UNIVERSIDAD CARLOS III DE MADRID
working papers

Working Paper 05-60
Economics Series 29
November 2005

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CAREER CONCERNS AND COMPETITIVE PRESSURE *

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Abstract

In a duopoly model I study the effects of increased competitive pressure on the implicit incentives provided by career concerns. By building a good reputation, managers are able to capture on the labor market part of the profits that they produce in excess with respect to less talented managers. Increased competition, then, has an ambiguous effect: it raises the reputational concern to the extent that it makes to hire a good manager more valuable. The threat of a hostile takeover is then introduced and it is shown to reduce managerial salary while having a potentially negative effect on ex ante incentives. In particular, it is argued that if alternative governance systems are already available, the threat of a hostile takeover can be harmful.

Keywords.: career concerns, competition, takeover.

JEL Classification: G39, L14

*__Acknowledgements__: A special thank goes to Marco Celentani who provided invaluable feedback on each version of this paper. I am also indebted to Luis Corchón, Francesco De Sinopoli, Pietro Reichlin, Pablo Ruiz-Verdú and seminar participants at University Carlos III for useful comments. The usual disclaimers apply.

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1 Introduction

The idea that firms should be run in the owner's interest is usually accepted so that in modern public corporations, where property and management are commonly separated, a problem arises of providing managers with the right incentives to implement the shareholders' value. Most of the corporate governance literature addresses exactly this agency problem and describes a number of possible solutions to it. In their comprehensive survey, Becht *et al.* (2002) identify five mechanisms currently used to discipline managers: the presence of a large shareholder, the market for corporate control (e.g. the threat of a hostile takeover), the board of directors, executive compensation packages and, finally, the managers' loyalty duty coupled with an effective shareholder legal protection[1]. Even if in the last twenty years a large body of both empirical and theoretical analysis has emerged, the real functioning and effectiveness of these governance mechanisms are not well understood yet.

At least since Smith (1776), another source of managerial discipline has been identified with the competitiveness of the product market. The basic idea goes as follows: in firms that operate under a strong competitive pressure, any lack of efficiency reduces profits and seriously threat the survival possibility in the market. Managers concerned with the very conservation of their job would then work as hard as they can to ensure profit maximization. As intuitive as it may appear at a first glance, a closer consideration of this idea rises at least two questions. First, what does a "more competitive market" exactly mean? Second, through which mechanisms the degree of product market competitiveness affects the managerial behavior? All the models I'm aware of treating this intuitive idea, assume that managers sign a formal contract that makes their compensation contingent on some measure of the firm efficiency (cost reductions, accounting profits...). In this way they are provided with incentives, indeed with the most classical instrument analyzed in the principal agent literature. Then, since the optimal contract offered by the firm is somehow linked with the competitiveness of the environment, the degree of competition indirectly affects managerial incentives. In this framework increased competition has then been assumed to either affect the information structure behind the contingent contract or to simply decrease the amount of profits earned by the firms. The model by Hart (1983) is in line with the first idea: in his paper the principal observes a cost index which depends on both an industry wide shock and the managerial effort. A more competitive product market then allows the principal to make better inferences about the agent's contribution. With a very special assumption on the agent preferences, Hart shows that agents work harder in more competitive markets. Scharfstein (1988 a) however shows that this conclusion is not robust

[1] Another very well known survey of corporate governance is by Shleifer and Vishny (1997). Here the authors suggest that the essential elements of a successful governance system are some form of concentrated ownership and legal protection of investors. There is a number of other general treatment of the issue. For example Tirole (2001) tries to analyze the role of the so called stakeholder society while Zingales (1998) frames the corporate governance problem in an incomplete contract approach.

to alternative specifications on the managerial utility function.

The idea that more intense competition decreases profits has been analyzed for example in the papers by Hermalin (1993) and Schmidt (1997). In both cases smaller profits for the firm are shown to have an ambiguous effect on the optimal contract and managerial effort. A mechanism that induce ambiguity in both models is what Schmidt calls the value-of-a-cost-reduction effect and Hermalin calls the change-in-the-relative-value-of-actions effect. To grasp the general idea consider a situation in which the efficiency of a firm can be either high or low and let π_H and π_L be the corresponding profits in the two cases. Of course $\pi_H > \pi_L$. More competition decreases both π_H and π_L, but what is really relevant is how competition affects the difference $\pi_H - \pi_L$, that is referred to as the value of efficiency in this paper, and this difference can either decrease or increase. Schmidt also identifies a bankruptcy effect that unambiguously rises managerial effort: in a more competitive market, because of the smaller amount of profits that can be earned, the probability of bankruptcy is higher an managers tend to work harder to avoid it. Hermalin uses a concave utility function in his model so that two more effects emerge: an income effect and a risk adjustment effect, both of them of ambiguous sign. However, both effects disappear if managers are assumed to be risk neutral (and then with a quasi-linear utility function with respect to money).

A different approach is taken by Willig (1987). Still retaining the usual principal-agent framework, he identifies increased competition in the product market with a smaller and more elastic (residual) demand function. From his analysis emerges that a smaller demand tends to reduce efficiency while the increased elasticity raises it. Again, the overall effect is ambiguous.

A common characteristic of the literature discussed so far, is that the strategic interaction among firms operating in an imperfectly competitive product market is ignored and the market structure is then assumed to be exogenous. An exception is Raith (2003) who analyzes explicitly a market game among firms run by managers rewarded in accordance to the cost reduction they induce. By doing so, Raith is able to naturally identify the market competitiveness with some parameters of the model. In particular he shows that more substitutable products or a larger market size induce managers to provide more effort while a reduction in the entry cost reduces managerial effort. In any cases a positive correlation between managerial incentives and profit volatility arises. To some extent his results are still ambiguous: smaller entry cost or larger substitutability could both be regarded as increased competition but have opposite effects on the equilibrium managerial effort.

In the model developed here, I depart from the previous literature in that incentives indirectly stem from the managerial career concerns. The advantage of such an approach is that it doesn't rely on the possibility for the firms to offer contingent payments, which is not always the case, but on the fact that managers are concerned with their future job conditions. From this point of view the present approach seems to be more general.

The model has two periods and in each periods two firms compete in the product market. Firms are run by managers that has to be hired at the beginning of each period with a fixed salary. The managerial ability and effort, then, determine firm's efficiency and profits. The managerial talent is symmetrically unknown to everybody in period one and effort is not observable by firms. All the managers have the same, commonly known, priors over their ability so that they are homogeneous from the point of view of the firms. Because of this homogeneity, young managers have a very weak bargaining position in the labor market which is here represented as a sequential game where first firms offer a wage to each manager and then managers choose one of them (if any). Such labor market structure allows firms to hire young managers at the reservation wage. In period two, however, the observation of past performance allows some inference about the managerial skill. The manager who performed the best is now more valuable to the firms and he obtains a wage premium on the labor market equal to the extra profits he is able to produce with respect to the other manager who is on the contrary rehired at his reservation wage. This extra profit is called the value of efficiency and is the analogue of the value of a cost reduction in Schmidt (1997). A central result of the literature described above is then confirmed: a change in the product market that rises the value of efficiency tends to increase the managerial effort. After considering some specific example of market game, the model is used to study the impact of the threat of a hostile takeover in period two. Such a threat affects the firms with the worst manager but, since he is already at his reservation wage, incentives are not affected. From the other hand, a successful takeover has a negative external effect on the good manager since it reduces his wage premium: the overall ex-ante effect on incentives is then negative. However the model is descriptive of organizations in which managers are not able to enjoy any rents in case of a poor performance, so that it seems likely that other effective corporate governance mechanisms are at work (e.g. an effective board monitoring).

The remainder of this paper is organized as follows: in section two the basic model is introduced and the managerial equilibrium effort is characterized. It is then argued that the main determinant of managerial career concerns is the value of efficiency. The impact of a changes in the market environment on indirect incentives passes, then, through their effect on the value of an efficient manager. In section three I consider some example of explicit market games and, using the results previously obtained, I am able to evaluate how parameter values affect indirect incentives. In section four I then introduce the possibility of a hostile takeover which in the present contest is shown to reduce both managerial incentives and expected compensation. Section five contains some final remarks.

2 Career Concerns within a Duopoly

2.1 The Basic Model

The are two periods $t = 1, 2$ and in each period two firms compete in the product market. Each firm is made by a principal (the owner) and an agent (the manager) who has to be hired at the beginning of each period t with a constant salary w_t.[2] Contingent payments are not allowed and long term binding contracts cannot be signed. There are two managers to be hired whose innate ability, or skill, is symmetrically unknown at the beginning of period one. To make things simpler I assume that each manager has a reservation salary $\overline{w}$ which is independent of his age and past experience. The competitive strength of a firm is summarized by an efficiency parameter x whose value is affected by the managerial skill and activity. More precisely firm hiring manager i in period t has in that period an efficiency parameter:

$$x_{i,t} = \eta_i + e_{i,t} + \varepsilon_{i,t} \tag{1}$$

where η_i is manager i's innate ability (or skill or talent), $e_{i,t} \in [0, \bar{e}]$ is his effort in period t, and $\varepsilon_{i,t}$ is an idiosyncratic random component. The manager's ability and effort are then substitutes in rising such an efficiency parameter and then the firm's strength in the product market. Such x-value can be thought of as some measure of what Leibenstein (1966) called X-efficiency, as opposed to allocative efficiency. The X-efficiency of a firm is typically determined by those cost reducing activities (plant restructuring, waste reductions, work methods and so on) that are directly under the managerial control. In period one $\eta_i \sim N(0, \sigma_\eta^2)$ while $\varepsilon_{i,t} \sim N(0, \sigma_\varepsilon^2)$ for any manager and any period. All random variables are assumed to be independent. In the following I will use the notational convention of identifying a generic manager with the superscript i while superscript j will denote the other one, finally superscript n will denote a generic firm.

