Matching Firms, Managers, and Incentives*

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Abstract

We exploit a unique combination of administrative sources and survey data to study the match between firms and managers. The data includes manager characteristics, such as risk aversion and talent; firm characteristics, such as ownership; detailed measures of managerial practices relative to incentives, dismissals and promotions; and measurable outcomes, for the firm and for the manager. A parsimonious model of matching and incentive provision generates an array of implications that can be tested with our data. Our contribution is twofold. We disentangle the role of risk-aversion and talent in determining how firms select and motivate managers. In particular, risk-averse managers are matched with firms that offer low-powered contracts. We also show that empirical findings linking governance, incentives, and performance that are typically observed in isolation, can instead be interpreted within a simple unified matching framework.

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1 Introduction

Personnel economics is concerned with two problems that firms face: how to find the right employees and how to motivate them. Moreover, matching and incentives are tightly related: different people pursue different goals. A firm should select a hiring policy in view of the incentive structure it has in place; and it should select an incentive structure in view of the people it wants to hire.

In a recent survey, however, Oyer and Schaefer (2010) conclude that personnel economics has made more progress on the understanding of incentive provision than on matching. In particular, relatively little is known about the ways firms and workers generate economic surplus by matching appropriately, and on the mechanism through which firms strategically design job packages to source appropriate workers. A key obstacle to advancement in this area has been the dearth of integrated evidence, due to the fact that most datasets only contain information on one side of the match.

In this paper we are able to analyze the matching mechanism using a unique dataset which provides detailed information on employees, firms and the contracts that tie them. Our data, which covers a random sample of Italian managers, draws from a variety of sources: our own manager survey that contains information on contracts, managers and firms characteristics, managers social security data on earnings throughout their career, and firms balance sheet data. The data contains direct measures of manager characteristics, like risk aversion and talent; firm characteristics, such as ownership and governance structure; contract characteristics, such as sensitivity to performance both through variable pay and implicit career incentives; and measurable outcomes such as manager effort and firm performance. To the best of our knowledge, this is the first time that – for any category of workers – firm-level information is combined with such a rich characterization of managerial preferences and compensation data drawn from individual social security records.

Our empirical analysis is guided by a simple model where firms and managers match through the choice of incentive policies, and entry decisions, manager-firm matches, compensation schemes, effort exertion, and firm performance are endogenously determined. The model generates an array of predictions, which can be tested on our data. Our contribution is twofold. First, we show empirically for the first time that managers’ risk aversion and talent are correlated with the incentives they are offered and, through these, with the characteristics of the firms that hire them. Second, we observe in our data a number of relations that have been reported, in isolation, in other works. Hence, our contribution is to show that, for the set of workers and firms under consideration, these regularities can be understood within a
parsimonious theoretical framework.

The model is based on the following primitives: a continuum of potential managers, who have heterogenous talent and risk aversion; a continuum of potential firms, which differ by the weight their owners put on the private benefit of control vis-a-vis profits, and by their idiosyncratic cost or revenue component; and a set of possible contracts that managers and firms can sign, defined by a fixed compensation and the slope of the performance-based component. The power of the contract should be viewed broadly, both as explicit incentives (bonus) and implicit incentives (promotions and dismissals).

The framework illustrates how managers and firms match through incentives. Other things equal, managers who are risk averse and have little talent prefer low-powered incentives. Other things equal, firm owners who put a higher weight on the private benefit of control rather than profits also prefer low-powered incentives, because high-powered incentives give managers a large stake in the firm’s profit, and therefore increase the probability that managers will oppose owners who want to extract private benefits at the expense of profits. This means that certain owners may be willing to trade off higher profits arising from good management to contain the risk of losing control.\footnote{The owner/manager of an Italian firm puts it in colorful terms: “I’d rather be worth 100 million euros, have fun now and enjoy people’s respect when I am the senile chairman of my firm, than be worth a billion and get paid fat dividends by a little ******* with a Harvard MBA, who runs my firm and lectures me at board meetings.” This comment was related to us in an email by a top-50 European CEO, with a Harvard MBA. Our translation.}

An equilibrium is such that: (i) firms are active if and only if their expected payoff is non-negative; (ii) managers are employed if and only if they receive at least their reservation utility; (iii) matches between firms, managers, and contracts are stable, even taking into consideration inactive firms and managers; (iv) contracts between matched firms and managers are optimal; (v) managers exert the optimal amount of effort given their contract. It is important to stress that our model does not assume an exogenous distribution of active firms or managers. In equilibrium, only firms that generate a non-negative payoff to their owners will be active. Similarly, only managers that can create a positive surplus for some firm will be employed as managers. Thus one can think of the underlying population as containing all potential firms and all potential managers. Rather than trying ex-post to correct for a “survivor bias,” our model offers a set of testable predictions on observed matches that build on equilibrium entry conditions.

We show that there exists a unique equilibrium. The equilibrium is characterized by assortative matching and yields four testable implications: (1) In a stable assignment of
managers to firms, the slope of the contract a firm offers is positively correlated to the talent of a manager and negatively correlated to his risk aversion; (2) Managerial outcomes are linked to incentives: in equilibrium managers who face steep contracts exert a higher level of effort, receive a higher expected compensation (both total and variable), and obtain a higher overall expected utility; (3) Firms whose owners put more weight on the private benefit of control are less likely to offer more performance-sensitive contracts; (4) Firms that offer more high powered incentives have higher profits. While each individual prediction is consistent with other models, we are not aware of a framework that can account for all four of them.

The aim of our empirical analysis is to present evidence on the rich set of equilibrium correlations suggested by the theory. We base our results on a unique data set which we created with the purpose of studying both matching and incentives. As discussed above, its defining feature is that it combines detailed information on all three components of the match, namely managers and firms characteristics, and the contracts that tie them. The survey was administered to 603 individuals sampled from the universe of Italian service sector executives. Our sample managers rank high in the hierarchy of the firms they work for: 60% report directly to the CEO and a further 28% to the board. We also observe the managers’ compensation history since their first appearance on the labour market from social security records, and we have standard accounting data on the firms.

We report four key findings, in line with the four theoretical predictions above.

First, we find that policies that create a tighter link between performance and reward attract managers who are more talented and more risk-tolerant. Using an index that summarizes the “contract” between firms and managers - i.e. whether firms reward, promote and dismiss managers based on their performance - we show that firms offering a one standard deviation steeper contract are more likely to attract high-talent managers by 16 percentage points of the sample mean, and the ones they attract have a degree of risk tolerance that is 10 percent above the mean. The latter result speaks to the debate on the trade-off between risk and incentives. In line with classic agency theory but contrary to most available evidence (Prendergast 2002), measures of risk tolerance and incentive power are positively related in our data. Our findings can however be reconciled with the existing evidence by noting that we measure the agent’s risk preferences directly rather than relying on proxies for risk aversion such as the agent’s wealth or using variation in the riskiness of the environment instead of the agent’s preferences. Our estimates therefore do not suffer from the bias due to correlated unobservables or endogenous matching discussed in Prendergast (2002) and Ackerberg and
Second, we find that managers who are offered steeper contracts exert more effort, receive higher fixed and variable pay, receive more non-pecuniary benefits, and (not obviously) are more satisfied with their job. For instance, raising our incentive index by one standard deviation is associated with an increase in the probability that the manager works more than 60 hours a week by 16% of the sample mean, an increase in variable pay by a third of the sample mean, and higher chances that he is very satisfied about his job as large as 12% of the sample mean. Reassuringly, the estimated correlation between incentives and pay is robust to using administrative (and thus objective) social security earnings data instead of our survey measures: hence, the correlation is not due to reporting errors or to survey reporting biases. Even more interestingly, when we use the time variation in social security earnings to compute the volatility of managers earnings through time, we find that steeper incentives are correlated with observed higher earnings variability, consistent with the fact that steeper contracts (as measured in the survey) implies that the managers bear more risk (as measured in observed time series of earnings).

Third, we use information on the firms’ ownership structure to test whether the incentive packages offered by firms depend on the weight their owners put on the benefit of private control. More specifically, we exploit the variation between family owned and widely held firms. This choice is rooted in the family firms literature (discussed below), which documents how family-owners often perceive the firm as an opportunity to address family issues and frictions. In this context, owners attribute a value to the firm as an “amenities provider”, even though the provision of such amenities might not be profit maximizing. In this context, direct control is extremely valuable as it minimizes the probability that other external owners might oppose the extraction of such private benefits. On the other extreme, diffused ownership makes it much harder for a single owner to extract private benefits from the firm.

2 Prendergast (2002) argues that delegation is more likely when the environment is more uncertain, and that, because performance pay is positively correlated with delegation, this generates a spurious positive correlation between environment uncertainty and incentive power when the degree of delegation is unobservable. Ackerberg and Botticini (2002) argue that a spurious positive correlation can emerge because risk loving agents are endogenously matched to risky environments and at the same time prefer high powered incentives. Using agents’ wealth as a proxy for risk aversion does not solve the problem because the riskiness of the environment is correlated with the error through the proxy error.

3 Our findings are complementary to existing evidence on executive pay that shows a negative correlation between stock volatility and pay performance sensitivity (Aggarwal and Samwick 1999). That literature focusses on endogenous variations in risk due to the characteristics of the environment, whereas we measure the characteristics of the managers that determine their preferences for performance pay.
In line with this view, we find that, compared to widely-held firms, family-owned firms offer flatter compensation schemes. Namely, family firms are less likely to offer bonuses as a function of individual or team performance, to promote and fire their managers based on their performance, and to use formal appraisals throughout the managers’ career. Differences are sizeable: unconditionally, the difference between the percentage of widely held and family firm that offer performance bonuses is 13 percentage points, and the corresponding difference among firms that offer fast track promotions for exceptional performers is 9 percentage points. Controlling for sector and firm size, we show that the incentive index is significantly weaker for family firms – up to 30% of one standard deviation. These findings are consistent with an established view that, compared to anonymous and institutional shareholders, large individual owners use corporate resources to generate ego rents, on-the-job amenities, or asset diversion (Demsetz and Lehn 1985). Such activities are mostly non-contractible and they require effective direct control. They become more difficult when the firm is run by talented outsiders whose pay depends on firm performance – hence the comparative disadvantage of family firms in the provision of managerial incentives.

Fourth, we estimate the correlation between incentives and firm performance measures from balance sheet data and find that firms that offer high powered incentives have higher productivity, profits, and returns on capital. This is consistent with a Demsetzian view that, in equilibrium, active but under-performing firms must offer some other form of reward to their owners.

Although some of these findings have been observed in isolation by other authors (more detail is provided in the literature section), the value added of this paper lies in showing that these relations all hold for the same set of firms and managers and can all be accounted for by our parsimonious matching model. Furthermore, while our data does not allow us to identify causal relations directly, the consistency of all the correlations we estimate with the predictions of the model strongly supports its validity. Being able to observe all sides of the match allows us to rule out alternative theories that might be consistent with a subset of the correlations we report, but not the whole set.4

The rest of the paper proceeds as follows. Section 2 discusses the theoretical model and

4One such prominent alternative is that family firms have a more effective monitoring technology and hence they do not need to offer high powered incentives. If that hypothesis were driving the results, however, we would expect managers who are better monitored to work harder and to have a higher fixed wage, to compensate for the higher effort. Our estimates indicate that the opposite is true: managers who face weaker incentives work less hard and have a lower base wage. Section 5 discusses this and other alternative explanations in more detail.
illustrates its main testable predictions. Section 3 presents our data and shows how we map the model’s variables into their empirical counterpart. Section 4 shows the evidence. Section 5 discusses the robustness of our results. Section 6 summarizes and concludes.

1.1 Literature Review

The main contribution of our paper is to integrate phenomena in personnel economics that were usually analyzed individually.

On the theory side, our model belongs to the manager-firm assignment literature initiated by Rosen (1982). Two recent papers (Gabaix and Landier (2008) and Terviö (2008)) provide tractable CEO-firm matching models, where CEOs differ on talent and firms differ on size/productivity. Our model is particularly close to an independent paper by Edmans and Gabaix (2011), which endogenizes the contract between the CEO and the firm and obtains a concise close-form characterization of equilibrium incentives and matches. Like us, they endogenize both worker-firm matching and incentive provision. The main difference is that the main source of heterogeneity on the firm side is size in their model and governance in ours. Also, their managers differ only on talent (risk comes to play indirectly as talented managers are wealthier), while our managers differ on both talent and innate risk-attitude.

The argument that talented workers are matched to firms that offer high-powered incentives was made by Lazear (1986) and further developed by Balmaceda (2009). While in those models firms are ex ante identical, our firms differ because of ownership. Moreover, our managers differ on both talent and risk attitude.

On the empirical side, the four findings discussed above relate to four lively strands of literature that we now briefly discuss. The first set of results – equilibrium matching – is close to the large literature on firm-employee matching (see Lazear and Oyer 2007, for a review). The distinctive feature of our work is that we highlight one possible determinant of the match value, namely the firm’s and the managers’ preferences over high powered incentives.

An important determinant of matching patterns, explored by Terviö (2008) and Gabaix and Landier (2008), is firm heterogeneity in terms of size. While the main focus of this paper is governance, our empirical analysis always controls for size. Our analysis confirms

\[\text{While Edmans and Gabaix (2011) and our paper utilize related models, the set of empirical questions that they ask is different. They calibrate their model with US data and show that the potential loss from talent allocation is much larger than the potential loss from inefficient contracting.}\]

\[\text{Our rich data allows us to overcome the identification issue pinpointed by Eeckhout and Kircher (2000). As they show, wage data alone is not sufficient to identify matching patterns. However, we have direct information on worker and firm characteristics.}\]
the presence of the strong complementarity between size, talent, and pay predicted by the assignment models above. In our sample, more talented managers are matched with larger firms and the level of managerial pay is increasing in firm size. Friebel and Giannetti (2009) study endogenous matching between firms and workers. In their model, large firms have better access than small firms to financing but they also investigate more thoroughly new ideas and are more likely to reject them. Workers differ in their creativity, namely in how likely they are to have promising ideas. The authors characterize the matching equilibrium and analyze the effects of relaxing individual borrowing constraints. The key predictions of the model are consistent with evidence available from the US Survey of Consumer Finances. While we consider a different set of employees – managers rather than creative workers – and we utilize a different empirical approach – a purpose-designed employee-employer survey – our paper shares Friebel and Giannetti’s goal of identifying the role of talent and risk aversion in the allocation of workers to firms.\footnote{Other examples of recent worker-firm endogenous matching models include Garicano and Hubbard (2007) for law firms, and Besley and Ghatak (2005) and Francois (2007) for the non-profit sector. See also Rose and Sheppard’s (1997) analysis of the link between firm diversification and CEO compensation. The authors provide evidence that managers of diversified companies appear to be paid more. By comparing the compensation of newly appointed and experienced CEOs, the paper shows that the premium is due to higher ability rather than entrenchment.}

The second set of results relates to the vast literature (summarized in Lazear and Oyer 2007) on how incentives affect worker behavior. In line with most of that body of work, our managers appear to work harder when they face steeper contracts. The results also relate to the literature that seeks to explain the correlation between pay for performance, pay levels and inequality both for CEOs (Hall and Liebman, 1998) and workers in general (Lemieux et al 2009). We contribute to the debate by measuring contract steepness directly, as our survey records whether both pay and career progressions are related to performance. In contrast, the existing literature relies on outcome measures either by regressing total pay on firm performance or by measuring whether workers have received bonuses during their employment with the firm.

The third set of results – how ownership affects managerial practices – relate to a number of works at the intersection of personnel economics and corporate governance (Burkart, Panunzi, and Shleifer 2003, Bertrand and Schoar 2006, Bloom and Van Reenen 2007, Leslie and Oyer 2008), which study firm ownership as the key firm characteristics that drives the adoption of different managerial practices. The distinction between concentrated and diffuse ownership is a particularly salient one in that literature.\footnote{For evidence on the relevance of family ownership see Claessens, Djankov, and Lang, 2000, Faccio and}
Our findings can be seen as a validation of the “cultural” view of family firms (Bertrand and Schoar 2006). The objective function of family owners contains a non-monetary component. We interpret this as family firms valuing direct control per se, so that retaining direct control gives rise to private benefits that the owner (the family) can enjoy in addition to the utility from monetary profits. Private benefits can derive from the status associated with leading a business, from the “amenity potential” of influencing the firm’s choices (Demsetz and Lehn 1985), from the use of firm resources for personal purposes, or from the opportunity to use the firm to address family issues, for example finding a prestigious job for a low ability offspring. Valuing direct control is not inconsistent with family ownership per se having a positive effect on performance, because, for instance, trust among family members can substitute for poor governance as suggested by Burkart, Panunzi, and Shleifer (2003). Our model indeed allows for family firms to have a comparative advantage on other dimensions.

