{X}_{i,t})} - \frac{(1 - PRP_{i,t}) \cdot SV_{i,t}}{Pr(SV = 1 | \boldsymbol{X}_{i,t})}$$

where $\boldsymbol{X}_{i,t}$ is the matrix including all control variables discussed in footnote 8, *SV* is the binary instrument for volatility of sales, and the weights $W_{i,t}^{AAI}$ combine the endogenous variable and the instrument. As stated above, the instrument is assumed to hit the sample firms randomly, and the conditional probability of having a volatility above the median, $Pr(SV = 1 | \boldsymbol{X}_{i,t})$, is estimated by means of a non-parametric regression, specifically, a local logit estimation, as suggested by Frölich and Melly (2013).

The Abadie et al. (2002) conditional quantile treatment effects estimator (IVQR_AAI) can be applied only if both the endogenous variable and the instrument are binary variables. Furthermore, the causal effect is identified only for the sub-population of compliers. In our case, the compliers are firms whose estimated probability of adopting a PRP scheme is correlated with a higher estimated probability of having experienced a value of past volatility of sales above the median. In our sample, these compliers are approximately 72% of all firms that adopt PRP.

[18] The binary nature of our key explanatory variable (PRP) leads us to address endogeneity via treatment effect techniques. As discussed below, under the instrumental variable quantile method used in our estimates, we compare the performance of both treated firms (firms adopting PRP schemes) and the control group (firms not adopting PRP schemes) to undertake a counterfactual analysis.

B.3

The IVQR_2 LAD estimator involves using the fitted values obtained from a regression performed in a first step and then inserting the fitted values for PRP as a covariate to yield the IVQR_2 LAD estimator of $ln\left(\frac{P}{L}\right)_{i,t}$, $ln\left(\frac{LC}{L}\right)_{i,t}$ and $ln\left(\frac{P}{LC}\right)_{i,t}$ in a second step. In our case, as noted above, the first step is a probit regression of PRP (our endogenous binary variable) on the binary instrument (sales volatility, *SV*) at the firm level.

Formally the probit regression reads as : $P\left(PRP_{i,t} = 1 \middle| SV_{i,t}, \boldsymbol{X_{i,t}}\right) = \boldsymbol{\Phi}\left(\boldsymbol{\xi} \cdot SV_{i,t} + \boldsymbol{\delta} \cdot \boldsymbol{X}_{i,t}\right)$**,** where SV is the binary instrument for the volatility of sales and $\boldsymbol{X}_{i,t}$ are the firm-level controls mentioned above**.**

To obtain consistent standard errors, we bootstrap them in both the first-stage and second-stage regressions (Arias et al. 2001; Bosio, 2009). Notice, however, that this approach relies on the symmetry of the composite error obtained in the second stage (see Wooldridge, 2010). Furthermore, Chernozhukov and Hansen (2005) show that this estimate is not consistent when the coefficients differ across quantiles, and it is precisely in this case that the quantile regression method is of interest (see also Melly, 2005 and Bosio, 2009). For this reason, we retain the IVQR_2 LAD estimator only as an IV conditional median estimator that permits us to show the significance of the instrument (sales volatility) in the first stage[19].

[19] For instruments to be valid, orthogonality conditions must be met. With regard to this second property, we have only one instrument and one endogenous variable, so the equation is perfectly identified; no test is available to prove the orthogonality condition. According to the authors who propose the methods discussed above (Abadie et al., 2002; Frölich and Melly, 2010; 2013), instrument-error independence is plausible when the random assignment of the instrument can be plausibly justified. In our case, the standard deviation of sales is strictly related to uncertainty (Bloom, 2009). Conceivably, this volatility is randomly assigned to firms.