The timing of events in period one is as follows:

0. Managers' ability are independently determined according to a $N(0, \sigma_\eta^2)$ distribution and are not revealed to anyone.

1. Firms bid to hire a manager.

2. Both managers decide how much effort to exert, then the efficiency parameters are determined according to 1 and publicly observed.

3. Firms compete in the product market.

In period two events from 1 to 3 take place anew. Agents are assumed to be risk neutral and their utility is simply $w_1 + w_2 - g(e_1) - g(e_2)$, where $g(e)$ is the cost of exerting effort $e \in [0, \bar{e}]$. The function g is twice continuously differentiable strictly increasing and strictly convex, furthermore $g(0) = g'(0) = 0$ and $\lim_{e \to \bar{e}^-} g'(e) = \infty$. Firms maximize total expected profits.

In order to fully describe the extensive form game to be analyzed, it is necessary to specify how the bidding phase in point 1 is realized. I assume that both firms simultaneously submit a wage offer to each manager. Then, in period 1 an equal probability lottery decides which of the two managers has to

[2] In the following the firm owner will be referred to as a female while the manager as a male.

make the choice between the offers he faces, if any, while the other manager will not be able to accept the offer received by the firm that closed its vacancy. In period two, if both managers worked in the first period, the manager who previously performed the best has the advantage of being the first to make a decision. Note that observing exactly the same managerial efficiency in the first period is a zero probability event and will induce a subgame in which managers are still identical, in such a case the rules of the first period are still applied. I will also assume that if a manager is not assumed by any firm in the first period, he will exit the industry so that he will not be on the labor market in the second period. His lifetime utility in this case is then $2\overline{w}$.

I consider these particular bidding rules to capture two relevant characteristics of the managerial labor market. First, in the market for young and inexperienced managers, firms have the strongest contractual position: the point here is that young managers are very close substitute to one another, for example because their past careers is not very informative about their talent as CEO in that particular industry, so that they compete very closely and firms can finally extract almost all the surplus generated by the relationship (in fact all the surplus in the model). Second, a senior manager with a good past performance is a "scarce good" in the managerial labor market and then he has a stronger bargaining position allowing him to obtain part of the surplus. The model captures this feature with the rule that assigns to the good manager the priority in choosing between the firm offers.

For the purposes of this paper it is better not to consider an explicit market game. I will rather describe the firms interaction in the product market by means of a (reduced form) profit function. In particular if $x_t = (x_{1,t}, x_{2,t})$ are the realized efficiency parameters in period t, for firm 1 and 2 respectively, product market competition yields to the firm hiring manager i the amount of profits:

$$\pi_{i,t} = \pi(\phi, x_{i,t}, x_{j,t}) \tag{2}$$

where the function $\pi : \Phi \times \mathbb{R}^2 \to \mathbb{R}$ is bounded both above and below, it is increasing in $x_{i,t}$ and decreasing in $x_{j,t}$ (monotonicity properties being strict in at least one argument) and, furthermore, it is twice continuously differentiable. The parameter ϕ belongs to some open interval $\Phi \subset \mathbb{R}$, and will be used to index the degree of competition in the product market with the interpretation that a higher ϕ corresponds to a more competitive environment.

Note that with the assumptions made on the function π, a higher efficiency parameter corresponds to higher profits for the firm who realizes it, and to lower profits for its competitor. Then a larger efficiency parameter corresponds to a stronger firm in the market. Note also that firms are in a substantial symmetric position in the market: it is only the realized efficiency parameters that determines profits and not their particular distribution among firms. This formalization, then, is not descriptive of those circumstances in which some firms have other sources of market power, as for example would be the case if one of the firms were a Stackelberg leader, or had an information advantage over the demand structure, etc.[3] In principle a firm could be run without a manager, that would be the case if some manager prefers the outside option, but I assume that the profits would then be so low that any strategy involving wage offers below the managers' reservation value are weakly dominated and are suboptimal whenever the probability of hiring nobody is positive. More precisely, I assume that if a firm doesn't hire a manager its profits are $\underline{\pi}(\phi) < \inf_{x,y} \pi(\phi, x, y) - \overline{w}$, while a firm managed with efficiency x and facing a competitor with no manager obtains a profit of $\overline{\pi}(\phi, x) = \sup_{y} \pi(\phi, x, y)$.

How the degree of product market competition (here indexed by the parameter ϕ) affects the amount of profits that can be earned is not very clear in general terms. For example, Boone (2000, 2004) analyses several examples of oligopoly markets where the strength of competition is naturally identified with the value of some parameter[4]. He finds that as competition increases, the amount of profits earned by the least efficient firm decreases but he also finds that the ratio between the profits of any firm and those of a less efficient one increases. With identical firms this result simply means that increased competition decreases the profits of every firm. However, when firms with different efficiencies coexist in the market, the result suggests the traditional "selection effect" of competition already described for example in Vickers (1995).[5] Since the main focus of this paper is on the relationship between the strength of career concerns and product market competition, I'll rather consider the following two alternative conditions that, as it will be shown thereafter, play a crucial role for what is at stake here.

Condition 1 (IVE) *For each (x, y) the difference $\pi_2(\phi, x, y) - \pi_3(\phi, y, x)$ is strictly increasing in ϕ.*

Condition 2 (DVE) *For each (x, y) the difference $\pi_2(\phi, x, y) - \pi_3(\phi, y, x)$ is strictly decreasing in ϕ.*

To interpret these VE (marginal Value of Efficiency) conditions consider the difference $\pi(\phi, x, y) - \pi(\phi, y, x)$. It represents the profit differential that a firm of efficiency x can produce when it competes with a firm of efficiency y, so that it could be thought of as the value of x versus y. Such differential has of course the sign of $x - y$ and depends on the product market degree of competition. The derivative $\pi_2(\phi, x, y) - \pi_3(\phi, y, x)$ represents then the marginal value of

[3] However, the formulation could easily allow for changing market conditions between period one and two: it would be enough to have different profit functions in the two periods. To add this possibility wouldn't change anything in the analysis so I prefer to stay with the notation introduced in the text.

[4] He considers three different sources of increased competition: a larger number of firms, more aggressive market interactions and more efficient competitors.

[5] Boone also finds that some quantities commonly used to empirically asses the degree of competition in an industry (e.g. the Herfindahl index, price cost margins, etc.) are not monotonic in the level of competition as measured by the relevant parameter. He then propose a new empirical measure based on profit ratios.

efficiency x, and condition IVE (Increasing VE) requires it to be increasing in the level of competition, while condition DVE (Decreasing VE) requires it to be decreasing in ϕ. According to IVE, then, to be more efficient is more important in a more competitive environment in the sense that the marginal value of efficiency is larger in more competitive environment[6]. The opposite is true according to DVE. None of these conditions are to be intended as an exact characterization of how the strength of competition in the product market affects firm profitability. The idea of (imperfect) competition is indeed a vague one. It refers to the existence of some kind of rivalry among firms that strategically interact in their product market but the exact nature of such rivalry, as well as its intensity and consequences, have to be better specified in any particular context. Broadly speaking, competition has both an exogenous and an endogenous component. There are characteristics in the product market such as entry fees, size, substitutability among different brands of the same product, transparency, the eventual threat of a potential entrant etc., that naturally affect the strength of the firm competition within an industry. These elements are, to a large extent, exogenous and, in this model, I exactly refers to this kind of determinants of the market competitiveness. However, the number of firms in any particular industry as well as their respective market shares are important determinants of the degree of competition and, of course, they are endogenous. I will not attempt to consider this other aspect of competition in this paper. In principle, the exogenous characteristics of a market determines its endogenous structure so that changes in the first can affect the second and the overall effect will be the sum of the two. Hence, it is incomplete to analyze only the effects of the exogenous elements but this is a first step toward a better understanding of the whole process. Of course, changes in the exogenous structure that do not affect the number of firms find here a complete treatment.

2.2 Analysis of the Equilibrium

The concept of equilibrium that will be used is the Perfect Bayesian Equilibrium, which will be simply referred to as the equilibrium. A pure strategy for a firm specifies in each period a wage offer for each manager on the labor market as a function of the observed history of the game.[7] A pure strategy for a manager has to specify in each period which offer to accept (if any) and the level of effort to exert in case he is hired by a firm as a function of the past observed history of the game. I will only consider pure strategies equilibria. Players also have beliefs about managerial talents. In period one everybody shares the same priors described above. The (possible) observation of the first period efficiency parameters then allows to update such beliefs in period two.