Finally, the results on the link with firm performance relate to the literature on human resources management and, more specifically, managerial practices (Black and Lynch 2001, Bloom and Van Reenen 2007, Bonin et al 2007, and Ichniowski, Shaw, and Premnushi 1997). In particular, we contribute to the literature on the effect of family ownership on performance through the choice of CEO and management (Bertrand and Schoar 2006, Pérez-González 2006, Bennedsen, Nielsen, Perez-Gonzalez, and Wolfenzon 2007, and Lippi and Schivardi 2010). Like these papers, we find that family firms may twist the choice of the manager towards less talented ones and thus provide a rationale for why they might perform worse even when not intrinsically less efficient – as the family firm owner’s quote reported earlier seems to suggest. However, while in these papers what affects firm performance is the refusal to choose from a wider set of managers and rely on the restricted pool of family (or social network) members, in our case performance may be affected because less able and risk tolerant managers self-select into family businesses at any time, not only at succession and even among family businesses that choose to be run by professional managers.

Our findings that family firms offer contracts that attract risk averse and less talented managers and pay them less, are consistent with Sraer and Thesmar (2007) who show that, compared to widely held firms, French family firms employ less skilled workers, offer long-run labor contracts that provide implicit insurance, and pay lower wages. Our paper is complementary with work by Cai, Li, Park, and Zhou (2008). While in our study we compare managers in non-family firms with non-family managers in family firms, they focus their attention on the difference between family managers and outside managers employed by Lang (2002), and La Porta, Lopez-de-Silanes, and Shleifer (1999).
family firms. Evidence from their detailed survey of Chinese family firms reveals that outside managers are offered contracts that are more performance-sensitive. Our and their papers taken together indicate that governance issues play a key role in the process of selecting and motivating managerial talent.

2 Theory

This short theoretical section adapts a workhorse agency model – linear contracts, quadratic payoffs, normally distributed additive noise – to the problem at hand. Our main contribution lies in allowing heterogeneity on both sides of the managerial market and in letting the terms of the contract be decided by the two parties. While some of our results have already been discussed individually elsewhere and none of them will surprise people familiar with agency problems, it is useful to provide a unified conceptual framework to interpret the rich set of patterns that emerge from our data.

This section presents an informal analysis of the model. A formal characterization and all the proofs are available in the attached Appendix.

As the model is quite rich and non-standard – two dimensions of heterogeneity on the workers’ side, two dimensions of heterogeneity on the firms’ side, endogenous contracts – it is developed in a simple function environment that allows us to obtain close-form solutions.

2.1 Model

To produce, a firm requires one manager. Suppose firm $i$ is matched with manager $j$. The manager generates a product

$$y_j = \sqrt{\theta_j} (x_j + \varepsilon_j),$$

where $x_j \geq 0$ is the effort level chosen by the manager, $\theta_j$ is the manager’s talent, and $\varepsilon_j$ is normally distributed with mean zero and variance $\sigma^2$ and it’s uncorrelated across firms (or managers). The parameter $\theta_j$ will be discussed shortly.

The wage that firm $i$ pays to manager $j$ is a linear function of the productivity signal

$$w^i_j = a^i + b^i y_j$$

The parameter $b_i$ represents the link between pay and performance. The compensation scheme should be interpreted broadly. Besides explicit contingent payments, such as bonuses and stock options, the manager can also be offered implicit incentives (career concerns): if he performs well, he will be promoted. In our model, both personnel policies will result in a higher $b_i$. 

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The assumption that explicit contracts are restricted to be linear is standard in personnel economics applications. For implicit contracts, Lazear and Rosen (1981) proved an equivalence result between rank tournaments and piece-rate pay. This implies that, at least in their stylized baseline environment, the kind of implicit incentives that comes from promotions would give rise to a linear reduced-form representation like the one we use.\(^9\)

The manager has a CARA utility function

\[
U_j = -\exp \gamma_j \left( w_j^i - \frac{1}{2} x^2 \right),
\]

where \(\gamma_j\) denotes \(j\)’s risk aversion coefficient. There is a mass of potential managers, whose human capital \(\theta_j\) and risk aversion coefficient \(\gamma_j\) are uniformly and independently distributed on a rectangle \([0, \bar{\gamma}] \times [0, \bar{\theta}]\). The total mass is \(\bar{\gamma} \bar{\theta}\).\(^{10}\) To avoid difficult signaling and screening issues, we assume that the characteristics of individual managers \((\theta, \gamma)\) are observable.\(^{11}\)

We now turn to firms. The owners of firm \(i\) pursue the following objective:

\[
V^i = \Pi^i + (1 - \phi_g) \Gamma^i,
\]

where \(\Pi^i\) denotes the standard corporate profit, while \(\Gamma^i\) represents some other form of benefit that the owners may receive from the company. This benefit has to do with direct control and can be material (use of company resources for personal entertainment) or of a less tangible sort (the status that derives from managing a company, the utility of keeping the firm “in the family,” or the guarantee of prestigious jobs for friends or relatives). The expression \((1 - \phi_g)\) represents the weight that the owners put on the benefit of direct control and it depends on \(g\), the ownership form. For the sake of simplicity, in what follows we allow for two types of ownership, denoted by \(F\) and \(N\), although the model can be extended to allow for a larger variety of ownership structures. The main difference between \(F\) and \(N\) lies in the size of parameters \(\phi_F\) and \(\phi_N\). In particular, \(F\) firms place a greater weight on direct control than \(N\) firms, namely \(\phi_F < \phi_N\).\(^{12,13}\)

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\(^9\)Dismissals are used both to provide incentives and to reduce firm/manager mismatch (Kwon 2005).

\(^{10}\)An important assumption here is that talent and risk aversion are independently distributed. While there is some evidence that (cognitive) ability is positively related to risk taking (Frederick 2005), in our data there appears to be no correlation between risk attitudes and measures of human capital.

\(^{11}\)If the characteristics were not observable, the manager will have an incentive to pretend that he is more talented than he actually is. However, given \(\theta_j\), the manager would have no incentive to mis-represent his risk attitudes because the contract that he is offered in equilibrium maximizes his expected utility given his risk-aversion coefficient \(\gamma_j\).

\(^{12}\)In particular, one can assume – although it is not necessary – that \(N\) firms have no direct control benefit: \(\phi_N = 1\).

\(^{13}\)The results would continue to hold if we assumed \(V^i = \bar{\phi} \Pi^i + \left(1 - \bar{\phi}\right) \Gamma^i\).
The firm profit is given by:

$$\Pi^i = y_j - w^i_j + h_g - k^i,$$

where the production $y_j$ and the compensation $w^i_j$ have already been discussed. The third term, $h_g$, represents a profit base, which may vary between $F$ and $N$ firms. We remain agnostic as to whether the difference $h_N - h_F$ is positive or negative. The fourth term, $k^i$, represents idiosyncratic fixed costs (or profit opportunities) faced by different firms. For any ownership type $g$, there is a potential mass of entrants and each entrant $i$ is characterized by an idiosyncratic cost $k^i$. We assume that firms are distributed as follows: For every $k \geq 0$, the mass of firms with $k^i \leq k$ is equal to $k$.\(^{14}\)

The (potential) control benefit is given by

$$\Gamma^i = \Gamma_g - b^j \theta_j,$$

where $\Gamma_g$ is a constant, which may depend on the ownership form $g$. The second term, $b^j \theta_j$, captures one of the key ideas of this paper: granting control to an outside manager dilutes the owners’ ability to extract private benefits from the firm.\(^{16}\)

The second term is crucial for our analysis and requires a careful discussion. Why is the control benefit that an owner can extract from her firm decreasing in her manager’s talent and incentive? We view the term as the reduced form of an un-modeled subgame between the owner and the manager. Suppose the owner can obtain a private benefit by misusing some of the firm’s productive inputs (buying a private jet, hiring friends and family, running a pet project, etc.). Suppose that the manager can spend effort to prevent the owner from appropriating resources. How motivated will the manager be to fight back?

Underlying this line of reasoning is an assumption on observability. While profits are, at least in part, publicly observable – private benefits are less so. Under this premise, it is easily to offer credible incentive contracts on profit than on other dimensions. To make an extreme case, how can the outside world know if a manager in a family firm has treated the founder and his family members in an obsequious manner? The owner could still offer high-powered

\(^{14}\) Qualitatively, results would be unchanged if one assumed that the distribution of potential $F$-firms is different from the distribution of potential $N$-firms.

\(^{15}\) The entry condition could be extended to allow for the possibility of $N$-firms to be bought out by families and $F$-firms to be sold to the market.

\(^{16}\) Even if one assumes that the benefit $\Gamma^i$ does not depend on the manager’s talent $\theta_j$ directly (namely that $\Gamma^i = \Gamma_g - b^i$), there is still an indirect complementarity between incentives and talent, because firms that offer high-performance schemes attract more talented workers. Hence, one should expect all our main results to go through (albeit in a less tractable setting).
incentives on profits, but a Holmstrom and Milgrom (1991) logic tells us that it might hurt the owner’s private benefits.

Owner appropriation reduces the pool of resources that is available to the manager. It is reasonable to expect that the amount of resources available and the manager’s talent are complements in the creation of profits. The manager’s bonus is then the product of resources times talent times profit share. The manager’s willingness to fight resource appropriation is an increasing function of $b^i\theta_j$.$^{17}$

To keep notation to a minimum, we set $\Gamma_N = 0$, and $h_N = 0$. These two variables do not affect matching and contract choice; they only determine the number of $N$-firms and $F$-firms that are active in equilibrium. Note that $\Gamma_F$ and $h_F$ can be positive or negative.

Firm entry is endogenous. In equilibrium: (i) The owners of every active firm $i$ maximize $V^i$; (ii) A firm $i$ is active if and only if the maximized $V^i$ is greater than the outside option (normalized at zero)$^{18}$.

The timeline is as follows: (i) Each firm chooses whether to become active; (ii) A matching market between firms and managers opens. Manager-firm pairs sign linear contracts; (iii) Managers who are hired by firms choose how much effort they exert.

### 2.2 Equilibrium

An equilibrium (in pure-strategies) of this model is a situation where: (a) A firm is active if and only if it receives a non-negative expected payoff; (b) All manager-firm matches are stable, namely no pair made of one manager and one firm, who are currently not matched to each other, can increase their payoffs by leaving their current partners (if any) and signing an employment contract with each other; (c) All matched pairs select the contract that maximizes joint surplus; (d) All managers choose the optimal level of effort, given the contracts they have signed.

The present section offers an informal analysis of the model. A formal result is provided in the end of the section and proven in the appendix.

Let us begin from the last step: effort choice. Given a contract with slope $b^i$, manager chooses effort

$$\hat{x}_j = b^i \sqrt{\theta_j}.$$  

$^{17}$ One could make this argument explicit in the model. It would require adding a second dimension to the manager effort (fighting back the owner) and modeling the owner’s strategic choices. The theory section would become even longer and more complex, without much gain.

$^{18}$ One could have different outside options for $F$-firms and $N$-firms, but that would be equivalent to a change in $h_F$ and $h_N$. 

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As the surplus created by the relationship can be allocated costlessly to the firm or the manager through the fixed compensation variable $a$, the contract between the two parties must maximize the sum of their expected payoffs. The surplus-maximizing contract has slope

$$b^i(\gamma_j) = \frac{\phi_g}{1 + \gamma_j \sigma^2}.$$

The contract power is decreasing in the risk aversion coefficient of the manager, $\gamma_j$, and in the profit weight of the firm owners, $\phi_g$. The manager’s product given the optimal contract is

$$y_j = \sqrt{\theta_j \hat{x}_j} = \frac{\phi_g}{1 + \gamma_j \sigma^2} \theta_j.$$

This means that there is a positive complementarity between the profit weight $\phi_g$ and managerial talent $\theta_j$ and a negative complementarity between $\phi_g$ and the risk-aversion coefficient $\gamma_j$. $F$-firms have a comparative advantage in low-talent, risk-averse managers.

This comparative advantage translates into a matching equilibrium where managers with high talent and low risk aversion work for $N$-firms, managers with medium talent and higher risk aversion work for $F$-firms, and less talented managers are unemployed.

To see that this must be the case, consider two managers, $A$ and $B$, and assume that $A$ is more talented and less risk-averse than $B$. Suppose for contradiction that $A$ works for an $F$-firm and $B$ works for an $N$-firm. The total surplus (the sum of $V_i$ and $U_j$) generated by the two firms is lower than the total surplus that would be generated by the same two firms if they swapped managers. This means that either the $F$-firm and manager $B$ or the $N$-firm and manager $A$ can increase their joint payoff by leaving their current partners and forming a new match. The same line of reasoning applies to an unemployed manager who is more talented and risk tolerant than a manager who is currently employed.

See the figure below for an example of such a matching equilibrium. Managers are uniformly distributed on a two-dimensional space of talent and risk aversion. The space is divided into three regions. The upper left region contains talented risk-takers employed by $N$-firms. The middle region is made of less talented and more risk-averse managers who work
for $F$-firms. The managers in the remaining region are unemployed.

The regions in the figure are determined by indifference conditions. Managers on the line that separates the $F$-region from the unemployment region receive an expected utility equal to their outside option. Managers on the line between the $F$-region and the $N$-region are indifferent between working for an $N$-firm or for an $F$-firm.

The expected payoff of firm $i$ is

\[
E \left[ V^i \right] = E \left[ \Pi^i + \left( 1 - \phi_g \right) \Gamma^i \right] \\
= \pi^i + E \left[ h_g - k^i + \left( 1 - \phi_g \right) \Gamma_g \right],
\]

where the term

\[
\pi^i = E \left[ y_j - w^i_j - \left( 1 - \phi_g \right) b^i \theta_j \right]
\]
can be seen as management-related payoff. Competition among firms guarantees that all active $F$-firms have the same management-related payoff $\pi^F$ and all active $N$-firm have the same management-related payoff $\pi^N$. The comparative advantage of $N$-firms in incentive provision means that $\pi^N > \pi^F$.

The size of the $F$-region in the figure above corresponds to the mass of $F$-firms that are active, $n_F$. Similarly, the size of the $N$-region equals the mass of $N$-firms, $n_N$. The variables $n_F$ and $n_N$ are determined endogenously by the free entry condition. Firm $i$ is active if and
only if $E[V^i] \geq 0$. This means that the $F$-firm with the lowest payoff satisfies

$$\pi_F + h_F - k^i + (1 - \phi_F) \Gamma_F = 0$$

while the $N$-firm with the lowest payoff satisfies

$$\pi_N - k^i = 0$$

### 2.3 Testable implications

The equilibrium characterization above yields an array of predictions regarding observable variables, which we group into four implications.

The first set of predictions relates to how managers are matched to incentive schemes:

**Implication 1 (Manager-Incentive Match)** *The slope of the contract that manager $j$ faces in equilibrium is negatively correlated with his risk aversion coefficient and positively correlated with his talent.*

Implication 1 shows how managerial human capital is matched to firms in equilibrium. Managers with high risk aversion and low talent face low-powered incentives. If that was not the case, there could be gains from breaking existing pairs and forming new matches.

We can also predict how the manager’s effort and his performance will be related to the incentive scheme he faces:

**Implication 2 (Manager Performance)** *Controlling for risk aversion, the slope of the contract that manager $j$ faces in equilibrium is positively correlated with the manager’s: (a) Effort; (b) Variable compensation; (c) Total compensation; and (d) Utility.*

Implication 2 describes what happens to the manager once he is matched to a firm. Managers who face steep contracts work harder. That’s both because of the direct incentive effect and because they are more talented (and talent and effort are complements). As a result, they produce more output and they receive more performance-related compensation. Finally, a revealed preference argument shows that managers who are offered a high contract slope must have a higher utility than managers who are offered a less steep contract (because being talented can obtain the same product with less effort).