[6]Note that for each pair (x, y) the difference $|\pi(\phi, x, y) - \pi(\phi, y, x)|$ measures the value of the most efficient manager and condition IVE implies that such quantity is strictly increasing in ϕ. This latter condition closely resembles the selection effect of increased competition found by Boone (2000) in his examples, but it is here expressed in terms of differences in profits rather than profit ratios.

[7]Hence, If a manager doesn't work in period one he won't be on the labor market in period two so that, after any such history, firms cannot make any wage offer to such manager.

The process of belief revision taking place after the observation of first period efficiency parameters depends on the amount of effort that manager i is expected to exert in period one, say $\widehat{e}_{i,1}$. Given (1) and given such expectation, the observation of $x_{i,1}$ is equivalent to the observation of:

$$z_{i,1} = \eta_i + \varepsilon_{i,1} = x_{i,1} - \hat{e}_{i,1}.$$

A simple process of normal learning then takes place and the updated belief about manager i's ability is $\eta_i/x_{i,1} \sim N(\tau z_{i,1}, \tau\sigma_\varepsilon^2)$, where $\tau = \frac{\sigma_\eta^2}{\sigma_\eta^2+\sigma_\varepsilon^2}$ is the signal to noise ratio. Note that manager i could choose in principle $e_{i,1} \neq \hat{e}_{i,1}$ so distorting the market learning process about his talent. In such a case, from manager i's standpoint, it would result that $\eta_i/x_{i,1} \sim N(\tau(z_{i,1}+e_{i,1}-\hat{e}_{i,1}), \tau\sigma_\varepsilon^2)$ which first order stochastic dominates the previous one as long as $e_{i,1} > \hat{e}_{i,1}$. In equilibrium firms have rational expectations in the sense that they correctly anticipate the level of effort chosen by the managers.

Given $\hat{e}_{i,1}$ and $\hat{e}_{j,1}$, if both managers are hired in period one, the firm hiring manager i has first period expected gross profits given by:

$$\Pi_{i,1} = E_{(\varepsilon_1,\eta)}\left[\pi(\phi, \eta_i + \hat{e}_{i,1} + \varepsilon_{i,1}, \eta_j + \hat{e}_{j,1} + \varepsilon_{j,1})\right],$$

while if only manager i is hired in period one his principal first period expected gross profits are:

$$\bar{\Pi}_{i,1} = E_{(\varepsilon_1,\eta)}\left[\overline{\pi}(\phi, \eta_i + \hat{e}_{i,1} + \varepsilon_{i,1})\right],$$

where the expectations above are evaluated at the beginning of period one and take into account the prior distribution of the random variable $\eta = (\eta_i, \eta_j)$.

It is immediate to recognize that in period two a hired manager has no incentive to provide a positive level of effort, that is, $e_{i,2} = e_{j,2} = 0$. Hence, if both managers are rehired in period two, the firm hiring manager i has expected second period gross profits given by:

$$\Pi_{i,2} = E_{(\varepsilon_2,\eta)}\left[\pi(\phi, \eta_i + \varepsilon_{i,2}, \eta_j + \varepsilon_{j,2})/x_1\right].$$

From the other hand, if only manager i is rehired in $t = 2$, his principal has expected second period profits, gross of wage payments, given by:

$$\bar{\Pi}_{i,2} = E_{(\varepsilon_{i,2},\eta_i)}\left[\overline{\pi}(\phi, \eta_i + \varepsilon_{i,2})/x_{i,1}\right],$$

where these second period expectations are evaluated at the beginning of period two using the distribution of $\eta = (\eta_i, \eta_j)$ resulting after the observation of $x_1 = (x_{i,1}, x_{j,1})$.

In period two, after the observation of first period efficiencies, managers are no longer homogeneous in terms of their talent, even if they are both expected to exert no effort. Furthermore, firms compete à la Bertrand to hire the most skilled of them so that they will end up paying out to the good manager a wage premium that completely exhausts the profit differential he is able to produce in the product market. This intuition is shown in the following two lemmas.

Lemma 1 *In any equilibrium, firms earn the same amount of expected net profits in each subgame starting at the beginning of period two.*

Proof. There are three different types of subgames starting at the beginning of period two. First, in subgames following histories where no manager was hired in the first period both firms obtain $\underline{\pi}(\phi)$ with probability one. Second, in subgames following histories where exactly one manager was hired in the first period (say manager i), at least one principal won't be able to hire a manager in period two and her profits will be $\underline{\pi}(\phi)$. Let $\bar{\Pi}_{i,2} - w_{i,2}$ be the expected profits of the other principal when she hires the manager with a salary $w_{i,2} \geq \overline{w}$ (note that in equilibrium it is not possible that the manager turns out to be unemployed in period two). If $w_{i,2} > \bar{\Pi}_{i,2} - \underline{\pi}(\phi)$ the principal hiring the manager would prefer not to hire him and if $w_{i,2} < \bar{\Pi}_{i_2} - \underline{\pi}(\phi)$ the principal hiring no manager could make a wage offer $w + \varepsilon$ that for $\varepsilon \in (0, \bar{\Pi}_{i_2} - \underline{\pi}(\phi) - w_{i,2})$ attracts the manager and allows the deviating firm to increase its profits. Hence it must be $w_{i,2} = \bar{\Pi}_{i,2} - \underline{\pi}(\phi)$. Finally in subgames following histories where both managers were hired in the first period, they are rehired in the following period in any equilibrium. Hence, let $w_{i,2}$ and $w_{j,2}$ be their salaries in period two, it must be shown that:

$$\Pi_{i,2} - w_{i,2} = \Pi_{j,2} - w_{j,2}.$$

Assume by contradiction that $\Pi_{i,2} - w_{i,2} > \Pi_{j,2} - w_{j,2}$, i.e. it is more profitable to hire manager i. There must be at least one principal hiring manager j with positive probability and she could attract manager i with probability one by offering him a slightly higher wage, say $w_{i2} + \varepsilon$ $(\varepsilon > 0)$ and withdrawing at the same time the wage offered to manager j, such a deviation is convenient for each $\varepsilon < \frac{1}{2}(\Pi_{i,2} - w_{i,2}) - \frac{1}{2}(\Pi_{j,2} - w_{j,2})$. A similar contradiction arises from the alternative assumption $\Pi_i - w_{i,2} < \Pi_j - w_{j,2}$ and this completes the proof. ■

Lemma 2 *In any equilibrium both managers are hired in both periods. Furthermore, the wage earned by manager i in period one is independent of $e_{i,1}$ while the wage he earns in period two is given by*[8]*:*

$$w_{i,2} = \overline{w} + (\Pi_{i,2} - \Pi_{j,2})\, I(x_{i,1} \geq x_{j,1}),$$

Proof. Let's show first that both managers are employed in period one. If, by contradiction, manager i doesn't work in the first period, his lifetime utility is $2\overline{w}$ and at least a firm is earning $\underline{\pi}(\phi)$ in the same period. Lemma 1 then implies that such a principal will not be able to earn more than $\underline{\pi}(\phi)$ in period two either, so that to offer $\overline{w} + \varepsilon$ to manager i in period one is a profitable deviation for each $\varepsilon \in (0, \Pi_{i,1} - \underline{\pi}(\phi))$, because she attracts manager i with such an offer and obtains strictly larger expected net profits. Hence both managers are hired in the first period and this immediately implies that they are both hired also in period two. To obtain the expression of $w_{i,2}$ consider first the situation in which $x_{i,1} < x_{j,1}$. Let's show that in this case $w_{i,2} = \overline{w}$. Assume by

[8] Thereafter I'll use the notation $I(E)$ to denote the indicator function of an event E, that is, $I(E) = 1$ if E is true and $I(E) = 0$ otherwise.

contradiction that $w_{i2} > \overline{w}$ (note that it cannot be $w_{i2} < \overline{w}$ in any equilibrium) and consider the following alternative bid for the principal hiring manager i: the offer made to manager i is slightly reduced while the other is kept constant. With such a strategy she will still end up hiring manager i but at a smaller wage and then she has an incentive to deviate. Similarly, if $x_{i,1} > x_{j,1}$ then $w_{j,2} = \overline{w}$. Note also that if $x_{i,1} = x_{j,1}$, then $\Pi_{i,2} = \Pi_{j,2}$, so that it must be $w_{i,2} = w_{j,2} = \overline{w}$ since there's no need for a firm to offer more in order to hire one of the two perfectly homogeneous managers. Together with lemma 1 and the fact that both managers always work at a firm, this last result immediately implies the expression given for $w_{i,2}$. To complete the proof it remains to show that $w_{i,1}$ doesn't depend on $e_{i,t}$ but this is trivially true since firms cannot observe effort levels (however the wage offers in the first period do depend on $\widehat{e}_{i,1}$ and $\widehat{e}_{j,1}$). ■

Lemma 2 makes it clear that there are two reasons for a manager to build a career, through the exertion of some positive level of effort in the first period. First of all, a manager can earn more than the reservation wage only if he performs better than the other one and, second, the wage premium that the best manager obtains increases with his perceived ability.

Note also that the lemma also suggests the existence of what could be called an "implicit lagged relative performance evaluation": the wage earned by a manager in period two depends on his relative performance in period one, and this is not an explicit contractual arrangements but simply a consequence of the firm equilibrium behavior in the model. This seems to be an interesting empirical prediction that would be worth analyzing.

The fact that in this model the best manager completely appropriates the extra profits he is able to produce may seem quite extreme. In a more realistic model firms would retain part of such profits but, what is really at stake here is how the competitiveness of the firms' product market shapes the managerial incentives to build a career. The previous lemma, then, simply suggests that such incentives depend on how profitable to hire a good manager is, which in turn depends on the characteristics of the product market. It seems reasonable to expect that in markets where the profits a firm can realize are not strongly linked to its efficiency, the incentives for managers to build a career are probably not very high. To make this point more explicit consider de following quantities:

$$
\begin{aligned}
z_{i,1} &= \eta_i + \varepsilon_{i1} \sim N(0, \sigma_\eta^2 + \sigma_\varepsilon^2); \\
z_{i,2} &= \eta_i + \varepsilon_{i2} \sim N(\tau(z_{i,1} + e_{i,1} - \hat{e}_{i,1}), (1+\tau)\sigma_\varepsilon^2); \\
z_{j,1} &= \eta_i + \varepsilon_{i1} \sim N(0, \sigma_\eta^2 + \sigma_\varepsilon^2); \\
z_{j,2} &= \eta_i + \varepsilon_{i2} \sim N(\tau z_{j,1}, (1+\tau)\sigma_\varepsilon^2).
\end{aligned}
$$

Their interpretation is as follows: $z_{i,1}$ and $z_{j,1}$ are simply the sum of the unknown talent and the noise term in the first period for manager i and, respectively, manager j. Note in particular that the distributions of such quantities are those commonly held at the beginning of period one and are independent of managers' choice of effort. From the other hand the quantity $z_{i,2}$ represents manager i's ability plus the second period noise, and its distribution is conditioned on the first period information (here summarized by $z_{i,1}$) in the hypothesis that manager i exerts effort $e_{i,1}$ while he is expected to exert effort $\hat{e}_{i,1}$. The quantity $z_{j,2}$ has a similar meaning for manager j but its distribution is computed assuming that her effort choice is correctly anticipated (and is equal to $\hat{e}_{j,1}$). Hence, by increasing the effort he provides manager i can bias firms' learning process making the distribution over his ability in period two better, in the sense of first order stochastic dominance. Of course, in equilibrium the manager will not fool the market.

In terms of the notation just defined, manager i is paid above his reservation wage in period two if and only if $z_{i,1} \geq z_{j,1} + \hat{e}_{i,1} - e_{i,1}$, furthermore, the wage premium that he obtains in such an event can be written as follows:

$$wp(\phi,\ z_{i,1} + e_{i,1} - \hat{e}_1,\ z_{j.1}) = E_{(z_{i,2},z_{j,2})}\left[\pi(\phi, z_{i,2}, z_{j,2}) - \pi(\phi, z_{j,2}, z_{i,2})\right].$$

Note that this quantity is twice continuously differentiable. The following lemma summarizes some of its most useful properties.

Lemma 3 *For each $(\phi, u, v) \in \Phi \times \mathbb{R}^2$ it results that $wp(\phi, v, v) = 0$, $wp_2(\phi, u, v) > 0$. Furthermore, if condition IVE is satisfied, then $wp_{12}(\phi, v, u) > 0$, while, if condition DVE is satisfied, then $wp_{12}(\phi, v, u) < 0$.*

Proof. The fact that $wp(\phi, v, v) = 0$ for each ϕ and v, immediately follows from the definition of the function wp. To show the remaining statements in the lemma, take the random variables $x \sim N(\tau u, (1+\tau)\sigma_\varepsilon^2)$ and $y \sim N(\tau v, (1+\tau)\sigma_\varepsilon^2)$, then consider the quantities:

$$\begin{aligned} wp(\phi, u, v) &= E_{(x,y)}\left[\pi(\phi, x, y) - \pi(\phi, y, x)\right] \\ wp_1(\phi, u, v) &= E_{(x,y)}\left[\pi_1(\phi, x, y) - \pi_1(\phi, y, x)\right] \end{aligned}$$

The difference $\pi(\phi, x, y) - \pi(\phi, y, x)$ is strictly increasing in x, while the difference $\pi_1(\phi, x, y) - \pi_1(\phi, y, x)$ is strictly increasing in x if condition IVE is satisfied and it is strictly decreasing in x if condition (DVE) is satisfied. Since a larger value for u induces a strictly dominant distribution on x (in the sense of first order stochastic dominance), the sign of wp_2 and wp_{12} are those claimed in the lemma.
■

At the beginning of period one manager i's expected wage in period two can then be written as follows:

$$w(\phi, e_{i,1} - \hat{e}_{i,1}) = \overline{w} + E_{(z_{i,1},z_{j1})}\left[wp(\phi, z_{i,1} + e_{i,1} - \hat{e}_{i,1}, z_{j1}) I(z_{i,1} + e_{i,1} - \hat{e}_{i,1} \geq z_{j,1})\right] =$$
$$\overline{w} + \int_{-\infty}^{\infty} \int_{v+\hat{e}_1 - e_{i,1}}^{\infty} wp(\phi, u + e_{i,1} - \hat{e}_{i,1}, v) dF_{z_{i,1}}(u) dF_{z_{j,1}}(v).$$

The above quantity, which is continuously differentiable, strictly increasing and strictly concave in $e_{i,1}$, can be used to characterize the equilibrium effort exerted in the first period. This is done in the following proposition.

Proposition 1 *In any equilibrium the two managers choose in the first period the same level of effort* $e_1(\phi)$ *which is uniquely identified by the condition:*

$$\int_{-\infty}^{\infty}\int_{v}^{\infty} wp_2(\phi,u,v)dF_{z_{i,1}}(u)dF_{z_{j,1}}(v) = g'(e_1(\phi)). \tag{3}$$

Proof. The level of effort that manager i exerts in period one can only affect his expected wage in period two, hence his choice solves the problem:

$$\max_{e_{i,1}\in[0,\bar{e}]} w(\phi, e_{i,1}-\hat{e}_{i,1}) - g(e_{i,1}).$$

The solution $e^*(\hat{e}_{i,1})$ exists and maps $[0,\bar{e}]$ into itself. Since for each $\hat{e}_{i,1}\in[0,\bar{e}]$ it results that

$$w'(-\hat{e}_1) - g'(0) = \int_{-\infty}^{\infty}\int_{v+\hat{e}_1}^{\infty} wp_2(\phi,u-\hat{e}_{i,1},v)dF_{z_{i,1}}(u)dF_{z_{j,1}}(v) > 0$$
$$w'(\bar{e}-\hat{e}_1) - g'(\bar{e}) = -\infty,$$

such solution must be interior and then it is identified by the first order condition $w'(\phi, e^*(\hat{e}_{i,1})-\hat{e}_{i,1}) = g'(e^*(\hat{e}_{i,1}))$. Furthermore, the equilibrium effort chosen by manager i must be correctly anticipated by the firms, i.e. it must be a fixed point of the function $e^*(e)$. When the objective function in the above maximization problem is not concave, such a fixed point, call it $e_{i,1}(\phi)$, may fail to exist, and then it would not be possible to obtain an equilibrium in pure strategy. However, when such fixed point exists, it is the unique solution to the equation $w'(\phi,0) = g'(e_{i,1}(\phi))$ which can be written as follows:

$$\int_{-\infty}^{\infty}\int_{v}^{\infty} wp_2(\phi,u,v)dF_{z_{i,1}}(u)dF_{z_{j,1}}(v) = g'(e_{i,1}(\phi)) \tag{4}$$

Note also that the equilibrium effort level chosen by manager j is similarly characterized by:

$$\int_{-\infty}^{\infty}\int_{v}^{\infty} wp_2(\phi,u,v)dF_{z_{j,1}}(u)dF_{z_{i,1}}(v) = g'(e_{j,1}(\phi)). \tag{5}$$

Since the random variables $z_{i,1}$ and $z_{j,1}$ are identically distributed, conditions 4 and 5 both coincide with condition 3. This shows the statement in the proposition. ■

Note that in equilibrium firms correctly anticipate the managerial effort in the first period so that it cannot affect the expected wage that a young manager will earn in period two. In fact, such quantity can be computed as follows:

$$w^* = w(\phi,0) = \overline{w} + \int_{-\infty}^{\infty}\int_{v}^{\infty} wp(\phi,u,v)dF_{z_{i,1}}(u)dF_{z_{j,1}}(v) \tag{6}$$

The above proposition characterizes the level of effort that managers choose in equilibrium in the first period. Such an effort, that can be considered as a proxy for the X-efficiency within the industry at hand, depends on the level of competition in the product market. Hence,implicitly differentiating expression 3 with respect to ϕ one can evaluate how competition affects managerial incentives to build a career:

$$e_1'(\phi) = \frac{\int_{-\infty}^{\infty}\int_{v}^{\infty} wp_{12}(\phi,u,v)dF_{z_{i,1}}(u)dF_{z_{j,1}}(v)}{g''(\phi)}. \tag{7}$$

Given the results in lemma 3, the comparative static properties stated in the following proposition are immediately established.

Proposition 2 *If condition IVE is satisfied then* $e_1'(\phi) > 0$*, while If condition DVE is satisfied then* $e_1'(\phi) < 0$.