The third set of predictions relates to incentive power. If an $F$-firm and an $N$-firm hire managers with identical risk aversion, the $F$-firm will offer a flatter contract because it has a higher control premium. Formally, $\phi_F > \phi_N$ implies:

$$\hat{b}_F(\gamma_j) = \frac{\phi_F}{1 + \gamma_j \sigma^2} < \frac{\phi_N}{1 + \gamma_j \sigma^2} = \hat{b}_N(\gamma_j).$$
We can write this result as:

**Implication 3 (Firm-Incentive Match)** *F*-firms offer less steep contracts than *N* firms.

This result constitutes a third testable implication: *F*-firms offer contracts that are less performance-sensitive. Note that this prediction holds a fortiori if we do not condition for the manager’s characteristics, as more risk-averse managers work for *F*-firms.

An additional prediction of our theory is that managers do not have an intrinsic productivity advantage in *F* or *N* firms. Implications 1 and 2 imply that all the effects on manager’s characteristics and performance come from the incentive structure. Once controlling for incentives, the data should display no residual firm ownership effect.

The model also makes some predictions on the link between incentive provision and firm performance. Before getting into that, it is important to stress that our theory does not say whether performance will be higher in *N*-firms or in *F*-firms. This is for two reasons. First, *F* firms may have some intrinsic business advantage or disadvantage, captured by $h_F$. Second, the fixed component of $\Gamma_F$ determines endogenously the threshold of idiosyncratic cost $k^i$ that induces *F*-firms to be active, and hence their performance. As a result, we can construct numerical examples where profits are higher in *F*-firms and numerical examples where they are higher in *N*-firms.

However, our model makes predictions on the correlation between firm performance and incentive provision, conditional on ownership:

**Implication 4 (Firm Performance)** Controlling for ownership, the slope of the contract is positively correlated with the firm’s profit $\Pi^i$.

The intuition for this last prediction is immediate. As an increase in the contract slope $b^i$ reduces control benefits, the firms who choose a higher slope must in equilibrium be compensated with a higher expected profit.

### 3 Empirical Analysis: Data Description

#### 3.1 Data Sources

Our empirical analysis exploits three data sources: (i) a novel survey of Italian managers that we designed to collect detailed information on their characteristics, the firms they work for and the incentives they face, (ii) Amadeus and the Italian Company Accounts Database,
which contain information on the firms’ balance sheets, demographics, and employment levels, and (iii) the Social Security Database, which contains longitudinal information from administrative records on the managers’ job position, pay, and employer since they joined the labor force.

The distinctive and unique feature of our survey is that it collects information on both sides of the market: the firms and the managers they employ. In particular, we collect measures of the firms’ ownership structure and details on their incentive policies on three dimensions: bonus pay, promotion, and dismissal decisions. On the managers’ side, we collect information on the managers’ risk aversion, talent, work effort, compensation package, and job satisfaction.

One advantage of using data from a continental European country like Italy is that all-encompassing rules about collective labor bargaining result in unambiguous job definitions. The job title of “manager” (dirigente in Italian) applies only to the set of workers that have a manager collective contract, a fact that is recorded by social security data. Italy has four managerial collective agreements: manufacturing, credit and insurance, trade and services, and public sector.

To avoid dealing with sector-specific contractual provisions, we focused on the managers in the trade and service sector. Managers in our sample are selected from the members directory of Manageritalia, an association of professional managers operating in the Italian trade and services sectors. Importantly, Manageritalia members account for 96% of all managers in the trade and service sectors. Hence, by sampling from the Manageritalia directory we are sampling from almost all the population of managers in that sector. These, in turn, make up for 20% of all Italian managers. The Manageritalia members directory contains.

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19 Amadeus is an extensive accounting database covering more than 9 million public and private companies across Europe, of which approximately 580,000 are in Italy. The Company Accounts Database is based on information provided by commercial banks that covers all the banks’ largest clients. The data is collected by Centrale dei Bilanci, an organization established in the early 80s by the Bank of Italy and Italian Banks with the purpose of recording and sharing information on borrowers.

20 There is a very clear distinction between being a manager and the closest collective contract job title, which corresponds to “clerical employee” (quadro in Italian). Indeed the two categories are represented by different trade unions and have different pensions schemes. The difference in terms of social status is also immediately perceived.

21 Social security data indicate that in 2006, the number of individuals employed on a “manager contract” in the private sector were 117,000. Of these, 23,000 belong to the trade and private service sectors, and 22,100 belong to Manageritalia. Managers working for Italian branches of multinational firms belong to the trade and service sectors even if the firm itself is classified as industry—e.g. car manufacturers—as long as no production plants are located in Italy.
22,100 managers employed by 8,739 firms. To make sure we obtain balance sheet data, we sample from the 2,012 firms that can be matched with Amadeus and the Italian Company Accounts Database. The balance sheet data-sets and, a fortiori, our sampling universe, are skewed towards large firms. To maintain comparability across managerial tasks we focus on managers employed in the three main operational areas – general administration, finance, and sales. We randomly assign each firm to one of the three areas and randomly select one manager within each firm. The final sampling universe contains 605 each of general directors, finance directors, and sales directors, for a total of 1,815 observations.\footnote{We do not sample from the 197 firms for which the Manageritalia member list does not contain managers employed in the main three operational areas.}

The administration of the survey was outsourced to Erminero & Co. – a well established survey firm located in Milan, Italy. The 1,815 sample managers were contacted by phone to schedule a subsequent phone interview, administered by a team of 35 analysts trained by Erminero & Co, and closely monitored by our research team. The response rate was 33\%, with an average duration of 21 minutes per interview. Thus, our final sample contains 603 observations, equally split across the three operational areas.\footnote{In our regressions we always include controls for manager operational area. We also collected detailed information on the interview process, including information on the interviewees’ tenure in the company, tenure in the post, seniority and gender, and interviewer identifiers. We use these variables to account for measurement error in the survey variables across some specifications.} Our sample managers rank high in the firm hierarchy: most of them (60\%) report only to the CEO, and a further 28\% directly to the board. Only 2\% rank three layers below the CEO. Moreover, 97.5\% of sample managers are outsiders, namely they do not belong to the family when the firm is family owned. Reassuringly, respondents and non-respondents are employed by observationally identical firms. Indeed we find no evidence that the probability of participating in the survey is correlated to firm’s size, labor productivity, profits, return on capital employed, or sector (Table A1 in the Appendix). Respondents also look similar to non-respondents on demographics (gender and age) and tenure on the job. Respondents however have lower wages but the difference, while precisely estimated, is small as the median weekly wage for respondents is 8\% lower than for non-respondents (€1648 vs. €1786). This is consistent with non-respondents having a higher opportunity cost of time, as expected. Reassuringly, however, the pay distribution have considerable overlap, and, as discussed below, there is considerable variation within our sample. Moreover, despite this level difference, respondents and non-respondents have a similar career path, as we find no difference in the average yearly rate of pay growth. Finally, while social security data do not contain information on incentive
policies, we can proxy sensitivity of pay to performance by calculating the standard deviation of pay of the same manager across years in the same firm. Table A1 shows that respondents and non-respondents do not differ on this dimension.

### 3.2 Firm Characteristics and Performance

The main characteristics of our sample firms are summarized in Table 1, Panel A. The table shows that family ownership is the most common ownership structure: 47% of the firms are owned by the founder (19%) or their family (28%). The percentage of family firms is in line with the findings of La Porta, Lopez-de-Silanes, and Shleifer (1999), who report that 60% of Italian medium-sized publicly traded firms belong to a family (including both founders and second generations firms). Widely held firms account for 30% of the sample.\(^{24}\) The remaining 23% is divided between cooperatives and firms owned by the State (8%), firms owned by their management (2%), and firms owned by a group of private individuals (13%). As there is no a priori reason to believe that the importance attached to the “amenity potential” of control by these firms is similar to either family firms or widely held firms, we keep this category separate in the analysis that follows.

The survey also contains information on firm size, sector, and multinational status. Over 90% of the sample firms employ less than 500 people. In more detail, 39% are small firms with 10 or fewer employees, a further 20% have between 50 and 100 employees, and the remaining 41% have more than 100 employees. All sample firms belong to the service sector, within which the three most frequent categories are Wholesale (45% of the sample), Business Services (11%), and Retail and Specialized IT services (4%). Finally, 58% of the firms in our sample are subsidiaries of a multinational company and in 21% of the cases the multinational’s headquarters are in Italy.\(^{25}\)

The last three rows of Table 1, Panel A report measures of firm performance from Amadeus. For each firm we use the last year for which data is available, which is 2007 for 62% of the sample firms and 2006 for 35% of them. We use three measures of performance: labor productivity (defined as operating revenues divided by the number of employees), profits per worker (computed as earnings before interests and tax divided by the number of employees),

\(^{24}\) Widely held firms are companies where no party detains more than 25% of the shares. We include in this category also private equity firms (8% of the sample), but the results are qualitatively similar once we include private equity in the residual ownership category.

\(^{25}\) Most sample firms are incorporated in the region of Lombardy (58%), followed by Emilia (9%), Lazio (9%), Veneto (8%), Piedmont (5%), and Tuscany (5%). This reflects the uneven geographical distribution of firms across the country.
and ROCE (operating income scaled with capital employed). For each measure we drop the top and bottom 1%, to remove outliers possibly due to measurement errors. Table 1 shows that the distribution of productivity and profits is heavily skewed to the left, the median is much smaller than the mean, indicating that there is a long tail of firms that perform considerably better than most of the sample. Finally, we observe considerable heterogeneity along all three measures – the standard deviation is between 1.3 and 2.3 times the mean.

### 3.3 Incentive Policies

The model in Section 2 makes it precise how the choice of incentive policies attracts different types of managers. To provide evidence on this issue we collected information on three types of firms’ policies that can be made conditional on manager’s performance: pay, promotions, and dismissals. This way we obtain a detailed picture of the firms’ incentive policies and can exploit variation along all three dimensions. For each type of policy we ask whether the outcome depends on the manager’s performance and whether this is evaluated through a formal appraisal system. The latter is crucial to ensure that managers know the exact mapping from performance to reward, which determines the effectiveness of the incentive scheme. In fact, our data shows that two thirds of the managers who are formally appraised know exactly how bonus payments are calculated, whereas the corresponding share in firms that do not have a formal appraisal system is one half.

To measure the sensitivity of pay to performance, we asked whether managers can earn a bonus, whether this is a function of performance and whether it is awarded through an established appraisal process. We summarize this information into two variables, $\text{bonus 1}$ (equal to 1 if bonus is conditional on performance and zero otherwise) and $\text{bonus 2}$ (equal to 1 if bonus is based on formal appraisal; zero otherwise). Half of the firms in our sample offer bonuses as a function of individual or team performance targets that are agreed in advance;\(^{26}\) in 33% of firms, bonuses are awarded through a formal appraisal system (Table 1, Panel B).\(^{27}\)

To measure the effect of performance on the manager’s career prospects within the firm

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\(^{26}\) Overall, 70% of the firms offer a bonus scheme, but for 20% the bonus is either a function of firm-wide performance or awarded at the discretion of the owners.

\(^{27}\) It is important to note that the fact that formal appraisal systems may have implications for the bonus does not necessarily imply the existence of bonuses related to individual performance. Managers report that formal appraisal systems may have implications for the bonus in 201 cases of 603. The vast majority of the times (77%) in which appraisals may have implications for the bonus, and the bonus exists, the bonus is linked - albeit not always exclusively - to individual or team performance. The rest of the times the bonus is independent of individual performance, but it is linked to firm performance and/or the discretionary judgement of the owners.
we asked whether fast promotion tracks for star performers exist, whether promotions depend on performance (as opposed to tenure or good relationships with the owners), and whether they are decided through formal appraisals. The variable promotion 1 equals one when fast tracks exist and zero otherwise. We define promotion 2 to equal one if performance is an important factor for promotion. Finally, promotion 3 equals one if promotions are decided within a well-defined system of formal appraisal. On average, 37% of sample firms report to have fast tracks for star performers, promotions depend on performance in 74% of the cases, and 34% of firms have a formal appraisal system to determine promotions (Table 1, Panel B).

Finally, we measure whether poor performance can be cause for dismissal, and, again, whether dismissals are decided through a formal appraisal system. The variable firing 1 is equal to 1 if in the past five years managers have been dismissed due to failure in meeting their performance objectives, and 0 otherwise. Overall, only 11% of firms have dismissed managers in the last five years, and 5% of these report doing so because of poor performance. 28 Finally, firing 2 equals one when dismissals are decided through a formal appraisal system, and this happens in 23% of the sample firms (Table 1, Panel B).

For parsimony, we combine the various incentive policies in a sole index that equals the sum of the measures described above. The findings are qualitatively unchanged if we use other summary measures, such as the first principal component. The resulting index takes values between 0 and 7, with higher values denoting policies that create a tighter link between reward and performance. The median firm adopts 2 out of the 7 incentive policies we consider, and the standard deviation of the index is 1.74. Just under 10% of the sample firms offer no explicit reward for performance, while only 0.5% adopt all seven measures.

3.4 Manager Characteristics, Pay and Performance

The manager survey provides a wealth of information on manager characteristics that are summarized in Table 1, Panel C. Managers are on average 47 years old, and 90% of them are males. 29

The theoretical model of Section 2 implies that a key variable driving the firm-manager match is the manager’s attitude towards risk. To shed light on this, we follow an emerging

28 The other, non-exclusive, reasons given for dismissals are “poor market conditions” (4%) and “disagreement with the owners” (6%).

29 This is in line with the figures for the manager population as a whole from social security records. In the last available year (2004), average age was 47 and the share of males 88%. See Bandiera et al (2008) for details.
literature that tries to elicit individual risk preference parameters and characterize their heterogeneity by using large-scale surveys (e.g. Barsky et al. 1997, Guiso and Paiella 2008, and Dohmen et al 2006). Our approach differs from most of the literature that analyzes the risk-incentive trade-off using measures of the riskiness of the environment or agents’ wealth as a proxy for their risk aversion. As such, it does not suffer from the bias caused by omitted variables and endogenous matching discussed by Prendergast (2002) and Ackerberg and Botticini (2002).

We collected two measures of risk attitudes that aim at measuring the managers’ own preference and the riskiness of the choices they make for the firm, respectively. Measures of this sort have been shown to correlate with actual risk taking in a field experiment by Dohmen et al (2006).

To measure the managers’ own risk preference we ask them to choose between a prospect that yields 1 million euros for sure (the safe choice) and a binary risky prospect that yields 0 with probability $p$ and 10 million with the complementary probability $1-p$, where $p$ varies between 0.01 and 0.8 at intervals of size 0.1. Suppose that for very low probability of zero return (and thus a very high probability of making 10 million) the manager prefers the risky prospect to 1 million euro for sure. We take as our risk attitude measure $p^*$, defined to be the level of $p$ at which the manager switches from the risky to the safe prospect. Obviously $p^*$ is inversely related to risk aversion, that is risk averse managers are willing to bear losses only if the probability is low. Table 1 shows that the average manager prefers the safe prospect when the risky one fails with probability 0.2 or higher. More interestingly, Table 1 also shows that managers’ risk attitudes are quite heterogeneous – the standard deviation of our measure is 18.94.

To measure the managers’ choice of risk for the firm we ask them explicitly to choose between alternative projects that present a trade-off between risk and expected profits in a qualitative scale from 0 to 10, where 0 indicates the safest and least profitable project. The average manager is just above the midpoint 5.7 and again there is considerable heterogeneity across managers. Interestingly, the two risk attitudes measures are strongly correlated (correlation coefficient 0.24) consistent with the model idea that managers with a high personal degree of risk tolerance self select into firms where this risk tolerance is required when

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30 The question reads as follows: “We would now like you to think to some important decisions you have taken or might take on behalf of your firm. These are strategic decisions whose outcome is uncertain, with a positive correlation between expected earnings and risk. On a scale from 0 to 10, where 0 means you would choose the safest option with the lowest expected earnings while 10 refers to very risky projects that have a very high rate of return in case of success, what would you choose?”
making strategic decisions for the firm.\textsuperscript{31}

[NOTE: THE DISCUSSION ABOVE WILL NEED TO BE UPDATED ACCORDING TO THE MEASURES OF RISK AVERSION THAT WE WANT TO USE - SEE NOTE IN REF REPLIES FOR DETAILS]

The next set of variables aim to proxy for the managers’ talent. The first two refer to the managers’ human capital, as measured by college and executive education degrees. In our sample, 50\% of the managers hold a college degree, and 56\% hold an executive degree.\textsuperscript{32} To capture additional aspects of managerial quality beyond education, we measure “desirability” by asking managers whether they received any job offer during the three years prior to the interview; 71\% reported that this was the case.