Note that the VE conditions are sufficient but by no means necessary for the result in the above proposition. In particular situations, weaker versions of them could suffice. For example, consider the following weak version of the VE conditions:

Condition 3 (IVE-W) *For each* (x, y) *with* $x > y$*, the difference* $\pi_2(\phi,x,y) - \pi_3(\phi,y,x)$ *is strictly increasing in* ϕ.

Condition 4 (DVE-W) *For each* (x, y) *with* $x > y$*, the difference* $\pi_2(\phi,x,y) - \pi_3(\phi,y,x)$ *is strictly decreasing in* ϕ.

In other terms condition IVE-W requires that the derivative $\pi_1(\phi,x,y) - \pi_1(\phi,y,x)$ be increasing in x in the hemiplane $x > y$ only. Similarly, condition DVE-W requires that $\pi_1(\phi,x,y) - \pi_1(\phi,y,x)$ be decreasing in x only for $x > y$.

Proposition 3 *If condition IVE-W is satisfied, then it exists* $\sigma^+ > 0$ *such that* $\sigma_\varepsilon^2 < \sigma^+ \implies e_1(\phi) > 0$*. Similarly, If condition DVE-W is satisfied, then it exists* $\sigma^- > 0$ *such that* $\sigma_\varepsilon^2 < \sigma^- \implies e_1'(\phi) < 0$.

Proof. I only show the first statement of the proposition, the second one is similar. Let's proceed in two steps.
Step 1 I first show that, if $\sigma_\varepsilon^2 = 0$ and condition IVE-W is satisfied then it results $e_1'(\phi) > 0$. Given an expectation $\hat{e}_1$ on the first period effort, the observation of $x_{i\,1}$ perfectly reveals the efficiency of manager i which is $\eta_i = x_{i\,1} - \hat{e}_1$. By choosing a different level of effort, say $e_{i,1}$, manager i could induce the market to believe him of talent $\eta_i + e_{i,1} - \hat{e}_1$ and then the expected second period wage for manager i can be written as follows:

$$w(e_{i,1} - \hat{e}_1) = \overline{w} +$$

$$+\int_{-\infty}^{\infty}\int_{v+\hat{e}_1-e_{i,1}}^{\infty} \pi(\phi, u+e_{i,1}-\hat{e}_1, v) - \pi(\phi, v, u+e_{i,1}-\hat{e}_1)dF_{z_{i,1}}(u)dF_{z_{j,1}}(v).$$

Thus, the first period equilibrium effort $e_1(\phi)$ is characterized by:

$$g'(e_1(\phi)) = \int_{-\infty}^{\infty}\int_{v}^{\infty} \pi_2(\phi, u, v) - \pi_3(\phi, v, u)dF_{z_{i,1}}(u)dF_{z_{j,1}}(v),$$

from which, implicitly differentiating, one obtains:

$$e_1'(\phi) = \frac{\int_{-\infty}^{\infty}\int_{v}^{\infty} \pi_{1,2}(\phi, u, v) - \pi_{1,3}(\phi, v, u)dF_{z_{i,1}}(u)dF_{z_{j,1}}(v)}{g''(e_1(\phi))} \tag{8}$$

so that the claim in step 1 immediately follows from condition IVE-W.
Step 2 To complete the proof, consider the numerator of the right side of 7 and note that it is a continuous function of the parameter σ_ε^2, converging to the numerator of the right side of 8 as $\sigma_\varepsilon^2 \to 0$. ■

Proposition 3 simply states that under a substantial weaker version of the VE conditions, the same result as in proposition 1 holds, provided that in period two the residual uncertainty on the managerial talent is small enough.

What is really relevant for the managerial career concerns is then the marginal value of efficiency. A change in the market conditions that increases the marginal value of an efficient manager also increases the incentive to build a good reputation. This is so in this model, because in the second period labor market, the good manager fully appropriates of the value of his (possibly) larger efficiency measured here by the difference in profits that he is able to produce. This result closely resembles proposition 4 in Schmidt (1997). A major difference consists in the source of managerial incentives: in this model they indirectly arises from career concerns while in the paper by Schmidt explicit contingent contract are used.

More competitive product markets are usually thought of as inducing smaller profits (e.g. smaller price-cost margins) to the firms. However, contrary to the models of Schmidt (1997) and Hermalin (1992), the amount of profits doesn't play any role in the present context. This wouldn't be so if managers were not assumed to be risk neutral. With more general managerial preferences, an income effect and a risk adjustment effect similar to those described by Hermalin (1992) would arise both with ambiguous sign. An explicit possibility of bankruptcy, with an associated turn over cost for the manager involved, would also create a scope for the amount of profits to the extent that, as it seems reasonable, smaller profits rise the probability of going out of business. As in Schmidt (1997), an increased probability of bankruptcy would naturally rise the managerial incentives in the first period.

In this model the bargaining power that managers with a good reputation acquires on the labor market has a key role: they are interested in building a career only to the extent that they can capture the value of such reputation. Any element that negatively affects their bargaining power, as for example the existence of switching costs for a manager who decides to change firm, eventually in the form of lost specific human capital, would then reduce their incentives.

Note also that the results in this paragraph especially holds for managers at the top level in the firm hierarchy. In fact, at lower levels career concerns are mainly driven by the internal labor market, that is, by the possibility of getting better employment conditions within the same firm. An interesting and related issue would then be to evaluate how competitive pressure in the product market affects the internal labor market of a firm and, then, the incentives throughout the firm structure.

As a final remark, note that it is not clear in this setting whether the equilibrium level of effort in the first period is too high or too low with respect to the efficient level. Of course, the second period effort is too low for sure but this depends on the fact that there isn't any future after period two and then, there isn't any scope for building a career. Efficiency here has to be defined with respect to profits, namely we could say that the efficient (symmetric) level of effort in period t is e_t^{FB} defined as follows:

$$e_t^{FB} \in \arg\max_{0 \leq e \leq \bar{e}} \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \pi(\phi, u, v) + \pi(\phi, v, u) dF_{x(e)_{i,t}}(u) dF_{x(e)_{j,t}}(v) - 2g(e). \tag{9}$$

Here the distribution of period t efficiencies $x(e)_{i,t}$ and $x(e)_{j,t}$ take into account all past information and assume that managers provide the level of effort e. The first order necessary and sufficient condition characterizing this first best effort level is then:

$$\frac{\partial}{\partial e} \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \pi(\phi, u, v) + \pi(\phi, v, u) dF_{x(e^{FB})_{i,t}}(u) dF_{x(e^{FB})_{j,t}}(v) = 2g'(e^{FB}). \tag{10}$$

Comparing condition 10, defining the first best level of effort, with condition 3 defining the equilibrium first period effort, it is not clear at all whether young managers are overworking or shirking too much. Furthermore, in this model the discount factor is for simplicity assumed to be one, namely that the future is as important as the present in determining the lifetime utility of agents. More generally, however, a small enough discount factor could induce young managers to provide an amount of effort below the efficient level. But in a model with a finite horizon like this, it could also be the case that "the future" is more important than "the present" so that the discount factor could be larger than one. A large enough discount factor could then induce managers to overwork.

3 Examples

In this section I discuss some examples of explicit market games. Propositions 2 and 3 directly allow to evaluate the impact of specific market parameters on managerial incentives within the industry. In the first two examples I consider firms producing a homogeneous good and competing à la Cournot with a linear demand, in the first place, and then with an Isoelastic demand. The third example is very common in IO and it represents the easiest way of modeling price competition among firms producing differentiated products. The last example analyzes the effect of a switch from Cournot to Bertrand competition. A common feature of all the examples is that a larger market size corresponds to stronger incentives. A more complete analysis would allow for an endogenous market structure. This possibility is partially pursued in the first example where the number of firms and their market shares is in fact endogenous, even if only two of them can potentially employ a manager[9].

3.1 Cournot Competition with Linear Demand

There's a continuum of mass n of entrepreneurial firms (EF), i.e. firms run directly by their owner, and 2 managerial firms (MF), i.e. firms run by a manager. They compete choosing the quantity to sell on the product market and the inverse demand function is given by $p(Q) = A - Q$, where $Q = q_i + q_j + \int_0^n q(h)dh$ is the aggregate production, being $q(h)$ the "production intensity" of a generic EF $h \in [0, n]$ and (q_i, q_j) the quantities produced by the two MF. The parameter $A > 0$ measures the size of the market. Each EF has a constant marginal cost equal to $c > 0$, while a MF has a marginal cost of $\kappa(x)$, where x denotes its manager efficiency and κ is a positive and decreasing function bounded above by c. Assuming that the parameters always allow for an interior solution (i.e. $A \geq 3c$), the profit function for a MF managed with efficiency x and competing against n EF and a MF of efficiency y is:

$$\pi(x,y) = \left[\frac{A + nc + \kappa(y) - (n+2)\kappa(x)}{n+3}\right]^2.$$

The function π is increasing in x and decreasing in y, strictly and it is possible to choose the function κ in such a way that the convexity properties required for π are satisfied. The parameter ϕ could be here identified with n, A or c. Furthermore it results that:

$$\pi(x,y) - \pi(y,x) = \frac{n^2 + 4n + 3}{(n+3)^2}\left[\kappa^2(x) - \kappa^2(y)\right] + \frac{2A - 2nc}{(n+3)}[\kappa(y) - \kappa(x)]$$

and then it is possible to obtain:

$$\frac{\partial}{\partial A}\left[\pi(x,y) - \pi(y,x)\right] = \frac{2\left[\kappa(y) - \kappa(x)\right]}{n+3}$$

$$\frac{\partial}{\partial c}\left[\pi(x,y) - \pi(y,x)\right] = \frac{2n\left[\kappa(y) - \kappa(x)\right]}{n+3}$$

$$\frac{\partial}{\partial n}\left[\pi(x,y) - \pi(y,x)\right] = \frac{2}{(n+3)^2}\left[\kappa^2(x) - \kappa^2(y)\right] - \frac{2(A-3c)}{(n+3)^2}\left[\kappa(y) - \kappa(x)\right].$$