It is important to note that the measures of risk attitudes and talent exhibit independent variation: no correlation between any two measures is higher than 0.06. This is crucial for our purposes as it allows us to identify matching on risk and talent separately.\textsuperscript{33}

Finally, Table 1, Panel D reports measures of the managers’ effort, remuneration, and job satisfaction. We proxy managerial effort by the number of hours worked over a week. In our sample 37\% of managers work 60 hours or longer.\textsuperscript{34} The average annual fixed salary of a manager is approximately 100,000 Euro, while the bonus amounts, on average, to 15\% of the fixed salary. On average, managers in our sample receive 4.2 non-monetary benefits out of a list of seven potential benefits.\textsuperscript{35} Finally 50\% of the managers in our sample report

\textsuperscript{31}To complement our measures of risk aversion we also collected proxy measures for the managers’ access to informal insurance. Intuitively, for a given degree of risk aversion, managers who have better access to insurance should be willing to bear more risk in general as this reduces background risk (Kimball 1993 and Gollier 2004). Following the literature that highlights the importance of inter-vivos transfers from Italian parents to their offsprings (e.g., Cannari and D’Alessio, 2008 and Guiso and Jappelli, 1999) we collected information on the managers’ family socioeconomic background to proxy for their ability to smooth risk. The underlying assumption is that managers whose parents are wealthy are better equipped to bear risk as the latter can be buffered by their parents’ wealth. We obtain very similar results when we proxy for risk aversion using fathers’ college education (as an indicator of family background). Not surprisingly, however, this variable is also strongly correlated to occupation and income. For this reason we have omitted results based on this variable from the main tables in this version of the paper (detailed results can be found in an earlier version of this paper, cfr Bandiera et al, 2011).

\textsuperscript{32}This relatively low figure is consistent with the information arising from existing surveys of Italian managers (see Bandiera et. al. 2008).

\textsuperscript{33}We discuss in more detail the validity of the risk aversion variable in the robustness section.

\textsuperscript{34}To minimize measurement error due to the choice of a particular week, the survey asks managers to pick the number of hours they work in the “typical” week out of 5 possible choices: (i) 40 hours or fewer, (ii) about 40 hours, (iii) about 50 hours, (iv) about 60 hours, (v) 60 hours or more.

\textsuperscript{35}The list of benefits include: company car (available to 83\% of our sample managers), flexible hours (85\%), telecommuting (27\%), training (71\%), sabbatical periods (6\%), health insurance (74\%), and life insurance.
to be “extremely satisfied” about their job. Only 5% report to be “unsatisfied,” while the remaining part of the sample is “satisfied.”

4 Empirical Analysis: Findings

We organize the empirical evidence in four parts that match the four set of predictions obtained in Section 2. We start by estimating the relation between the firms’ incentive policies and the risk and talent of the managers they hire in equilibrium. We will show that firms offering stronger incentives attract managers who are more risk tolerant and more talented. Second, we estimate the correlation between the strength of incentives and managers’ outcomes. We will show that managers who are offered stronger incentives exert more effort, receive higher fixed and variable pay, receive more non-pecuniary benefits, and are more satisfied with their job. Third, we estimate the correlation between the weight given to keeping a direct control of the firm (as proxied by ownership) and the strength of managerial incentives. We will show that family ownership, which in our setting reveals a stronger preference for direct control, is negatively correlated with the adoption of bonus systems related to individual or team performance, and with the adoption of practices that promote and fire employees based on their performance. Fourth, we estimate the correlation between incentives and firm performance. We will show that firms that offer high powered incentives have higher productivity, profits, and returns on capital.

It is important to make precise that our aim is to present evidence on a rich set of equilibrium correlations that are suggested by the theory. We do not, at any stage, aim at identifying the causal effect of ownership on incentives or incentives on performance, as neither varies exogenously. However, at the end of this section we discuss a number of alternative interpretations of our findings and argue that, when taken together our evidence while consistent with the matching model, is not consistent with any of these alternatives.

4.1 Incentives and Managers’ Characteristics

We begin by testing Implication 1, namely that high powered incentives attract managers who are less risk averse and, conditional on risk aversion, more talented. Starting with risk aversion, we estimate the conditional correlation:

\[
R_i = \eta^R I_j + \mathbf{X}_j \mathbf{\zeta}^R + Y_i \sigma^R + \epsilon_{ij}^R
\]  

(74%).
where $R_i$ is a measure of the manager risk aversion and $I_j$ is the incentive policies index. Throughout the empirical analysis, $X_j$ includes the firm’s multinational status, employment levels, and SIC2 industry codes. $Y_i$ includes the manager’s tenure, seniority level, whether he belongs to the owner family, and his operational area (general administration, finance, sales).  

Finally we add interviewers’ dummies and control for the duration of the interview to account for potential noise in the measurement of the incentive policies.

Columns (1) and (2) of Table 2 estimate (1) for our measure of the manager own risk preferences with and without the controls vectors $X_j$ and $Y_i$. Recall that our risk preference measure – the probability of failure of the risky project the manager is willing to bear – is inversely related to risk aversion. Columns (1) and (2) then show that risk tolerant managers are more likely to be offered high powered incentives. The estimates of $\eta^R$ are positive and significantly different from zero at conventional levels. Column (2) estimate implies that one standard deviation increase in the index is associated with a 1.75 increase in the risk preference measure, or 10% of a standard deviation of the risk tolerance measure.

It is important to note that the interpretation of the findings is qualitatively unaffected if our measure captures the manager’s risk attitudes when he takes a decision on behalf of his firm instead of his individual risk aversion parameter $\gamma_j$. If so, our measure effectively captures $b^i \gamma_j$, namely the portion of the risk taken by the firm that ends up to the manager through his incentive scheme. Note that the finding that $b^i \gamma_j$ is smaller when $b^i$ is higher implies a fortiori that $\gamma_j$ is smaller when $b^i$ is higher.

In Columns (3) and (4) we define $R_i$ directly as the manager’s own account of the risks he takes on behalf of the firm using our second measure of the manager’s risk attitude. The findings indicate that high powered incentives are associated with managers who take more risks. The estimates in Column (4) show that one standard deviation increase of the index is associated with a 0.17 increase in the risk measure, or 10% of its standard deviation.

The second part of Implication 1 indicates that, conditional on risk aversion, high powered incentives attract more talented managers. To test this, in Table 3 we estimate the conditional correlation:

$$T_i = \eta^T I_j + \chi^T R_i + X_j \zeta^T + Y_i \sigma^T + \epsilon_{ij}^T \quad (2)$$

36 On average, managers have 6.6 years of tenure (standard deviation is 3.6). Seniority is characteristic of the standardized managerial contract. In our sample 7% have a lower management contract, 72% a middle management contract, and 21% an upper management contract. Only 2.5% of our sample managers belong to the family who owns the firm. Finally, by construction, managers are equally split between the three operational areas.
where $T_i$ are measures of the manager’s talent, $R_i$ is the measure of the manager’s own risk tolerance, and all the other variables are defined above. The findings in Table 3 provide broad support to the prediction that “better” managers are attracted by steep incentives. For all our measures of talent, $\eta^T$ is positive and significantly different from zero at conventional levels. Namely, managers who work under high powered incentives are more likely to have a college degree, to have attained executive education, and to be “desirable,” namely to have received job offers from other firms in the last three years. Using the estimates with the full set of controls, we find that one standard deviation increase in the incentive index increases the probability that the manager has a college degree by 0.08 (16% of the unconditional mean), that he has an executive education degree by 0.10 (18% of the mean), and that he has received outside offers by 0.08 (17% of the mean). Finally, we note that there is a positive correlation between firm size and managerial talent: larger firms are more likely to hire more skilled managers. This is in line with the prediction of a large class of manager-firm matching models, from Lucas (1978), to Rosen, (1982) and Terviö (2008).

### 4.2 Incentives and Managers’ Outcomes

Implication 2 links the firms’ incentive policies to managers’ effort, pay, and job satisfaction. It predicts that, holding constant their risk tolerance, managers who are offered steeper incentives work harder, receive higher fixed and variable pay, and have higher utility. To provide evidence on this, Table 4 reports estimates of the conditional correlation:

$$O_i = \eta^O I_j + \lambda^O R_i + X_j \zeta^O + Y_i \sigma^O + \epsilon_{ij}^O \quad (3)$$

where $O_i$ are our measures of managers’ outcomes and all the other variables are defined above. Proxying effort by hours worked, Columns (1) and (2) show that managers who are offered steeper incentives work longer hours. The estimate of $\eta^O$ is positive, and statistically and economically significant. One standard deviation increase in the incentive index is associated with a 0.06 increase in the probability that the manager works more than 60 hours per week, which corresponds to 16% of the sample mean.

Columns (3) to (6) show that managers who are offered steeper incentives receive higher fixed and variable pay. The estimates of $\eta^O$ with the full set of firm and manager controls indicate that one standard deviation increase in the incentive index is associated with an increase of 2,900 euros in fixed pay and an even larger amount of 4,375 euros in variable pay. These correspond to 10% and 25% of one standard deviation in fixed and variable pay, respectively. Managers who are offered steeper incentives also receive a larger number of job
benefits. The estimates in Column (8) imply that one standard deviation increase in the incentive index is associated with 0.24 more benefits, equal to 17% of a standard deviation of the number of benefits in the sample.

Finally, to measure the managers’ level of utility we ask them to report their level of satisfaction on the job. Only 5% report to be unsatisfied, while 45% is satisfied, and 50% is very satisfied. Columns (9) and (10) show that managers who are offered steeper incentives feel happier. According to the estimate in Column (10), one standard deviation increase in the incentive index is associated with a 0.06 increase in the probability that the manager reports to be very satisfied, which is as large as 12% of the sample mean.

4.3 Firm Ownership and Incentives

Implication 3 predicts that firms attaching a higher weight to direct control (\(F\) firms in our notation) will tend to offer a weaker link between reward and performance than \(N\) firms. We exploit the difference between family firms and firms owned by disperse shareholders to proxy for the \(F\) and \(N\) firms described in our model. In particular, our key assumption is that families put more weight on direct control than shareholders of widely held firms, such that \(\phi_F < \phi_N\).

This choice is rooted in the family firms literature (discussed in the Introduction), which documents how family-owners often perceive the firm as an opportunity to address family issues and frictions. In this context, owners attribute a value to the firm as an “amenities provider”, even though the provision of such amenities might not be profit maximizing (Kets de Vries, 1993). Alternatively, since the boundaries of the firm and those of the family are less clearly defined in family-firms, the transfer of these amenities from the firm to the family is more efficient in family firms and thus more of these amenities are transferred. In either case, \(\phi_F < \phi_N\).

Unconditionally we find that family firms do offer a weaker link between reward and performance than dispersed shareholders firms. Family firms are less likely to offer bonuses based on individual performance (44% versus 57%), to have promotion fast tracks (32% versus 41%), and to have dismissed managers for failure to meet performance targets (3% versus 6%). Family firms are also less likely to award bonuses, decide on promotions, and fire employees through a formal appraisal process and in all cases the gap between the two types of firms is not only statistically significant (see last column) but also substantial. Only performance seems to matter for promotions regardless of ownership.

In Table 5 we test whether these differences are robust to controlling for a rich set of
manager and firm characteristics, which might create a spurious correlation between firm ownership and incentive policies. We estimate the conditional correlation:

$$P_{ij} = \alpha^F D_j^F + \alpha^O D_j^O + X_j \beta + Y_i \delta + \epsilon_{ij}$$ (4)

where $P_{ij}$ are the different incentive policies adopted by firm $j$ as reported by manager $i$, $D_j^F = 1$ if firm $j$ belongs to its founder or a family and 0 otherwise, $D_j^O = 1$ if the firm belongs to the government, a cooperative or its managers and 0 otherwise. The coefficient of interest is $\alpha^F$, namely the difference in incentive policies between family-owned and dispersedly owned firms, and $X_j$ and $Y_i$ are the vectors of firm, manager, and interview controls defined above.

Table 5 shows that the difference in personnel policies between family firms and firms owned by disperse shareholders are robust to the inclusion of this rich set of controls. The first two columns estimate (4) for the aggregate index built as the sum of all seven policy measures. Both in Columns (1) and (2) $\alpha^F$ is negative and significantly different from zero at conventional levels. The magnitude of the coefficient indicates that the differences between family and dispersed shareholder firms are large: with the full set of controls the incentive index is 0.51 points smaller in family compared to dispersedly owned firms. This difference amounts to 18% of the sample mean and 30% of a standard deviation of the incentive index. The remaining columns estimate (4) for the three subcomponent of the index: bonuses, promotions, and dismissals. Throughout $\alpha^F$ is negative and significantly different from zero at conventional levels, indicating that family firms choose low powered incentives on all dimensions.

Table 5 also shows that high powered incentives are more likely to be offered by firms that are part of multinational corporations. None of the other controls are correlated with incentive policies. Namely, the strength of incentives is not correlated with firm size or industry sector, or with the managers’ tenure, seniority, and operational area.\footnote{The lack of correlation between the steepness of the incentive scheme and firm size is at odds with the findings reported in Schaefer (1998), which shows that the incentives of U.S. CEOs fall in strength roughly with the square root of firm size. There are many possible reasons behind this discrepancy. First, Schaefer (1998) is based on a sample of very large (with assets worth $3,775 million on average) and listed US firms, while we look at much smaller firms ($3.3 million in assets on average and only 1.4% listed on the stock market). Second, our size measures (dummies for the average number of employees in the firm) might simply be too rough to estimate the effects reported by Schafer. Third - and perhaps more importantly - Schaefer focuses exclusively on CEOs and top managers, while our sample also includes managers lower down the hierarchy. Interestingly, when we restrict the sample to the set of 126 managers who report to be "Top Managers" (i.e. reporting directly to CEOs), we find some evidence that the strength of managerial incentives declines with firm size. In fact, when we repeat the regression shown in Table 5, column 2, relating the incentive index with...}
While the findings are consistent with Implication 3, and hence with the assumption that family firms put more weight on the “amenity value” of control, $\varepsilon_{ij}$ contains all other unobservable characteristics that differ by ownership and could be driving the results. For instance, family firms might have a better monitoring technology and hence less need to offer performance incentives. We will discuss this and other alternative explanations in the robustness section.

4.4 Incentives and Firms’ Outcomes

The final step of our analysis presents evidence on Implication 4, which suggests a positive correlation between incentive policies and firm performance. Though, as said, our data does not allow us to identify a causal relationship, we are nevertheless interested in establishing whether the data are consistent with this model prediction.

In Table 6 we estimate the conditional correlation over a repeated cross section:

$$Z_{jt} = \theta I_j + X_{jt} \beta + \kappa_t + \omega_{jt}$$

(5)

where $Z_{jt}$ measures the performance of firm $j$ in year $t$, $\kappa_t$ are year fixed effects, and all other variables are as defined above. We consider three alternative measures of firm performance a) labour productivity (log of sales/employees); b) profits per employee; and c) return on capital employed, all measured yearly for the period 2004 to 2007. To account for the fact that error terms $\omega_{jt}$ are correlated within firm across years we cluster the standard errors at the firm level. Firm performance measures are obtained by matching our survey data with Amadeus, an extensive accounting database covering more than 9 million public and private companies across Europe, of which approximately 580,000 are in Italy.\(^{38}\) Once we clean the accounting data dropping the first and the bottom percentiles of the performance variables and taking into account missing observations for some items, we end up with a sample of 554 observations.\(^{39}\)

The estimation results are reported in Table 6. Two points are worth of note. First, the incentive index carries a positive coefficient significant at conventional levels for all measures of firm ownership and firm characteristics the coefficient (standard error) on the dummy denoting firms with 50 to 100 employees is -0.670 (0.690), and the coefficient (standard error) on the dummy denoting firms with 100 employees or more is -1.076 (0.584) (with the omitted category being firms with less than 50 employees). This finding is driven by all components of the incentive index, and in particular by the set of questions measuring the presence of monetary bonuses linked to individual performance, and awarded through formal appraisal systems.

\(^{38}\) To match the two datasets we use the unique company identifier Codice Cerved.

\(^{39}\) The results are qualitatively similar without these cleaning procedures.
of productivity. A one standard deviation increase in the incentive index is associated with a 5%, 8%, and 9% of a standard deviation increase of log-productivity, profits, and return on capital, respectively. Second, this finding is robust to controlling for ownership structure; namely it is not merely due to the incentive index capturing systematic differences in performance directly due to different ownership structures. The estimates of the coefficient on family ownership is negative throughout but only precisely estimated for labor productivity. Thus, once differences in the power of incentives are accounted for, we find no evidence of a systematic difference in profits between family and shareholder owned firms, a feature itself in line with the implications of our model with endogenous firm entry.