Note that the derivatives of the difference $\pi(x,y) - \pi(y,x)$ with respect to A and with respect to c are both strictly increasing functions of x so that

[9] This is a major limitation indeed, because the market structure does not directly affect the managerial labor market.

condition IVE is satisfied in those cases. Hence, a larger market or less efficient entrepreneurial competitors induce larger incentives to build a career. It is also possible to compute

$$\frac{\partial^2}{\partial n \partial x}\left[\pi(x,y)-\pi(y,x)\right]=\frac{2}{(n+3)^2}\kappa'(x)\left[2\kappa(x)+A-3c\right]$$

which is for sure a negative quantity whenever $A \geq 3c$, then, since this is always the case in any interior solution, the more EF are in the market the smaller the implicit incentives created by career concerns[10].

To make the market structure endogenous consider the existence of a fixed entry cost $F > 0$[11]. Notice that since the MF are always more efficient than any EF and the profit function is increasing in own efficiency, if an EF is in the market then the two MF are also in the market. Restrict attention to a range of parameters that allow the entrance of at least one EF. Let $n^* = n(A, c, F)$ be the number of EF which optimally decide to enter as a function of the other parameters; of course n^* increasing in A, and decreasing in both c and F. It is now possible to evaluate the impact of A, c or F on the managerial indirect incentives in case of endogenous market structure. A decrease in the entry cost increases the number of EF so that indirectly reduces the managerial incentives. Usually a market protected by a smaller entry cost is considered as a more competitive one but this example shows that it also tends to be less efficient[12]. The impact of changes in the other parameters is now ambiguous: for example, a larger market size would in principle increases incentives but the entrance of more EF in the market tend to outweighs this effect and the final result cannot be predicted.

3.2 Cournot Competition with Isoelastic Demand

Consider a Cournot duopoly in the market for a homogeneous good whose inverse demand function is $p(Q) = \left(\frac{A}{Q}\right)^{\frac{1}{\varepsilon}}$, where, again, $Q = q_i + q_j$ is the total quantity produced by firms i and j, and $\varepsilon > 1$ is the constant elasticity of the demand function. Firm i marginal cost is constant and is given by $\kappa(x)$ where x denotes its manager efficiency and κ is a positive and decreasing function.

The profit function for a firm of efficiency x competing with a firm of efficiency y is then the following:

$$\pi(x,y)=\frac{A\left(2\varepsilon-1\right)^{\varepsilon-1}\left[\left(1-\varepsilon\right)\kappa(x)+\varepsilon\kappa(y)\right]^2}{\varepsilon^{\varepsilon}\left[\kappa(x)+\kappa(y)\right]^{\varepsilon+1}};$$

[10] This result is similar to the one found by Martin (1993). He considers a model of Cournot competition among firm run by a manager and in which incentives are provided through explicit contingent contracts. He finds that the optimal effort induced in equilibrium decreases with the number of firms.

[11] This entry cost has to be paid at the beginning of period one and allows to remain in the market for two periods.

[12] Raith (2004) also finds that a smaller entry cost reduces efficiency and for the same reason: the presence of a larger number of firms tend to reduce incentives.

where parameters are assumed to be such that no corner solutions arise, i.e. it is assumed that $\varepsilon < \frac{\sup \kappa}{\sup \kappa - \inf k}$.

Note that the function π is continuous, differentiable, strictly increasing in x, strictly decreasing in y. The parameter ϕ can here be identified either with A or ε. It is immediate to compute:

$$\pi(x,y) - \pi(y,x) = \mathrm{A}\left[\frac{(2\varepsilon - 1)}{\varepsilon\left[\kappa(x) + \kappa(y)\right]}\right]^{\varepsilon}\left[\kappa(y) - \kappa(x)\right]$$

which can be shown to be a strictly increasing function of x and a strictly decreasing function of y. It is then possible to compute:

$$\frac{\partial}{\partial A}\left[\pi(x,y) - \pi(y,x)\right] = \left[\frac{(2\varepsilon - 1)}{\varepsilon\left[\kappa(x) + \kappa(y)\right]}\right]^{\varepsilon}\left[\kappa(y) - \kappa(x)\right]$$
$$\frac{\partial}{\partial \varepsilon}\left[\pi(x,y) - \pi(y,x)\right] = A\left[\kappa(y) - \kappa(x)\right]\left[\frac{(2\varepsilon - 1)}{\varepsilon\left[\kappa(x) + \kappa(y)\right]}\right]^{\varepsilon}\left[\ln\frac{2\varepsilon - 1}{\varepsilon\left[\kappa(x) + \kappa(y)\right]} + \frac{1}{2\varepsilon - 1}\right].$$

The former of such derivatives is a strictly increasing function of x so that condition IVE is satisfied, meaning that a larger market size induces managers to exert more effort. From the other hand, the latter derivative is not monotone so that the impact of a more elastic demand on the managerial incentives cannot be predicted unambiguously. As in Willig (1987) a smaller market size tends to reduce managerial incentives but an increased demand elasticity has not a well defined effect here. The point is that at the equilibrium for firm i it results that:

$$\frac{p - c_i}{p} = \frac{1}{\varepsilon}\frac{q_i}{Q};$$

so that a larger value of the elasticity parameter has not a well defined effect on profits (and on profit differentials). In fact, the most efficient firm will be able to get a larger market share if the demand is more elastic but this doesn't ensure that the overall profits increases. However, it is possible to note that if $\sup \kappa < 1$ the quantity $\frac{\partial}{\partial \varepsilon}\left[\pi(x,y) - \pi(y,x)\right]$ is the product of three positive and increasing function of x and then it is strictly increasing in x in the hemiplane $x > y$. Condition IVE-W is satisfied and it is possible to conclude that, if the residual uncertainty is small enough, an increased demand elasticity improves managerial incentives. The intuition is that in such a case there cannot be a big difference between an efficient and inefficient firm (recall that κ is a positive function) so that the effect of a changing elasticity on the market shares is not very important and it is dominated by the "direct" effect on profits, which is the only one showing up in the model by Willig.

3.3 Differentiated Products

In the spirit of Hotelling 1929, consider a liner city of length 1 where consumers are uniformly distributed with density A. Two firms are located at the opposite ends of the city and they sell the same good. The first firm location is at $s = 0$

and the other firm is located at $s = 1$. Consumers' demand can be either one or zero and $v > 0$ denotes their common valuation for the good. To move from their location to one of the firm, consumers incur a transportation cost of t for unit of length. Firm hiring manager i has constant marginal cost $c_i = \kappa(x_i) < c$. To fix notation assume that manager i is hired by the firm located at zero while the other firm is hiring manager j. Competition is in prices and, if (p_i, p_j) are the prices charged by the two firms, to buy one unit of the good the consumer located at s faces a total cost of $p_i + ts$ or of $p_j + t(1-s)$ depending on whether he goes to firm i or to firm j. The consumer located at $s(p_i, p_j) = \frac{1}{2} + \frac{p_j - p_i}{2t}$ is indifferent between the two firms so that those located at his left prefer to buy from firm i and those located to his right prefer to buy from firm j. The parameter t is traditionally interpreted as a measure of the product substitutability: the smaller is t the closer substitute the two products are. Competition among firms producing closer substitutes is usually considered to be tougher so that it is quite natural to interpret a decrease in t as an increase in competition. However, as in the other examples, it is also interesting to evaluate the impact of the parameter A on the managerial incentives. Assuming that v is large enough to ensure that, in equilibrium, each consumer is always willing to buy one unit of the good , the profit function of a firm having efficiency x and competing with a firm of efficiency y is:

$$\pi(x,y) = \begin{cases} A\left[\kappa(y) - \kappa(x) - t\right] & \text{if} \quad \kappa(x) < \kappa(y) - 3t \\ \frac{A}{18t}\left[3t + \kappa(y) - \kappa(x)\right]^2 & \text{if} \quad |\kappa(x) - \kappa(y)| \leq 3t \\ 0 & \text{if} \quad \kappa(x) > \kappa(y) + 3t \end{cases}$$

Note that only when $|\kappa(x) - \kappa(y)| \leq 3t$ both firms are producing a positive amount of goods while in the other cases the most efficient firm only is suppling the whole market. If κ is decreasing then the profit function $\pi(x,y)$ satisfies all the properties stated in section 2 but it doesn't have partial derivatives, and then it is not differentiable, in the region $\{(x,y) : |\kappa(x) - \kappa(y)| = 3t\}$. However, this region has measure zero in the real plane so that all the results in the previous section still go through with the exception of proposition three that requires continuity of partial derivatives of π. It is possible to obtain:

$$\frac{\partial}{\partial x}\left[\pi(x,y) - \pi(y,x)\right] = -A\kappa'(x)\left[\frac{2}{3} + \frac{1}{3}I(|\kappa(x) - \kappa(y)| > 3t)\right].$$

The above quantity is strictly increasing in A and then a larger market size increases the managerial incentive to build a career. However, it doesn't depend on t if the parameter configuration only allows for an interior solution, i.e. $\sup\kappa - \inf\kappa \leq 3t$. This corresponds to a situation in which firm efficiency doesn't make a big difference (the possible cost reductions are small compared to transportation costs) but when corner solutions are possible, i.e. $\sup\kappa - \inf\kappa > 3t$, the above derivative is a decreasing function of t for any (x,y). Hence, provided that firm efficiency is important enough, an increased product substitutability makes managerial career concerns sharper[13].

[13] These results seem to be robust to alternative specification of the transportation cost, as long as it is the same for each consumer. For example, using a convex transportation cost as

3.4 A Switch from Cournot to Bertrand Competition

An increase in competitive pressure is sometimes represented by a switch from Cournot to Bertrand competition. In order to analyze how such a change affects the managerial career concerns let's consider a market with linear demand $P(Q) = A - Q$ in which two firms compete in prices with probability q and in quantities with probability $(1 - q)$. As above, each firm has constant marginal cost equal to $\kappa(x)$ where x is its managerial efficiency and κ is a positive and decreasing function bounded above by some value $c > 0$. Of course, this is a fictitious market, but it exactly reproduces the Bertrand game when $q = 1$ and the Cournot game when $q = 0$. Assume that parameter values are such that both firms produce a positive quantity in the Cournot competition (i.e. $A > 2 \sup \kappa - \inf \kappa$) and that in the Bertrand competition the less efficient firm's marginal cost is always below its competitor monopoly price (i.e. $A > 3 \sup \kappa$,note that this last condition implies the previous one). With these restrictions the profit function in case of Cournot and Bertrand competition are respectively:

$$\pi^C(x,y) = \left[\frac{A + \kappa(y) - 2\kappa(x)}{3}\right]^2$$

$$\pi^B(x,y) = \begin{cases} [A - \kappa(y)]\,[\kappa(y) - \kappa(x)] & if \quad x > y \\ 0 & if \quad x \leq y. \end{cases}$$

Hence the overall profit function is:

$$\pi(x,y) = q\pi^B(x,y) + (1-q)\pi^C(x,y).$$

It is then possible to compute[14]:

$$\frac{\partial^2}{\partial x \partial q}\left[\pi(x,y) - \pi(y,x)\right] = \begin{cases} -\kappa'(x)\left[\frac{A+2\kappa(x)-3\kappa(y)}{3}\right] & if \quad x > y \\ -\kappa'(x)\left[\frac{A+3\kappa(y)-4\kappa(y)}{3}\right] & if \quad x < y. \end{cases}$$

The last quantity is always strictly positive as long as $A > 4 \sup \kappa$. Under this restriction then, the IVE condition is satisfied and an increase in the probability q induces managers to exert a larger effort in the first period. In particular, this means that in a Bertrand game career concerns are sharper then in a Cournot game, provided that the market size is large enough[15].

4 The Threat of a Hostile Takeover

The model developed so far has been useful to asses the impact of exogenous characteristics of the product market on the managerial career concerns. It has

$c(x) = tx^2$ or a concave one as $c(x) = t(2x - x^2)$ exactly yields the same results.

[14] As in the previous example, the function π is not differentiable everywhere. In this case π doesn't have partial derivatives along the line $y = x$ but such a region has measure zero in the real plane and all the previous results, but proposition three, still hold.

[15] Similarly to the previous example, the profit function is not differentiable along the line $x = y$, but this region has measure zero in the (x, y) plane so that all the results established in the text, with the exception of proposition 3, still hold.

already been argued that the impact of the managerial labor market is at least as important but the model is not suited to directly address such issue. However, in this section I will discuss how the managerial labor market can be affected by the presence of a potential raider that, after observing managerial performances in the first period, may decide to enter the industry acquiring control of one of the two firms. In this way the model allows to evaluate the impact of a takeover threat on the first period incentives and on the (second period) level of managerial compensation. It is usually thought that the existence of a potential raider increases ex-ante incentives (see for example Scharfstein 1988 b) but this is not so in the present context. It will also been shown that takeover threats reduce managerial compensation.

4.1 The Role of a Potential raider

Let's introduce, then, a new player called the raider (he). He remains silent during the first period but he can observe the realized managerial efficiencies and, at the beginning of period two, he may identify one of the two firms as his target and then make a tender offer. The tender offer will succeed with probability $\alpha \in [0,1]$, whose exact value depends on the strength of the antitakeover legislation: the stronger such legislation the lower the value of α. With $\alpha = 0$ the model doesn't allow any takeover, so exactly reproducing the situation described in the previous section. If a takeover is realized the raider will directly run the firm he acquired with an efficiency z^R that I assume to be distribute as a $N(\tau r, (1+\tau)\sigma_\varepsilon^2)$. Hence, the precision of the raider knowledge of his own efficiency is exactly the same as the senior managers'[16], so that the distribution of z^R first order stochastically dominates that of the second period efficiency of manager i if and only if his past performance was $z_{i,1} < r$. In running the firm he has taken over, the raider gives up alternative opportunities that, for simplicity, I assume to be worth $\bar{w}$. If a takeover is not observed events develop exactly has in the previous section: the two firms compete in the managerial labor market to hire a manager, then, managers decides the level of effort to exert (so determining their efficiency up to a stochastic term) and, finally, product market competition takes place. If, on the contrary, a takeover is observed there will be only one firm on the managerial labor market in period two but thereafter events are as above.

The time structure in period two is then the following:

1. The potential raider decides to which firm (if any) address the tender offer.
2. If a tender offer is made, the target firm is taken over with probability $\alpha \in [0,1]$,

3.a. In case of no takeover both firms bid to hire a manager.

3.b. In case a firm is taken over only the other firm bids to hire a manager.

[16] This could depend on the raider's past experience having brought some information on his talent.

4. The hired manager(s) decide the level of effort to exert and the efficiency parameter(s) is (are) determined according to 1.

5. Product market competition takes place.

Firms' and managers' preferences are as in the previous section while the raider is assumed to maximize his expected profit.

A pure strategy for the raider specifies which firm to make the tender offer (if any) as a function of the observed managerial efficiencies in the first period. The equilibrium concept to be used is still the perfect Bayesian equilibrium. Going backward, the hired manager(s) in period two will not exert any effort, as in the previous section. What is really crucial to be analyzed here, is the equilibrium wage(s) of the hired manager(s) in period two.

If a takeover doesn't occur, we can still apply the analysis of the previous section: in particular lemma 1 still holds and determines the equilibrium wages of both managers in period two. However, if a takeover does occur, the firm which has not been taken over is now the only bidder on the managerial labor market and will optimally hire the best manager at the reservation wage. This characteristic of the model may appear quite extreme and indeed somehow unnatural: the occurrence of a takeover has a very heavy external effect on the best manager who completely loose the wage premium that he would have earned in case no takeover were observed. However, the point that I want to stress here is that an external effect of this kind, even if not of this magnitude, in any case emerges. If a firm is taken over the managerial bargaining power on the labor market is somehow weakened: either because less bidders remain or, if the raider participates the labor market, he has a better alternative to the hiring of a manager and then a stronger bargaining position.

Going one step backward, the decision of making a tender offer has to be analyzed. Given that, in case of a takeover, the other firm will end up hiring the best manager,and assuming that manager i resulted the best, the raider anticipates that his post-takeover profits will be[17]: $E_{(z^R,\ z_{i,2})}\left[\pi(z^R, z_{i,2})\right]$. The price that the raider has to pay to acquire control of a firm is the expected profits of that firm in case of no takeover (net of any managerial compensation) but in this model such quantities are exactly the same since firms are paying their managers all the extra profits they are able to produce[18]. Assuming again that i was the best manager in the first period, a tender offer, made to any of the two firms, would then imply a cost, in case of success, which is given by $E_{(z_{i,2},\ z_{j,2})}\left[\pi(z_{j,2}, z_{i,2})\right] - \bar{w}$. The raider would then decide to make the offer if and only if:

$$E_{(z_{i,2},\ z^R)}\left[\pi(z^R, z_{i,2})\right] - \left\{E_{(z_{i,2},\ z_{j,2})}\left[\pi(z_{j,2}, z_{i,2})\right] - \bar{w}\right\} \geq \bar{w}. \qquad (11)$$

[17] To easy notation, in this section I will eliminate any reference to the parameter ϕ which doesn't play any role here.

[18] By introducing some element limiting the managerial bargaining power on the second period labor market, firms would be able to retain part of such extra profits. In this case firm net earnings wouldn't be the same and, in particular, the less efficient firm would have a smaller price.