5 Robustness and Alternative Interpretations

5.1 Unobserved Heterogeneity in Manager Characteristics

The residuals in (1),(2), and (3), contain unobservable manager characteristics that can generate a spurious correlation between the incentive index and the outcome of interest. This concern is particularly serious in survey-data because unobservable psychological characteristics of the respondent may lead to systematic mis-reporting. For instance, managers who are more self-confident might be more likely to overestimate their control over their pay, hence more likely to report facing high powered incentives, and at the same time more likely to take risks and to overestimate their earnings. Unobservable self-confidence could therefore generate a spurious correlation between incentive power and risk tolerance, and between incentive power and earnings.

We can probe the robustness of our survey data directly using social security records that contain detailed information on the managers’ pay and occupation since the beginning of their careers. Hence we can estimate (3) using the social security administrative earnings data that are not affected by perception errors or other managers’ unobservable traits, which could in turn contaminate self-reported variables. Table 7 reports the estimates of:

$$Q_i = \varphi I_j + Y_i \psi + \zeta_i$$

where $Q_i$ is the logarithm of manager $i$’s pay and the vector of controls $Y_i$ includes the manager’s seniority level, whether he belongs to the owner family, his tenure in the current firm and category (general administration, finance, sales), overall tenure since his first job, the number of firms he has worked for, and the average number of weeks worked in a year, duration of the interview and interviewer dummies. For comparison, columns (1) and (2)
report the estimate of (6) using pay data from the survey, whereas in Columns (3) and (4) we use pay data from the social security records. Throughout $\varphi$ is positive and precisely estimated. Moreover, the estimates of $\varphi$ obtained with our survey data or with the social security records are quantitatively similar, reassuring us directly on the reliability of our survey earnings and indirectly on our incentive index.

Since the social security records contain information on the managers’ entire careers, we can further refine the evidence that incentive policies are matched to the managers’ type by regressing managerial pay in previous jobs on current incentives. Under the plausible assumption that managers’ risk attitudes and ability are stable traits one should find that a given managers matches with firms that offer similar types of incentive contracts. Consistent with this, columns (5) and (6) show that managers who currently face high powered incentives, had higher levels of pay throughout their career.

Furthermore, while the social security records do not contain information on the managers’ risk preferences, they allow us to measure earnings variability, which, by revealed preference, is an indicator of the risk the manager is willing to bear. To provide further evidence on the validity of our incentive measure, we exploit the time variation in earnings in the social security records and test whether high powered incentives result in a higher earnings variability, as they should if the managers who face steep incentives bear more risk in equilibrium.\footnote{In our model, earnings variability can be computed directly. The realized wage variance is $Var(w) = Var(b^i y_i) = (b^i)^2 \sigma^2$. Hence the realized standard deviation is linear in the power of the incentive contract faced by the manager.} We estimate the same specification as in (6) with the standard deviation of yearly pay computed over the managers’ time at the firm on the left hand side. Columns (7) to (10) show that earnings variability and the power of incentives are correlated: managers hired by firms that offer high powered incentives face more earnings variability, and have done so throughout their careers. This is additional evidence in support of our matching model: throughout his career, a bold, talented manager tends to be matched with firms that offer steep incentives.

Finally, another potential concern is that our risk aversion measure is correlated with other unobservable personal characteristics, which in turn may determine matching and incentive preferences. While this hypothesis cannot be verified within our dataset, we can explore this question using another survey of 2,295 Italian entrepreneurs and managers, which is focused on the measurement of risk aversion (measured in the very same way used in this paper) and its link with other managerial characteristics (Guiso and Rustichini 2010). In line with our results, risk aversion is not statistically correlated with measures of cognitive ability.
Reassuringly, the risk aversion measure is also not statistically correlated with managerial personality traits that could affect the matching process, such as optimism, confidence and the ability sustain effort. On the other hand, we find evidence that our risk aversion measure is correlated with actual risk taking behavior of managers outside their work environment. Appendix 2 discusses data and results of the external validation analysis in more detail.

5.2 Alternative Interpretations

Taken together our findings are consistent with the rich set of equilibrium correlations suggested by the model outlined in Section 2. Incentive policies are correlated with the type of managers hired in equilibrium: the strength of incentives is positively correlated with the managers risk tolerance and with their talent. Incentive policies are also correlated with managers’ effort, their compensation package, and their utility: managers who face stronger incentives work harder, receive higher fixed and variable pay, and (not obviously) are happier. Ownership type is correlated with incentive policies: compared to firms owned by disperse shareholders, family firms offer lower powered incentives. Finally, stronger incentives are positively correlated with firm performance.

Although some of these results have been already observed in isolation in previous work, this is the first time that specific personnel policies are analyzed in conjunction with such a rich array of firm and manager characteristics. Compared to prior studies, this gives us the unique opportunity to explore the validity of alternative theories that have been proposed in the past, especially with regards to the understanding of the difference between family firms and other types of ownership.

For example, similarly to what we show in Table 5, Bloom and Van Reenen (2007) report that family owned firms are less likely to adopt "modern" management practices, which include basic practices related to the provision of performance incentives and the adoption of practices that promote and dismiss workers based on their performance. The absence of detailed information on workers’ effort and characteristics, however, complicates the interpretation of this finding. First, family firms may have a better monitoring technology, and hence less need to offer explicit performance incentives (Roe 2003, Mueller and Philippon 2006). This would explain the observed correlation between ownership and incentives. A related hypothesis is that family firms may have access to other technologies to motivate managers, e.g. non-taxable benefits, and hence do not need to offer explicit monetary incentives to reward performance, so that effective performance is better rewarded even if incentives are low.
Having data on all sides of the match, we are able to show that both hypotheses - the family firm advantage in monitoring and motivating their employees - are actually not supported by the data. For example, if family firms were better at monitoring their employees, this would imply a comparative advantage in incentive provision, which in turn would lead to three conclusions, which are all falsified in the data. First, managers who face better monitoring should work harder. To the extent that hours worked are a proxy for effort, the estimates of (3) indicate that the opposite is true: managers who face weaker explicit incentives work less hard. Second, better monitoring implies higher productivity. In a competitive labor market, where firms are competing to hire managers, then more productive managers should be paid more. The findings suggest that the opposite is true: both fixed and variable pay are lower in family firms. Third, if effort and talent are complements in the production function (as it is standard to assume), a comparative advantage in monitoring should translate in a comparative advantage in employing talented managers. But the estimates of (2) suggest the opposite: managers who face stronger incentives are more talented. Similarly, if family firms were better at motivating their employees, we should observe low powered incentives to be correlated with higher managerial talent and effort. The estimates of (2) and (3) indicate the opposite.

As a further check, we investigate whether family firms might offer flatter incentives as they happen to be in sectors where managerial effort is less relevant. To shed light on this hypothesis we estimate (4) without industry controls, then with SIC2 industry codes, and finally with SIC3 industry codes. The estimated coefficient of family ownership in the three specifications is -.57, -.53, and -.59, significantly different from zero at the 5% level. The fact that the estimated coefficient of family ownership remains constant as we add increasingly fine industry controls rules out that family owned and widely held firms sort into different sectors. While it remains possible that firms sort within each three digit industry, for instance different types of beauty salons or dry cleaners, the extent to which the returns to managerial effort can differ within such narrowly defined groups is likely to be limited.

6 Conclusions

Personnel economics models produce an array of testable predictions on workers and firms match, how firm characteristics drive incentive schemes, how incentives determine worker behavior, and how worker behavior determines firm performance. Due to data limitations,

\footnote{Of course, one can always argue that the number of hours and weekends worked is not a good proxy of effort.}

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previous empirical work focused on individual predictions.

This paper has explored the potential of utilizing integrated personnel data, combining information about the worker’s characteristics, the firm’s characteristics, and the terms of the (implicit and explicit) contract linking the worker and the firm. A wide array of empirical regularities can be accounted for by a simple model where incentives and matches are endogenously determined.

The combination of novel and comprehensive data and a simple theory that features widely shared heterogeneity in firms governance has allowed us to make progress along two lines. First, we have showed the key relevance of manager’s willingness to bear risk as well as talent as key factors in driving matching with firms. Highly talented and risk tolerant managers tend to match with firms that value these characteristics the most. Second, we have offered a unified account of several findings in the literature treated so far in isolation and sometimes thought to be independent instead of stemming from the same problem.

References


7 Appendix 1: Formal Result and Proofs

The model presented above yields the following equilibrium characterization:\footnote{\begin{quote}The technical condition that $\bar{\gamma}$ is sufficiently small (i.e. there is more heterogeneity in talent than in risk aversion) guarantees that the regions depicted in figure 1 are trapezoids rather than triangles. If the condition fails, one would have a different characterization but with similar properties.\end{quote}}

**Proposition 1** Suppose that $\bar{\gamma}$ is sufficiently small. In equilibrium, $N$-firms and $F$-firms use contracts with slopes

\[
\begin{align*}
\hat{b}_N (\gamma_j) &= \frac{\phi_N}{1 + \gamma_j \sigma^2} \\
\hat{b}_F (\gamma_j) &= \frac{\phi_F}{1 + \gamma_j \sigma^2}
\end{align*}
\]

Manager $j$ is matched with an $N$-firm if and only if

\[
\theta_j \geq \frac{2(\pi_N - \pi_F)}{\bar{\phi}_N^2 - \bar{\phi}_F^2} (1 + \gamma_j \sigma^2)
\]

and, if not, he is matched with an $F$-firm if and only if

\[
\theta_j \geq \frac{2\pi_F}{\bar{\phi}_F^2} (1 + \gamma_j \sigma^2)
\]

where

\[
\begin{align*}
\pi_F &= \frac{\bar{\phi}_F^2 (2 + \bar{\gamma} \sigma^2)}{D} \bar{\theta} \bar{\gamma} \\
\pi_N &= \frac{\bar{\phi}_N^2 (2 + \bar{\gamma} \sigma^2) \bar{\gamma} + \bar{\phi}_F^2 (\bar{\phi}_N^2 - \bar{\phi}_F^2) \bar{\theta} \bar{\gamma}}{D}
\end{align*}
\]

With

\[
D = (\bar{\phi}_F^2 + \bar{\phi}_N^2) (2 + \bar{\gamma} \sigma^2) \bar{\gamma} + (2 + \bar{\gamma} \sigma^2)^2 \bar{\gamma}^2 + \bar{\phi}_F^2 (\bar{\phi}_N^2 - \bar{\phi}_F^2)
\]

Equation (7) is the condition that determines the boundary between the $N$-region and the $F$-region. Similarly, (8) describes the boundary between the $F$-region and the unemployment region. The proposition also provides precise expressions for the management-related equilibrium payoffs $\pi_F$ and $\pi_N$, which in turn pin down the region boundaries. It is immediately visible that the management-related payoff is greater in $N$-firms than in $F$-firms, which – as we discussed above – is due to the comparative advantage that $N$-firms have when it comes to incentive provision.

The proof of Proposition 1 follows the informal discussion above, with the addition of a somewhat laborious computation of the actual fixed point of the matching problem.
7.1 Proof of proposition 1

Given the CARA assumption, if \( w \) is normally distributed, the manager’s expected payoff can be written as

\[
E[u] = E[w] - \frac{1}{2} \gamma V[w] - \frac{1}{2} x^2.
\]

Given \( a \) and \( b \), the manager chooses \( x \) to maximize \( E(u) \):

\[
\hat{x} = \arg \max_x E[w] - \frac{1}{2} \gamma V[w] - \frac{1}{2} x^2
\]

\[
= \arg \max_x a + b E[y] - \frac{1}{2} b^2 \gamma V[y] - \frac{1}{2} x^2
\]

\[
= \arg \max_x a + b E[\sqrt{\theta_j} (x + \varepsilon)] - \frac{1}{2} b^2 \gamma V[\sqrt{\theta_j} (x + \varepsilon)] - \frac{1}{2} x^2
\]

The first-order condition on \( x \) yields

\[
\hat{x}_j = b^j \sqrt{\theta_j}.
\]

The manager’s expected payoff is hence

\[
E[U_j] = a^i + b^j \sqrt{\theta_j} \hat{x} - \frac{1}{2} (b^j)^2 \gamma_j \theta_j \sigma^2 - \frac{1}{2} \hat{x}^2_j
\]

\[
= a^i + (b^j)^2 \theta_j - \frac{1}{2} (b^j)^2 \gamma \theta_j \sigma^2 - \frac{1}{2} (b^j)^2 \theta_j
\]

The expected payoff for a firm that employs manager \( j \) at wage \( (a, b) \) is

\[
E[V^i] = E[y_j - w_j + h^2 - k^2] + (1 - \phi_g) (\Gamma - b^i \theta_j)
\]

\[
= b^i \theta_j - a^i - (b^j)^2 \theta_j + h^2 - k^2 + (1 - \phi_g) (\Gamma - b^i \theta_j)
\]

Let \( S^i_j = E[U_j] + E[V^i] \) denote the total surplus generated by the match between firm \( i \) and manager \( j \). As the fixed component can be used to distribute the surplus between the firm and the worker, it is easy to see that the firm will always want to maximize surplus and pay the manager her reservation wage (determined in equilibrium by what he could get if he worked for another firm).

The surplus is

\[
S^i_j = E[U_j] + E[V^i]
\]

\[
= \left( \phi_g b^i - \frac{1}{2} (1 + \gamma \sigma^2) (b^i)^2 \right) \theta_j + (h^2 - k^2 + (1 - \phi_g) \Gamma)
\]

Differentiating the surplus function with respect to \( b^i \) we obtain the optimal contract slope:

\[
b^i = \frac{\phi_g}{1 + \gamma_j \sigma^2}
\]
Hence, the maximal surplus is
\[ S^i_j = \left( \frac{\phi_g}{1 + \gamma_j \sigma^2} - \frac{1}{2} \left( 1 + \gamma_j \sigma^2 \right) \left( \frac{\phi_g}{1 + \gamma_j \sigma^2} \right)^2 \right) \theta_j + (h^g - k^i + (1 - \phi_g) \Gamma) \]
\[ = \frac{1}{2} \frac{\phi_g^2}{1 + \gamma_j \sigma^2} \theta_j + (h^g - k^i + (1 - \phi_g) \Gamma) \]

Restrict attention to the first term of \( S^i_j \), which can be thought of as the management-related component of the match surplus. It depends on \( \phi_g \). We let:
\[ S_F (\theta_j, \gamma_j) = \frac{1}{2} \frac{\phi_F^2}{1 + \gamma_j \sigma^2} \theta_j \]
\[ S_N (\theta_j, \gamma_j) = \frac{1}{2} \frac{\phi_N^2}{1 + \gamma_j \sigma^2} \theta_j \]

Next, we examine match stability. Note that, for all \( \theta_j \) and \( \gamma_j \),
\[ S_N (\theta_j, \gamma_j) > S_F (\theta_j, \gamma_j) \]
Also, given \( \theta_j \geq \theta_k \) and \( \gamma_j \leq \gamma_k \) (with at least a strict inequality), the following three inequalities hold
\[ S_N (\theta_j, \gamma_j) > S_N (\theta_k, \gamma_k) \]
\[ S_F (\theta_j, \gamma_j) > S_F (\theta_k, \gamma_k) \]
\[ S_N (\theta_j, \gamma_j) - S_F (\theta_j, \gamma_j) > S_N (\theta_k, \gamma_k) - S_F (\theta_k, \gamma_k) \]

Given two managers \( j \) and \( k \) with \( \theta_j > \theta_k \) and \( \gamma_j < \gamma_k \), the following three statements are always false (because they contradict, respectively, one of the three inequalities just stated – a new match could be formed with a higher surplus):

- Manager \( k \) works for an \( N \)-firm and manager \( j \) is unemployed
- Manager \( k \) works for an \( F \)-firm and manager \( j \) is unemployed
- Manager \( k \) works for an \( N \)-firm and manager \( j \) works for an \( F \)-firm

This restricts the shape of the regions of manager types that work for \( N, F \), or are unemployed. It is easy to see that if \( \bar{\gamma} \) is sufficiently small, the regions must be trapezes, as in figure 1.

Note that we can write
\[ S_F (\theta_j, \gamma_j) = E [U_j] + \phi_F b^i \theta_j - a^i - (b^i)^2 \theta_j \]
\[ S_N (\theta_j, \gamma_j) = E [U_j] + \phi_N b^i \theta_j - a^i - (b^i)^2 \theta_j \]
Perfect competition among firms means that all $F$-firms must have the same management-related payoff

$$\pi_F = \phi_F b^i \theta_j - a^i - (b^i)^2 \theta_j$$

and all $N$-firms must have the same management-related payoff

$$\pi_N = \phi_N b^i \theta_j - a^i - (b^i)^2 \theta_j$$

A manager $j$ who is employed by an $F$-firm receives expected utility

$$u_j = S_F (\theta_j, \gamma_j) - \pi_F$$

and every manager $j$ that is employed by an $N$-firm receives utility

$$u_j = S_N (\theta_j, \gamma_j) - \pi_N$$

The managers on the line that separates the $F$ region from the unemployment region receive their outside option: zero. Hence all the surplus goes to the firm

$$S_F (\theta_j, \gamma_j) = \pi_F$$

The managers on the line that separates the $F$ region and the $N$ region are indifferent between working for an $N$-firm and an $F$-firm. Hence

$$S_N (\theta_j, \gamma_j) - \pi_N = S_F (\theta_j, \gamma_j) - \pi_F$$

These two indifference condition can be applied to the extreme cases: $\gamma_j = 0$ and $\gamma_j = \bar{\gamma}$, yielding

$$S_F (t_F, 0) = \pi_F$$
$$S_F (s_F, \bar{\gamma}) = \pi_F$$
$$S_N (t_N, 0) - S_F (t_N, 0) = \pi_N - \pi_F$$
$$S_N (s_N, \bar{\gamma}) - S_F (s_N, \bar{\gamma}) = \pi_N - \pi_F$$

We can re-write the first four equations as

$$\frac{1}{2} \phi_F^2 t_F = \pi_F$$
$$\frac{1}{2} \phi_F^2 \frac{1}{1 + \gamma \sigma^2} s_F = \pi_F$$
$$\frac{1}{2} \phi_N^2 t_N - \frac{1}{2} \phi_F^2 t_N = \pi_N - \pi_F$$
$$\frac{1}{2} \phi_N^2 \frac{1}{1 + \gamma \sigma^2} s_N - \frac{1}{2} \phi_F^2 \frac{1}{1 + \gamma \sigma^2} s_N = \pi_N - \pi_F$$
That is

\[ t_F = \frac{2\pi_F}{\phi_F^2} \]

\[ s_F = \frac{2\pi_F}{\phi_F^2} (1 + \bar{\gamma}\sigma^2) \]

\[ t_N = \frac{2(\pi_N - \pi_F)}{\phi_N^2 - \phi_F^2} \]

\[ s_N = \frac{2(\pi_N - \pi_F)}{\phi_N^2 - \phi_F^2} (1 + \bar{\gamma}\sigma^2) \]

The area of the regions (trapezes) correspond to the mass of firms in business. Hence

\[ \frac{(t_F + s_F) \bar{\gamma}}{2} = \bar{\theta}\bar{\gamma} - n_F - n_N \]

\[ \frac{(t_N + s_N) \bar{\gamma}}{2} = \bar{\theta}\bar{\gamma} - n_N \]

Then

\[ \frac{\pi_F}{\phi_F^2} (2 + \bar{\gamma}\sigma^2) \bar{\gamma} = \bar{\theta}\bar{\gamma} - n_N - n_F \] (9)

\[ \frac{\pi_N - \pi_F}{\phi_N^2 - \phi_F^2} (2 + \bar{\gamma}\sigma^2) \bar{\gamma} = \bar{\theta}\bar{\gamma} - n_N \] (10)

Finally, the entry condition on F-firms implies that the expected payoff of the least profitable F-firm (let’s call it \( \bar{i} \)) is zero:

\[ E[V^i] = E[y_j - w_j + h_F - k^i] + (1 - \phi_F)(\Gamma_F - \theta_j) \]

\[ = b^i\theta_j - \alpha^i - (b^i)^2 \theta_j + h_F - k^i + (1 - \phi_F)(\Gamma_F - \theta_j) \]

\[ = \pi_F + h_F - k^i + (1 - \phi_F)\Gamma_F = 0 \]

implying

\[ k^i = \pi_F + h_F + (1 - \phi_F)\Gamma_F \]

As there are \( k^i \) F-firms with a lower \( k \), the mass of active F-firms is

\[ n_F = \pi_F + h_F + (1 - \phi_F)\Gamma_F \]

Similarly, the mass of active F-firms is

\[ n_F = \pi_F \]

Hence (9) and (10) become

\[ \pi_F (2 + \bar{\gamma}\sigma^2) \bar{\gamma} = \phi_F^2 (\bar{\theta}\bar{\gamma} - \pi_N + h_N + (1 - \phi_F)\Gamma - \pi_F - h_F - (1 - \phi_F)\Gamma) \]

\[ (\pi_N - \pi_F)(2 + \bar{\gamma}\sigma^2) \bar{\gamma} = (\phi_N^2 - \phi_F^2)(\bar{\theta}\bar{\gamma} - \pi_N) \]
Let $G_F = h_F + (1 - \phi_F) \Gamma_F$, $H = (2 + \gamma \sigma^2)^{\gamma}$, $F \equiv \phi^2_F$ and $N \equiv \phi^2_N - \phi^2_F$. Then,

$$\pi_F H = F (\theta \gamma - \pi_N - \pi_F - G_F)$$

$$(\pi_N - \pi_F) H = N (\theta \gamma - \pi_N)$$

with solution

$$\pi_F = \frac{F H \theta \gamma - (H + N) G_F}{2FH + FN + HN + H^2}$$

$$\pi_N = \frac{F H \theta \gamma + FN \theta \gamma + HN \theta \gamma - FH G_F}{2FH + FN + HN + H^2}$$

which can be written as

$$\pi_F = \frac{\phi^2_F (2 + \gamma \sigma^2) \gamma - (2 + \gamma \sigma^2 + \phi^2_N - \phi^2_F) G_F}{D \theta \gamma}$$

$$\pi_N = \frac{\phi^2_N (2 + \gamma \sigma^2) \gamma \theta \gamma + \phi^2_F (\phi^2_N - \phi^2_F) \theta \gamma + (2 + \gamma \sigma^2) \gamma (\phi^2_N - \phi^2_F) \theta \gamma - \phi^2_F (2 + \gamma \sigma^2) \gamma G_F}{D \theta \gamma}$$

$$D = 2FH + FN + HN + H^2$$

$$= 2\phi^2_F H + \phi^2_F (\phi^2_N - \phi^2_F) + H (\phi^2_N - \phi^2_F) + H^2$$

$$= \phi^2_F H + \phi^2_F (\phi^2_N - \phi^2_F) + \phi^2_N H + H^2$$

$$= \phi^2_N (2 + \gamma \sigma^2) \gamma + \phi^2_N (2 + \gamma \sigma^2) \gamma + (2 + \gamma \sigma^2) \gamma \gamma + \phi^2_F (\phi^2_N - \phi^2_F)$$

$$= (\phi^2_F + \phi^2_N) (2 + \gamma \sigma^2) \gamma + (2 + \gamma \sigma^2) \gamma \gamma + \phi^2_F (\phi^2_N - \phi^2_F)$$

### 7.2 Proof of implication 1

Manager $j$ is characterized by talent $\theta_j$ and risk aversion $\gamma_j$. An increase in the risk-aversion coefficient $\gamma_j$ leads to a decrease in

$$\hat{b}^i (\gamma_j) = \frac{\phi_g}{1 + \gamma_j \sigma^2}$$

both because $\frac{\phi_g}{1 + \gamma_j \sigma^2}$ is decreasing in $\gamma_j$ and because, for $\gamma_j$ large enough, the value of $\hat{b}^i (\gamma_j)$ jumps from $\frac{\phi_N}{1 + \gamma_j \sigma^2}$ down to $\frac{\phi_F}{1 + \gamma_j \sigma^2}$.

The contract slope $\hat{b}^i$ is non-decreasing in $\theta_j$: while $\frac{\phi_g}{1 + \gamma_j \sigma^2}$ does not depend on $\theta_j$, for $\theta_j$ large enough, the value of $\hat{b}^i (\gamma_j)$ jumps from $\frac{\phi_F}{1 + \gamma_j \sigma^2}$ up to $\frac{\phi_N}{1 + \gamma_j \sigma^2}$.
7.3 Proof of Implication 2

For (a), note that the manager's effort is \( \hat{x}_j = b^i \sqrt{\theta_j} \). Hence, it is positively correlated to \( b^i \) both directly and indirectly (because, by implication 1 the contract slope is positively correlated with \( \theta_j \)).

Part (b) is immediate as the (expected) variable compensation is \( b^i \hat{x}_j \). Hence, it is increasing in \( b^i \) both directly and indirectly (through \( \hat{x}_j \), as per (a)).

It is useful to show (d) before (c). The proof relies on a revealed preference argument. Consider two employed managers with the same risk-aversion coefficient \( \gamma \), but different talent levels: \( \theta'' > \theta' \). In equilibrium, the first manager has contract \((a'', b'')\) while the second receives \((a', b')\). We already know that \( b'' \geq b' \), but we cannot say anything about the fixed part.

The two managers have respectively expected utilities
\[
U'' = a'' + (b'')^2 \theta'' - \frac{1}{2} \gamma \sigma^2 (b'')^2 \theta'' + \frac{1}{2} \gamma \sigma^2 (b'')^2 \theta''
\]
\[
U' = a' + (b')^2 \theta' - \frac{1}{2} \gamma \sigma^2 (b')^2 \theta' + \frac{1}{2} \gamma \sigma^2 (b')^2 \theta'
\]

If the \( \theta'' \)-manager were offered contract \((a', b')\) and exerted the same effort as the other manager, he would still have a higher utility because he is more productive. By a revealed preference argument, if the manager chooses to work for a firm that offers contract \((a'', b'')\) and chooses a higher level of effort, he must get a utility level that is at least as high.

For (c), consider the same two managers as in point (d) and note that \( U'' \geq U' \) implies that the difference between the expected total compensation of the two managers can be written as:
\[
\left( a'' + (b'')^2 \theta'' \right) - \left( a' + (b')^2 \theta' \right) \geq \left( \frac{1}{2} \gamma \sigma^2 (b'')^2 \theta'' + \frac{1}{2} \gamma \sigma^2 (b'')^2 \theta'' \right) - \left( \frac{1}{2} \gamma \sigma^2 (b')^2 \theta' + \frac{1}{2} \gamma \sigma^2 (b')^2 \theta' \right) = \frac{1}{2} \gamma (\sigma^2 + 1) \left( (b'')^2 \theta'' - (b')^2 \theta' \right) \geq 0
\]

7.4 Proof of Implication 4

As we saw in the proof of proposition 1, in equilibrium all \( F \)-firms have the same management-related payoff \( \pi_F \) and all \( N \)-firms have the same management-related payoff \( \pi_N \).

Recall that management-related payoff is defined as
\[
\pi_g = \phi_g b^i \theta_j - a^i - (b^i)^2 \theta_j
\]

Hence, if \( \pi_g \) is constant and the direct-control part of the payoff, namely \( (b^i)^2 \theta_j \), becomes more negative, the profit part \( \phi_g b^i \theta_j - a^i \) must increase.
8 Appendix 2: Risk Aversion Measures: External Validation

In this section we provide some support for the risk aversion measure we use, in order to address the main concerns that it raises: that it may reflect attributes that we do not observe and cannot control for, which happen to be correlated with the matching between the manager and the firm. We have already provided evidence that elicited risk attitudes are unlikely to reflect skills, as measured by educational attainment. In this section we use an external validity test in order to support our contention that answers to our lottery measures do indeed reflect risk preferences of the entrepreneurs and not other potentially matching-relevant traits.

To this end, we rely on a sample of 2,295 Italian entrepreneurs and managers who participated in the Ania Survey on Small Companies, conducted in 2008 using face to face interviews. This survey targeted the CEO of the company, and elicited a large number of relevant traits including measures of risk attitudes and abilities. A detailed description of the data is available in Guiso and Rustichini (2010).

The managers were asked the exact same investment lottery question that we employ in this paper, i.e. they were asked to reveal their preferences over a lottery. The average level of the risk tolerance indicator is 20.06 which is very similar to the one in our sample; the standard deviation is 26.6, a bit larger than that in our sample. The Ania survey also provides additional measures of business relevant personality traits and ability: a) optimism; b) an indicator of (over)confidence; c) an index of obstinacy and will power; and d) a measure of ability to sustain enduring effort. Additionally, the survey provides a rich set of information on managers’ physical traits and job experience. Finally, matching may be related to some dimension of personal connections, which could in turn be correlated with risk attitudes. For instance, firms may have a preference for a manager born in the same area where the firm is located. If there is a systematic relation between place of birth and risk preferences, our correlations may reflect matching on networking and not on risk preferences. We test this hypothesis including dummies for the region where the manager was born.

In this appendix we analyze the correlation between our risk aversion measures and these additional variables. The results of these regressions, controlling also for CEOs demographics and education (a dummy for college degree), are shown in Table A2. Risk tolerance is decreasing in age and higher for males, a pattern that has been found in many other studies of risk attitudes (e.g. Barsky et. al. (1999); Dohmen et. al. (2009)). Reassuringly, other measures of managerial ability which could in principle be relevant for the matching mechanism are in fact uncorrelated with risk aversion. For example, job experience, measured by the number of years the CEO has been in control of the firm and the year he started
working, is uncorrelated with risk tolerance. We also do not find evidence of any statistical correlation between our measure of risk aversion and CEO height (which has been found to capture economic success by Persico et al 2004), whether the manager was the firstborn and whether the father was an entrepreneur (proxying for inherited entrepreneurial ability). We cannot reject the hypothesis that region of birth fixed effects have some explanatory power - we cannot reject them being jointly equal to zero - but their size is small.

The second column adds to the specification the grade obtained by the manager at the end of the secondary school (Esame di Maturità), a possibly more precise proxy for cognitive ability which we do not have in our main sample (since some managers have not completed the secondary school the sample size is slightly smaller). Even this more sophisticated measure of cognitive ability turns out not to be correlated with risk attitudes.

In the third column we include as additional regressors the managerial personality traits described above. Three of the four measures – optimism, confidence and ability to sustain effort – are not statistically correlated with risk tolerance. The only variable that appears to be correlated with our measure of risk preferences is obstinacy. CEOs that do not give up easily when faced with an unanticipated problem are more risk tolerant. In so far this attitude is important in the matching mechanism, our measure of risk preferences captures it as well. On the other hand, obstinacy may be regarded as a dimension of a person risk attitudes, in so far as being less afraid of obstacles because of a high persistence, one is also more prepared to take risks.\(^{43}\)

Finally, the Ania survey allows us to verify whether the elicited measure of risk tolerance is able to capture actual risk taking behavior even outside the manager’s workplace, using information on the portfolio allocation of their private wealth. Table A3 shows the results of a probit regressions, where the dependent variable is a dummy for whether the CEO has any stock of listed companies – an indicator of willingness to take extra risk in addition to those involved in managing the firm (and owning shares of private business wealth). Measured risk tolerance is strongly and positively correlated with stock ownership, suggesting that our lottery question is indeed capturing managerial preferences for risk. Interestingly, obstinacy has no predictive power once we control for risk attitudes.

\(^{43}\)The obstinacy indicator is based on the following question: "If you are trying to achieve an objective and all of the sudden you are faced with an obstacle, would be give up as the first difficulties show up or would you never give up? Provide your answer on a scale between 0 and 10, with 10 meaning that you would never give up and zero that you would give up immediately."
Response to Reviewers

1 Editor

First Referee:

1. First, the referee points out that your argument concerning how incentive provision affects loss of control depends on incentives being based on objective measures of performance rather than subjective evaluation. I think this is a good point that needs to be addressed.

[IMPORTANT POINT: to be written after we answer the referee, quoting what we do on the theory side and on the empirical side]

2. Second, the referee is worried that your omission of measures of profit sharing could bias your results. This also seems important to me.

[RAF] I WOULD USE REPLY TO REF COMMENTS BELOW

The second referee also has a number of concerns and suggestions. There are two that I think are particularly important.

1. First, this referee’s first main comment about the theory is related to the first comment I discuss above concerning the first referee’s report. That is, why can’t family firms compensate managers for firm performance conditional on available resources, or similarly, why can’t owners compensate managers for not interfering with owner appropriation? A clear justification for your contracting assumptions that addresses this point and the related point of the first referee would clearly help the paper.