Recall that $z_{j,2} \sim N(\tau z_{j,1}, (1+\tau)\sigma_\varepsilon^2)$, so that condition 11 is equivalent to $r \geq z_{j,1}$. Manager i will then earn his wage premium in period two with probability one if the event $E_1 = (z_{i,1} + e_{i,1} - \hat{e}_1 > z_{j,1} > r)$ is observed, with probability $(1-\alpha)$ if the event $E_2 = (z_{i,1} + e_{i,1} - \hat{e}_1 > z_{j,1}) \cap (r \geq z_{j,1})$ is observed and with probability zero otherwise. At the beginning of period one, his expected period two wage is then:

$$
\begin{gathered}
w_{ht}(e_{i,1} - \hat{e}_1) = \overline{w} + \\
E_{(z_{i,1}, z_{j1})}\left[wp(z_{i,1} + e_{i,1} - \hat{e}_1, z_{j1}) I(E_1)\right] + \\
(1-\alpha)\, E_{(z_{i,1}, z_{j1})}\left[wp(z_{i,1} + e_{i,1} - \hat{e}_1, z_{j1}) I(E_2)\right] = \\
\overline{w} + \int_r^\infty \int_{v + \hat{e}_1 - e_{i,1}}^\infty wp(u + e_{i,1} - \hat{e}_1, v) dF_{z_{i,1}}(u) dF_{z_{j,1}}(v) + \\
(1-\alpha) \int_{-\infty}^r \int_{v + \hat{e}_1 - e_{i,1}}^\infty wp(u + e_{i,1} - \hat{e}_1, v) dF_{z_{i,1}}(u) dF_{z_{j,1}}(v).
\end{gathered}
$$

Rearranging the previous expression one can easily obtain:

$$
\begin{gathered}
w_{ht}(e_{i,1} - \hat{e}_1) = w(e_{i,1} - \hat{e}_1) - \\
\alpha \int_{-\infty}^r \int_{v + \hat{e}_1 - e_{i,1}}^\infty wp(u + e_{i,1} - \hat{e}_1, v) dF_{z_{i,1}}(u) dF_{z_{j,1}}(v).
\end{gathered} \tag{12}
$$

The interpretation of the previous expression is simple: the existence of a potential raider imposes an expected loss, with respect to the case in which takeover are not possible, and this loss is exactly the expected wage premium manager i could have gained when the other firm is taken over weighted with the probability of effectively suffer such a loss, which is α. Taking derivatives of the previous expression one obtains:

$$
\begin{gathered}
w'_{ht}(e_{i,1} - \hat{e}_1) = w'(e_{i,1} - \hat{e}_1) - \\
-\alpha \int_{-\infty}^r \int_{v + \hat{e}_1 - e_{i,1}}^\infty wp_2(u + e_{i,1} - \hat{e}_1, v) dF_{z_{i,1}}(u) dF_{z_{j,1}}(v).
\end{gathered}
$$

Since the function wp_2 is always positive, the previous expression indicates that, in this particular model, the existence of a potential raider reduces managerial incentives with respect to the case in which the threat of a hostile takeover is not present. Similarly to the case of no takeover, the unique first period equilibrium level of effort e_{ht} is characterized by the condition $g'(e_{ht}) = w'_{ht}(0) < w'(0)$ which clearly identifies a lower level of effort than in the previous section.

The second period equilibrium expected wage, for both managers, can be written as follows:

$$
w^*_{ht} = w_{ht}(0) = w^* - \alpha \int_{-\infty}^r \int_v^\infty wp(\phi, u, v) dF_{z_{i,1}}(u) dF_{z_{j,1}}(v) < w^*. \tag{13}
$$

Managers have then a smaller expected wage in period two, basically because the presence of a potential raider reduces the comparative value of being efficient. Note also that the expected wage decreases in α.

4.2 Discussion

In treating the possibility of a takeover, I didn't discuss the traditional free rider problem among shareholders that tends to increase the tender price. Indeed, it exists a very strong evidence that most of the efficiency gain produced with a hostile takeover goes to target shareholders, in the form of an above the market price (see for example Jensen and Ruback 1983 for a survey of the early literature), but this is not the issue at stake here, since I was primarily concerned with the ex ante incentive effect of the takeover threat. Of course, if the raider is forced to pay a higher tender price, fewer takeover attempts result so mitigating their effect.

Most important here is the source of the negative incentive effect, which has not yet been described in the literature. To better understand it, recall that there are two reasons motivating the managerial effort in period one: first, a larger effort induces a higher probability of being the best and then of earning a wage premium and, second, it also increases the expected wage premium that can be obtained. In this model, however, if a takeover is observed the bad manager exits the industry but, as a bad manager, he doesn't really suffer any additional loss from the takeover, because he ends up with his reservation wage in any case. A manager's real fear is then of being the worst and it doesn't matter whether, in such a case, he is also forced to exit the market by a takeover. The first kind of incentive, then, is not affected by the threat of a takeover. From the other hand, wage premia are smaller under such a threat so that the other source of incentive is reduced, as well as the equilibrium expected wage for the bad manager.

The fact that poorly performing managers do not earn much above their reservation salary is very likely to be true if there isn't any other source of private benefits within the firm. For example, entrenched managers, that are able to fix their own compensation while, at the same time, diluting the monitoring role of the board, are probably enjoying high rents regardless of their performance. In such a case the threat of a hostile takeover is much more serious and would probably have a disciplining effect on managers. This discussion suggests that where the governance structure is weak allowing managers to expropriate shareholders, a hostile takeover can be an effective disciplining device but, in the presence of an otherwise good governance system that itself effectively punishes underperforming managers, takeover is not only unnecessary but even harmful because tends to reduce managerial career concerns. In this light, an antitakeover legislation is beneficial in those industries that have already achieved good governance standards but should otherwise be regarded suspiciously.

To conclude this brief discussion it is worth noting that the upsurge in U.S. managerial compensation observed during the 90's and corresponding to the spreading adoption of antitakeover legislation is consistent with the previous analysis. A stronger legal protection against a takeover corresponds in the model to a smaller value of α, and then to a larger wage. It is usually thought that the adoption of antitakeover legislation is the result of some form of political pressure carried out by managers, eventually constituted in a lobby. The present analysis, however, suggests that such legislation could be efficiently adopted as long as good governance practices are already established.

5 Concluding Remarks

This paper represents an attempt to study the effects of the product market competitive level on the intensity of career concerns. Vickers (1995) suggests that the most basic characteristic of competition is the very existence of competitors and this in itself allows firms to confront the performance of their management with that of other firms'. This relative performance evaluation in the case of career concerns means, according to Vickers, that the learning process on the unknown ability of any given manager takes into account both own performance and the performance of any other manager in the market. Of course this form of relative performance evaluation is relevant only if there exists some correlation among the agents' abilities and its effect depends on the sign of such correlation. If managers' ability are positively correlated then the observation of a good industry performance is the signal that managers' ability is indeed high so that, in this case, the wage paid to any given manager results to be an increasing function of the market performance and this fact gives managers the possibility to free ride on other managers performances then, in principle reducing incentives. The opposite is true if managers ability are negatively correlated (but this latter possibility has a clear meaning only in the case of two managers). Vickers then shows that the overall effect on the ex ante incentive to provide effort depends crucially on the correlation in the measurement errors affecting individual performances: if there is a large positive correlation, incentives to provide effort are increased, the intuition being that if this correlation is strong the precision with which firms can observe their manager's ability is higher and then any given level of effort has a higher impact on the learning process.

The approach presented in this paper abstracts from the existence of any correlation among managers ability (they were in fact assumed to be independent), but the competition among managers on the labor market introduces a new form of relative performance evaluation that is referred to as a "lagged indirect relative performance evaluation": managers are ranked according to past performances and those who resulted the best are offered the highest wages in the future, whose exact amount depends on the level of profits they are able to produce, that is, on the value of their efficiency. It was then shown that changes in market parameters that reduce the value of efficiency also reduces ex ante incentive to provide effort. The existence of a potential raider was also shown to reduce the value of efficiency and then to exert a downward pressure on incentive. It is important to stress that the argument given to describe the negative effect of takeover implicitly assume that there isn't any kind of private benefit that managers are extracting from their job. If this is not the case the takeover mechanism is of course an important device to remove an inefficient management who is earning above its contribution to the firm and also, the fear of loosing the private benefits provides ex ante incentives to exert effort. However, if good governance systems are already in place and prevent management from expropriating shareholders, the above analysis shows a possible downside of takeover[19].

The effect of product market competition on the managerial career concerns is an effect that emerges from the interaction of two markets: the firms product market and the managerial labor market. As such, it would be better treated in a general equilibrium framework but, unfortunately, there isn't any satisfactory way of treating imperfect competition in general equilibrium models. The analysis in this paper, which is framed in a partial equilibrium context, then suffers of several limitations. For example, top executives' skills are usually of a general nature and are worth more or less the same in many different markets. It is in fact not infrequent that the CEO of a firm in a given industry moves to some firm in another industry. In the partial equilibrium framework used in this paper, this would mean that the exogenous outside option for any given manager depends in fact on his performance in the industry, but the kind of dependence would certainly be better treated as a general equilibrium phenomenon. The model should also allow for more then two managers and, possibly, for overlapping generations of managers but these are relatively simpler extensions that shouldn't add too much to the result obtained above.

At a more general level, much remain to be understood on the interaction between competition (in product or factor markets) and corporate governance mechanisms, but my impression is that a reasonable treatment of strategic interactions in general equilibrium is needed to properly address these and related issues.

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