[IMPORTANT POINT: to be written after we answer the referee, quoting what we do on the theory side and on the empirical side]

2. Second, this referee is concerned that, because data about a firm’s policies comes from the responses of a single manager, there may be measurement error either because responses might reflect the manager’s personal characteristics (the referee’s concerns) or because responses might reflect the specific situation faced by this manager at the firm as opposed to the firm’s overall policies (my concern). At a minimum this issue needs to be discussed.

[RAF: SEE REPLY in REFEREE RESPONSES].
My own reading of the paper yielded a few other important issues that I would like you to address.

1. *First, I would like discussions of alternative explanations other than just for your results concerning family firms. For example, there is a vast literature on pay for performance and various theoretical arguments appear in that literature. To what extent are arguments in that literature different than the ones you provide consistent with your empirical findings?*

The original contribution of our paper is that – because of the nature of our data – our results speak to four strands of literature, summarized in section 1.1, namely: (i) matching; (ii) pay for performance; (iii) ownership and governance; (iv) managerial practices.

We have now expanded on point (ii) and we relate our findings to the papers you mention in the points below, as well as others. By and large, our findings are in line with the lessons that emerge from the pay-for-performance literature. More details are given in the answers to the points below.

2. *Second, your theoretical model does not formally capture promotions and dismissals and possible incentives from promotions and dismissals. Yet, you draw implications from the theory concerning incentives from promotions and dismissals. At a minimum this needs to be more clearly discussed and justified.*

See point 3 below.

3. *Also, you should discuss the related literatures on these subjects. Specifically, you should discuss Lazear and Rosen (JPE 1981) which is the seminal paper on promotion incentives and the literature that follows. Another specific paper you might mention is Zabojnik and Bernhardt (REStud 2001) which provides a somewhat different perspective on why promotions are used for incentives. On dismissals I think the closest paper is Kwon (JOLE 2005) which provides a model where both wages and dismissals are used for incentives.*

Thank you for spurring us to think more deeply about this. We have made the following modifications:

- Lazear and Rosen’s (1981) main result is that, under simple conditions, rank tournaments are equivalent to piece-rate incentives. This is important for us because it means that, under their condition, a promotion/dismissal system would give the
manager an incentive scheme that can be represented as a linear function ex ante. Hence, our set-up can capture it. Of course, Lazear-Rosen’s baseline is highly stylized but it’s a good starting point. We now mention it in the model section: “The assumption that explicit contracts are restricted to be linear is standard in personnel economics applications. For implicit contracts, Lazear and Rosen (1981) proved an equivalence result between rank tournaments and piece-rate pay. This implies that, at least in their stylized baseline environment, the kind of implicit incentives that comes from promotions would give rise to a linear reduced-form representation like the one we use.”

- Zabojnik and Bernhardt (2001) predict a positive relation between firm size and compensation, which we test (see point 4 of R1) [RAF: to be cited in the result section]

- We refer to Kwon (2005) at the beginning of the model section.

I also had a few minor suggestions that come out of my own reading of the paper.

1. I would like you to elaborate on the relationship between your paper and Edmans and Gabai (Mimeo 2010) which on page 7 you say is the paper in the literature closest to yours.

We now discuss the connection more in depth. In the literature section we write: “Our model is particularly close to an independent paper by Edmans and Gabaix (2011), which endogenizes the contract between the CEO and the firm and obtains a concise close-form characterization of equilibrium incentives and matches. Like us, they endogenize both worker-firm matching and incentive provision. The main difference is that the main source of heterogeneity on the firm side is size in their model and governance in ours. Also, their managers differ only on talent (risk comes to play indirectly as talented managers are wealthier), while our managers differ on both talent and innate risk-attitude.”

While the two papers are close in terms of theory, the empirical focus is different. Of course, the most obvious difference is that our empirical analysis is based on detailed micro data. We write in a footnote: “While Edmans and Gabaix (2011) and our paper utilize related models, the set of empirical questions that they ask is different. They calibrate their model with US data and show that the potential loss from talent allocation is much larger than the potential loss from inefficient contracting.”
We also update the reference has Edmans-Gabaix has been published on the Review of Financial Studies.

2. Your argument that highly productive workers sort into firms with high powered incentives is related to arguments that appear elsewhere such as Lazear (JBus 1986) and Balmaceda (JLEO 2009). Earlier papers making this argument such as the two I mention should be discussed.

This is now discussed in the literature section: “The argument that talented workers are matched to firms that offer high-powered incentives was made by Lazear (1986) and further developed by Balmaceda (2009). While in those models firms are ex ante identical, our firms differ because of ownership. Moreover, our managers differ on both talent and risk attitude.”

3. Like the first referee, I wondered a little about the form of the production function on page 10. Some discussion might be helpful.

For a detailed response, see R1’s point 1. In few words, there are a lot of technical assumptions to make sure that we can get something tractable (and even then the proof takes six pages). The key substantive assumption is the one about the complementarity between ownership, talent, and incentives, which is discussed at length both in the introduction and when the model is presented.

4. The last sentence of the top paragraph of page 11 is awkwardly written.

Fixed.

5. On page 11 it would be helpful to say that later on you will discuss the roles that h and k play in the profit function.

[Raf, Luigi: do you understand what this means? We talk about h and k right after we define them]

[Raf: NO, IT IS NOT CLEAR TO ME EITHER]

6. I had a little trouble following the discussion at the bottom of page 20.

For example, if a firm has a bonus based on formal appraisal does it necessarily also have a bonus conditional on performance? Some elaboration here would be helpful.

Apologies if the description of the variable was not clear enough. The fact that formal appraisal systems may have implications for the bonus does not necessarily imply the existence of bonuses related to individual performance. Table E.1 provides some
detail on this point. First, managers report that formal appraisal systems may have implications for the bonus in 201 cases of of 603 (Panel A). We can provide specific detail on the type of bonus offered in 172 cases (Panel C). In the vast majority of times (133 managers, or 77% of the cases), the bonus is linked - albeit not always exclusively - to individual or team performance. The rest of the times (39 managers, or 23% of the cases), the bonus is independent of individual performance, but it is linked to firm performance and/or the discretionary judgement of the owners. It is important to note that in 29 cases managers report that formal appraisal systems may have in principle implications for the bonus, but they also declare that the bonus does not actually exists (Panel B). We tested the sensitivity of our results to this apparent inconsistency in the responses in several ways. First, we repeated the estimations excluding these 29 observations from the main sample. This exercise is reported in Table E.2, which shows that the core results of the paper are still strongly significant even in this smaller sample of 574 observations. Second, we set the variable recording the fact that appraisals may have implications for the bonus to zero, whenever managers reported that a bonus system did not actually exist. The results of this robustness check are reported in Table E.3. Reassuringly, also in this case the main results of the estimations are not affected by the recoding. We have clarified this point in the paper when we discuss the bonus variable.

7. The risk measure described at the bottom of page 22 seems problematic to me because a manager might respond taking into consideration the type of incentives that he/she faces. In other words, cause and effect here could be from the type of incentives provided by the firm to a measure of risk tolerance for choices made on behalf of the firm. Given this problem, you might be better off just using the other risk preference measure.

Thanks very much, and we agree with you that the alternative risk measure may be problematic. We have decided to omit results based on this variable, and to include instead as an alternative measure of risk measure the desired amount of variable pay declared by the manager during the interview.

[LUIGI: PLEASE CHECK YOU ARE FINE WITH USING THIS VARIABLE AS ALTERNATIVE RISK AVERSION MEASURE. THE PROBLEM WE HAVE IS THAT THE EDITOR DOES NOT LIKE THE MEASURE OF RISK AVERSION BASED ON CHOICES MADE FOR THE FIRM, WHILE THE REFEREES DO NOT LIKE THE FATHER EDUCATION VARIABLE. IF WE DROP BOTH OF THESE MEASURES, WE WILL END UP RELYING ON A SINGLE RISK AVERSION VARI-
ABLE, WHICH IS RISKY. THE ALTERNATIVE RISK AVERSION MEASURE I AM PROPOSING TO USE IS DERIVED FROM QUESTION 6 IN THE SECOND SECTION OF THE QUESTIONNAIRE: "SE POTESSI SCEGLIERE LA FRAZIONE DI RETRIBUZIONE FISSA (GARANTITA) E DI RETRIBUZIONE VARIABILE, LEGATA A RISULTATI INDIVIDUALI STABILITI, QUALE SAREBBE IL SUO MIX DI RETRIBUZIONE IDEALE?" NOTE: I HAVE NOT CHANGED THE TEXT OF THE PAPER OR THE MAIN TABLES AS I WANT TO MAKE SURE WE ALL AGREE ON THIS BEFORE MAKING SUBSTANTIVE CHANGES>

THE TABLES FOR THE REFEREES ARE INSTEAD BASED ON THIS NEW MEASURE OF RISK AVERSION, BUT THEY CAN BE EASILY CHANGED]

8. In the middle of page 25 you provide a discussion related to my point in 7 above, but I had trouble following the discussion.

Please see answer to point 7 above. We have now dropped this discussion.

2 Reviewer #1:

Overall, this is a nice paper that provides valuable insights into the effects of ownership structure on both sorting and incentives. That said, I do have concerns and suggestions for improvement:

1. The model is carefully constructed so as to ensure that the slope of the optimal incentive contract does not directly depend on the manager's talent, $\theta$. This is achieved by assuming that: (i) in the control benefits, the talent parameter enters via $\theta$, whereas in the production function it enters via $\sqrt{\theta}$, and (ii) $\sqrt{\theta}$ interacts multiplicatively not only with effort but also, less standardly, with the noise term $\varepsilon$. In a more general model, $\theta$ would appear in the expression for the optimal contract. Now, usually the contract's slope tends to increase with $\theta$ (when the cost function is quadratic), so my guess is that a somewhat different formulation probably wouldn't affect the model's predictions. I am inclined to believe that these assumptions were adopted merely to make the analysis as clean as possible, but I'd like to be assured that I haven't spotted here a magician's wire. A brief comment would help.

Indeed, the model is carefully constructed to ensure that it can be solved analytically. Our assumption that workers are heterogeneous along two dimensions, talent and risk attitude, combined the presence of endogenous contracts put us in non-standard territory. It was essential – at least for us – that the expression of the surplus from a match
(after solving for the optimal contract) is linear in talent $\theta$. The assumptions (i) and (ii) above guarantee that. Indeed we obtain:

$$S^i_j = \frac{1}{2} \frac{\sigma^2}{1 + \gamma^2 / \sigma^2} \theta_j + (h^g - k^i + (1 - \phi_g) \Gamma).$$

It was also essential that the slope of the optimal contract $b_i$ had a simple interior solution. In the current formulation $b_i$ turns out to be chosen to maximize a simple quadratic expression:

$$\phi_g b^i - \frac{1}{2} \left( 1 + \gamma / \sigma^2 \right) (b^i)^2.$$

We agree with your impression that these assumptions are mostly technical. The key feature of matching, namely that firms with a comparative advantage in incentive provision, end up with managers with more talent and less risk-aversion would seem to be robust. We mention this at the beginning of the model section.

The moment the rabbit gets into the hat is when we assume complementarity between firm type, talent, and incentive provision, namely when we assume:

$$\Gamma^i = \Gamma_g - b^i \theta_j.$$

We highlight this substantive assumption both in the introduction and in the presentation of the model. We discuss it further in response to your next point.

2. I am afraid I was not convinced by the authors theoretical arguments that stronger incentives should lead to a loss of control. The authors argue that owner consumption of private benefits reduces the pool of resources available to the manager, which decreases the probability that the manager performs well and so increases his willingness toght owner appropriation. This argument is plausible when the incentives are provided through explicit contracts based on objective measures of performance such as profit targets. However, if the bonus, probability of promotion, dismissal, etc. depend on the owner's discretion, I would think that the stronger is the contract (e.g., the bigger is the bonus), the less willing should the manager be to challenge the owner, for fear that the owner might respond by withholding the bonus. In other words, an explicit bonus contract based on profit makes the manager care solely about pro.ts. On the other hand, a discretionary bonus based on the owner's subjective evaluation of the manager's performance makes the manager care about the owner's objectives and aligns the manager's preferences with the preferences of the owner (which include consumption of private benefits). In this case, a bigger bonus should translate into a better alignment/stronger incentives.
Thus, I would like to suggest a somewhat different interpretation of the model’s implications regarding the incentives provided by the two types of firms: Dispersely owned firms provide incentives that are more explicit and based on more objective measures of performance than the incentives provided by family firms. This interpretation is consistent with the paper’s evidence that dispersedly owned firms are more likely to use formal appraisal systems. The paper also documents that dispersedly owned firms are more likely to use bonuses, fast track promotions, and dismissals linked to performance and the authors interpret this as evidence that these firms use stronger incentives. But I think it all comes down to what is meant by "strong incentives." If one narrowly focuses on incentives to maximize profit, then I agree with the authors, but if by incentives one means alignment with the owners objectives, which I think is a more appropriate notion, then I’m not sure the evidence is clear.

Thank you for bringing up this important issue. Your comment contains two related issues: Why don’t F firms design incentive contracts that take into account their non-profit goals? Can we interpret the observed patterns as non-family firms offering high-powered incentives but not on the profit dimension?

On the first issue, there is a problem of credibility. While profits are, at least in part, publicly observable – private benefits are less so. Under this premise, credible incentive contracts can be offered on profit but not on other dimensions. To make an extreme case, how can the outside world know if a manager in a family firm has treated the founder and or his family members in an obsequious manner? In which case, how do we know if the founder made good on his implicit promise to promote him? Moreover, sometimes family firms are simply not in the position to offer a certain kind of incentive. If the CFO job is taken by the founder’s otherwise unemployable offspring, how can promotion to CFO be used to motivate lower-tier managers in the finance area? Therefore, the assumption we make is that explicit and implicit contracts on profits will be honored, while contracts on private benefits are not credible (or maybe just less credible). The owner of the family firm could still offer high-powered incentives on profits, but a Holmstrom-Milgrom logic tells us that it might hurt his private benefits. Hence, our stark way to capture this considerations in a simple form is to assume that incentives – implicit or explicit – can only be offered on profit. This point is now discussed more thoroughly in the presentation of the model, after we assume that $\Gamma^f = \Gamma_g - b^j \theta_j$.

On the second issue, we agree that this could be a viable alternative scenario. Although they may suffer from a credibility problem, firms may still offer implicit incen-
tive schemes that reward the provision of private benefits to the owner. In simple terms, if the manager does not treat the owner deferentially, he gets fired or earns less. In that case, we should observe no difference in managers' variable compensation between family and non family firms, since a bonus would always be awarded, but in recognition of the achievement of non-profit related objectives. In fact, in our data we find the opposite: managers working for family firms report systematically lower levels of variable compensation. Furthermore, the difference in variable compensation between family and non family firms becomes statistically insignificant once we control for our incentive index, suggesting that bonuses are primarily related to profit maximizing objectives. We show these results in Table R1.1. Column 1 shows that family firms offer systematically lower variable pay than dispersed shareholders-owned firms, while Column 2 shows that this difference is reduced and becomes statistically insignificant once we control for the incentive index. Columns 3 and 4 show that the results holds even if we exclude from the incentive index questions measuring the presence of a performance related bonus (which might be mechanically correlated with variable salary). Our interpretation of these results is that - although in principle owners may provide monetary incentives rewarding the provision of private and non profit maximizing benefits - in practice they rarely do so.

3. To measure incentives, the authors have collected information on bonus pay, promotions, and dismissals. But another important tool companies use to provide incentives, at least in the U.S., is various forms of profit sharing. I wonder why the authors ignored this when creating their incentive index. Is profit sharing negligible in Italian firms? Or was the data not available?

[LUIGI PLEASE PROVIDE BROAD INSTITUTIONAL CONTEXT ON PROFIT SHARING. Also check with guy at Manager Italia how popular is profit sharing; if not then we have the answer for why we do not mention it explicitly in the question]

In our survey we actually recorded several reasons which may lead to the provision of a bonus, including firm performance. We provide a detailed breakdown of these measures in Table R1.2. The table shows that - of the 439 managers reporting the presence of a bonus in their company - in 67% of the cases (296 observations) the bonus was also linked (exclusively or with some other criteria) to firm performance. It interesting to note, however, that in the vast majority of cases (194 out of 296, or 65% of the times) the bonus was also linked to individual performance, so that it would be captured in our incentive index. As a robustness check, we tested whether the presence
of a bonus related to firm but not to individual performance showed any significant correlation with managerial characteristics and outcomes. The results of this exercise are shown in Table R1.3. The first thing to notice is that the Incentive index retains its significance and similar magnitudes even when the profit sharing variable is included. Second, the presence of bonuses related to firm performance shows no correlation with most managerial characteristics (with the exception of one of the two risk aversion measures) and outcomes (salary, benefits, job satisfaction), with the main exception of variable pay and manager desirability. Furthermore, the presence of a bonus related to firm performance does not systematically differ across different types of ownership. We conclude from this analysis that - at least in our sample - profit sharing schemes do not seem to play a major role in explaining the match of managers across different ownership types, nor do they significantly correlate with their effort and job satisfaction.

4. Schaefer (REStat, 1998) documents that the incentives of U.S. CEOs fall in strength roughly with the square root of firm size. In contrast, this paper finds that the strength of managerial incentives is not correlated with firm size. Any thoughts on what might be behind this apparent discrepancy?

Thanks very much for pointing this out. We believe that there are many possible reasons why the strength of managerial incentives is not correlated with firm size in our data. First, Schaefer (1998) is based on a sample of very large (with assets worth $3,775 million on average) and listed US firms, while we look at much smaller firms ($3.3 million in assets on average and only 1.4% listed on the stock market). Second, our size measures (dummies for the average number of employees in the firm) might simply be too rough to estimate the effects reported by Schaefer. Third - and perhaps more importantly - Schaefer focuses exclusively on CEOs and top managers, while our sample also includes managers lower down the hierarchy. Interestingly, when we restrict the sample to the set of 126 managers who report to be "Top Managers" (i.e. reporting directly to CEOs), we find some evidence that the strength of managerial incentives declines with firm size. In fact, when we repeat the regression shown in Table 5, column 2, relating the incentive index with firm ownership and firm characteristics the coefficient (standard error) on the dummy denoting firms with 50 to 100 employees is -0.670 (0.690), and the coefficient (standard error) on the dummy denoting firms with 100 employees or more is -1.076 (0.584) (with the omitted category being firms with less than 50 employees). This finding is driven by all components of the incentive index, and in particular by the set of questions measuring the presence of monetary bonuses.
linked to individual performance, and awarded through formal appraisal systems. We have now included the Schaefer (1998) paper in the references and we discuss these results in the paper.

5. *Can it be ruled out that the managers of the dispersedly owned firms are less risk averse simply because they are wealthier (since they earn more)?*

[LUIGI TO WORK ON THIS IN DATA SET WITH RICHER WEALTH MEASURES]

R: We control for firm size which in turn is correlated with manager pay and still find that risk tolerance is correlated with incentives; we can check in Table 7 that the correlation between incentives and pay still holds if we control for RA. Similarly we can add pay in Table 4 and show that incentives are still correlated with RA even controlling for manager pay.

6. *To complement their measures of the managers attitudes toward risk, the authors use the manager’s father education level to proxy for the availability of informal insurance through his family. It seems to me though that the father education could equally well proxy for the manager’s (unobserved) talent.*

Thank you for pointing this out, and we agree that the father education variable might be problematic for the reasons you mention. We have thus decided to omit the results based on this variable.

7. *Proposition 1 requires that the support of the risk aversion coefficient (given by gamma) be sufficiently small. What happens if is not small? Would the paper’s qualitative conclusions continue to hold? If not, I’d find it a reason for concern.*

No. The role of the assumption is to simplify the characterization by assuming that all top-talent managers are employed by N-firms and all bottom-talent managers are
unemployed, as in the graph that we report in the paper, and that we repeat below:

Equilibrium allocation of managers to firms

If the assumption failed, it might be the case that some of the top-talent managers are so risk-averse that they prefer to work for $F$-firms (or even be unemployed). Conversely, some of the worst managers may still be employed. See the picture below.

Equilibrium allocation of managers to firms
However, this would not change the result that on average \( N \)-firms have more talented and less risk-averse employees than \( F \)-firms.

**Minor points and typos:**

   Fixed. It was meant to be Gabaix and Landier (2008).

9. p. 11: The weight that the owners put on the benefit of direct control is measured by
   \[ 1 - \phi_g \] rather than by \( \phi_g \).
   Fixed.

10. p. 11: If \( h_g \) is the profit differential between the \( F \) and \( N \) firms, why is it indexed by
    the type of the firm \( (g) \)? Presumably, there is only one profit differential between the
    two types of firms.
    Thank you. We now write: “The third term, \( h_g \), represents a profit base, which may
    vary between \( F \) and \( N \) firms. We remain agnostic as to whether the difference
    \( h_N - h_F \) is positive or negative.”

11. In footnote 11, what is the purpose of the inequality \( \phi_F < \phi_N \)?
    Typo fixed.

12. For readers not familiar with the Italian education system, it might be helpful to explain
    briefly what is an executive degree (p. 23).
    The question on executive education is very broad and it is not meant to capture
    specific degrees provided within the Italian education system (see question 6.9 in the
    translated survey for details). Instead, we wanted to measure whether the interviewee
    attended any courses accruing to their professional development as managers, over and
    above the standard educational curriculum. As such, the variable might well record the
    attendance of shorter and specialized training courses, rather than fully-fledged MBA
    programs. In fact, 48% of the 335 managers reporting to have attended at least one
    executive course do not even have a college degree. We also did not find evidence that
    the executive education variable was significantly correlated with any other obvious
    demographic characteristics. For example, in a simple probit analysis, we did not
    find any correlation between executive education and gender, college education, age,
    nationality, seniority, tenure in the company or tenure in the position.
13. The proof of proposition 1 says "see appendix." But the proposition itself is already in
the appendix and the proof is less than half a page away.

Thank you very much for pointing this out, and we have now fixed this.

3 Reviewer #2

Comments on the theory

1. A central tenet of the model is that family-firm owners prefer flatter contracts for managers (who are not family members) so that owners can appropriate firm value without interference from the managers. The argument is that family-firm owners seek private benefit by misusing some of the firm’s productive inputs (buying a private jet, hiring friends and family, running a pet project, etc.) this reduces the available resources for the manager to maximize firm performance, and hence incentivizes managers with steeper contracts to block owner appropriation. In contrast, widely-owned firms prefer steeper contracts because of their benefits and because owners are not in a position to appropriate value. These assumptions naturally lead to equilibrium predictions that family firms use flatter contracts and match to the less talented, more risk-averse managers in the employment pool. (The two other main predictions - managers with steeper contracts exert more effort and receive higher pay, and firms with steeper contracts have higher profits - seem like standard contracting predictions) What isn’t clear in the paper is why appropriating value and using performance-based contracts are mutually exclusive. For example, why can’t family owners buy a private jet and also compensate managers for firm performance conditional on available resources?

And why can’t owners compensate managers for not interfering with owner appropriation (e.g., withhold a bonus for interference)? Equilibrium conditions in the model don’t appear to limit these contracting options. These imposed contracting limitations are not well justified in the paper but are the determinants of the results.

This important point can be addressed in two ways. From a theoretical point of view, one must ask which incentive schemes are credible and which are not. While profits are, at least in part, publicly observable – private benefits are less so. Under this premise, credible incentive contracts can be offered on profit but not on other dimensions. The incentive contract that you propose requires that the firm resources devoted to private benefits of family members be contractible or at least observable by outsiders. While in some cases they may be, it is reasonable to assume that they are less easy to observe than
standard performance measures like profit. But this is an assumption, and we thank you for highlighting the need to make it more explicit. We already had a sentence about it but now we discuss the point more thoroughly in the presentation of the model, after we assume that $\Gamma^i = \Gamma_g - b^i \theta_j$.

From an empirical viewpoint, we know that the compensation of family firms managers is less variable. This is shown in Table R2.1, which reports the correlation between the log of variable pay and ownership dummies. Furthermore, we also know from the data that - as predicted by the theory - the difference between family and dispersed shareholder owned firms is in large part accounted for by the fact that family firms provide flatter incentive contract to their managers (column 2). It is important to note that this result holds even when we exclude from the incentive index measures that record the provision of variable pay, which (as you correctly point out below) might be mechanically correlated with variable pay. We show this point in columns 3 and 4. Overall, these findings are at odds with the idea that family firms might be compensating managers for pursuing practices that are not strictly profit maximising (e.g. not interfering with owner appropriation).

2. To what extent do Italian labor laws determine contracts? E.g., are there stipulations about pay and hours? Bonuses? Hiring/firing restrictions? Some of the factors that are endogenized in the model may in fact be exogenous. If the authors could provide some institutional background, that would help.

[LUIGI: provo a dare una risposta: correggimi]. Italian labor laws are quite strict, in terms of firing restrictions, minimum salary, and hours worked. However, such rules mostly do not apply managers for the following reasons:

- Executives (“dirigenti”) constitute one of the very few categories – together with athletes, apprentices, and domestic workers – explicitly excluded from the firing restrictions contained in the Labor Protection Law (Statuto dei Lavoratori). They can be dismissed at will.

- Like all Italian workers, executives have a union-negotiated collective contract, which we describe in paragraphs 3 and 4 of section 3.1. This contract sets a minimum annual wage, but this is extremely low (3000 euros/month currently) and indeed it does not appear to be binding (our median monthly salary is around 7000 euros). This is in stark difference with the rest of the Italian workforce, for whom the collectively bargained minimum is often binding.
• Executives are not entitled to explicit constraints on hours worked (Italian Supreme Court, 101/1975). They do not receive overtime compensation.

So, unlike the rest of Italian workers, the managers in our sample are in a de facto position that is not dissimilar from non-unionized US workers.

3. Manager talent is assumed to be observable in the labor market. Assuming otherwise may make the model intractable, but I wonder about the implications of this simplification.

Indeed, this is an important assumption. If talent was not directly observable, we would have to think about career concerns, perhaps a la Holmstrom (1999). There is a rich literature on career concerns, with many implications. Frankly, we would not know how to fit in the present framework in a tractable way.

Comments on the data

1. Related to my comments about the theory, the data on contracts come from a survey of Italian managers in which managers were asked whether they can receive a bonus, whether they can be promoted based on their performance, and whether the firm ever fires anyone. Under these broad incentive tools, firms have very significant leeway to incentivize managers how they wish, including in ways that won’t interfere with appropriation.

Although we agree with you that the questions intentionally capture the existence of broad incentive tools relative to bonus provision, firing and promotion of employees, our incentive measures are actually more specific that what is described above. For example, across all dimensions (bonus, promotions and dismissals) the index differentiates between firms that merely provide these incentives and those that channel them via an explicit appraisal process, as the presence of a clear and explicit mapping between performance and incentives is a crucial determinant of the effectiveness of the incentive scheme. We are also more specific in terms of the type of practices adopted for promotions and dismissals. For promotions, in addition to asking what role is played by performance, we also record whether fast tracks for star performers exists, as this is another important indicator of how easily a good performance can accelerate the career progression of the manager within the firm (in fact, it turns out that although 573 firms report that performance plays an important role for promotions, only 219 of them, or 38%, also report the presence of accelerated career path for star performers).
Finally, we do not merely record "whether the firm ever fires anyone", but whether dismissals are linked to underperformance and decided in the context of a formal appraisal process. The summary statistics shown in Table 1 in the paper indicate that the diffusion of these practices is relatively heterogeneous and low (the average adoption rates range between 0.05% to 74% depending on the specific question), which can be seen as evidence that the incentive tools that we consider are not so broad to be trivially adopted by all firms.

Perhaps more importantly, the data offers limited support to the idea that firms use monetary incentives to reward non interference (or - more generally - objectives that might be at odds with profit maximisation). As we discussed on the point 1 you raised on the theory side, we find that the level of variable salary is actually significantly lower in family firms, and that a large part of the difference across ownership types is accounted for by the steepness of the incentives offered to managers.

2. I have some reservations about much of the data. The second measure of a manager’s risk aversion is whether the manager’s father has a college education, which the authors argue proxies for the manager’s access to informal insurance and hence measures risk aversion. This measure strikes me as tenuous. The measures of manager talent are indicators for college education, executive education, and whether the manager received any job offer during the last three years. These also strike me as tenuous. The measures of manager effort and manager happiness with the job are the manager’s self-reported answers about hours worked per week and job satisfaction. Since the survey was not anonymous (as far as I can tell), managers may face incentives to misreport these measures.

We agree with you that the second measure of risk aversion - father education - might be too weak for our purposes. Based on this consideration, we have decided to omit the results related to this variable. We are more confident about our measures for talent and effort.

Regarding talent, measures of college education as proxy for human capital are fairly standard in the literature (see for example Bresnahan, Brjnjolffson and Hitt, 1999, Caroli and Van Reenen, 2000, Bloom and Van Reenen 2007). The other two measures of talent - executive education and whether the manager received any offer during the last three years - are specific to our study, but as we show in Table 3 in the paper they provide similar results to the college education variable.
As far as the measures of effort and happiness are concerned, it is important to note that the survey is actually anonymous, as the data was collected over during a private conversation between the manager and one of our interviewers, and under an explicit confidentiality agreement. Responses were thus not visible to any other member of the firm, and collected under the provision that names of participating firms or managers would not be revealed.

Although we agree with you that managers might have nevertheless misreported their responses, we actually believe that on average the responses were truthful. Our direct evidence on this point stems from the comparison between the salary levels reported by the managers during the survey, and those recorded in the administrative records from the social security files. The two measures are highly correlated (the pairwise correlation between the two measures is 0.48 in the raw data, significant at the 1% level), as can be seen in Figure R2.1, and deliver very similar results (this can be seen in Table 7 in the paper). We find this reassuring on the quality of our data, given the fact that pay is an extremely sensitive matter, surely more that reporting on features of firm personnel policy.

3. Could the authors include a (translated) copy of the survey? At least some information about the wording of the questions and the full set of questions that were asked would help.

[LUIGI POTRESTI OCCUPARTENE TE?]

Comments on the empirical analysis

1. The data only contain information on one manager per firm, and the contract, risk aversion, and talent of this manager are assumed to be representative of all managers at that firm. Since many of the firms have hundreds of employees or more, and since managers’ survey responses might reflect a manager’s personal characteristics as much as the contract characteristics (e.g., managers who say the firm does not have a formal process of assigning bonuses could be rationalizing their own low talent), the data may contain significant measurement error. It’s easy to see how this error could be correlated with other firm characteristics, which may introduce significant biases into the estimates.

This is very valid concern, and indeed something we worried about as we thought about the survey design and the data analysis. We have taken a number of steps...
in order to attenuate this concern. First, we have deliberately chosen to focus on a restricted set of practices that could be reliably measured in a survey context. In fact, our incentive index regarding bonuses, promotions and dismissals is modeled after a subset of the questions included in the Bloom and Van Reenen (2007) management score. In their work, Bloom and Van Reenen provide direct evidence that individual manager responses to these survey questions have the potential of being representative of the practices adopted throughout the firm by showing the presence of a very strong correlation between two management scores collected for the same firm using different manager-interviewer pairs. Second, as the translated survey shows, we tried our best to formulate the questions regarding the types of incentives offered by the firm in such a way that they could measure firm-wide phenomena, rather than features specific to the interviewee. For example, when asking about promotions, dismissals and appraisals, we explicitely asked the manager to report on firm-wide policies and explicitely included the words "in your firm" in the questions whenever appropriate, and trained the interviewers accordingly. Third, in Section 5.1. of the paper we deal explicitely with the concern that strategic misreporting could generate spurious correlations between our variables of interest by showing that the results are robust to the use of social security data on managerial pay. Crucially, in Table 7 we show that the correlation between our incentive index and the level and the variability of the managers salary is strikingly similar across the self-reported and the administrative earnings data, which are not affected by perception errors or other managers’ unobservable traits.

2. The regression from equation (3) where the dependent variable is manager variable pay and the explanatory variable of interest is whether the manager’s contract provides high-powered incentives basically puts the same variable on the left and right sides of the equation.

Thanks for your comment, and this is indeed a very valid point. In Table R2.2 we show that the relationship between variable salary and the incentive index is robust across all dimensions of the incentive index, and not just bonuses.

3. The authors provide several robustness checks in Section 5 but my sense is that they don’t effectively address the core issues discussed above.

LUIGI, RAF? This means that we have to expand the robustness checks:

RAF: DECIDIAMO COSA METTERE ALLA FINE DELLA REVISION, OK?