The Determinants of Governance

Piergiuseppe Fortunato and Ana Hidalgo-Cabrillana*

Preliminary Draft
Please do not quote without permission
October 2007

Abstract

Recent empirical evidence shows that corporate governance (CG for short) at the firm level differs across as well as within countries. Moreover the quality of governance is positively correlated with firm performance. However, although CG practices appear to benefit the firm, not all firms adopt good codes. This paper tries to tackle this corporate governance puzzle by endogenizing the choice of governance practices at the firm level as well as the portfolio decisions of investors. In our model managers raise money on financial markets that are subject to imperfections arising from the non-observability of output for financiers. Effective CG at the firm level can be adopted to amend these frictions. Shareholders only observe a signal correlated with the returns. Managers optimally decide about the quality of the signal (i.e. the "quality of governance") trading off the possibility of expropriating a bigger share of the profits against the opportunity of raising more capital on the market. The model delivers important and novel predictions. First, when CG is low shareholders pay an additional premium due to agency problems. Therefore, CG practices at the firm level turn out to be an important determinant of the portfolio choice of shareholders. And second, in equilibrium the quality of CG at the firm level depends on three key variables: the market structure (measured by the level of competition in the capital market), firms' idiosyncratic characteristics (measured by the level of cash flow of the firm), and the country level dimension of CG. We test these predictions with data provided by CLSA and OSIRIS and found that, consistently with our model, firms operating in competitive capital markets tend to display a higher level of CG.

Keywords: Corporate Governance; Asymmetric information; Portfolio Choice

JEL No. D82, E44, G32, O16

*Ana Hidalgo: Departament of Economics, Universidad Carlos III de Madrid. Email: ahidalgo@eco.uc3m.es. Piergiuseppe Fortunato: Università di Bologna and UNDE-SA. E-mail: fortunato@un.org. Financial support from the Spanish Ministry of Education through SEJ2004-00968/ECON grant is gratefully acknowledged.

1 Introduction

A recent and growing literature in the last years focuses on the effects of CG practices. This literature is evolving along two different lines. On the one hand, CG has an external, country-level, dimension. The quality of the institutions of a country affects the investors' returns. Indeed a country's laws specify the rights that investors have, and the enforcement of the laws determines the extent to which these rights are meaningful. This rapidly developing body of literature began with La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997) and analyzes the effects on capital markets of having different degrees of investor protections at the country level. On the other hand, corporate governance has an internal, firm-level, dimension. Shleifer and Vishny (1997) relate firm-level CG to "the ways in which the suppliers of finance to corporations assure themselves of getting a return on their investment". Indeed, many provisions at the country level investor protection laws are not binding since firms generally have some degree of flexibility and may either choose to "opt-out", and decline specific provisions, or adopt additional provisions not listed in the legal code. For example, firms could improve investor protection rights by increasing disclosure, hiring well-functioning and independent (expensive) boards, imposing disciplinary mechanisms to prevent management and controlling shareholders from engaging in expropriation of minority shareholders.

This paper focuses on the firm-level CG. In particular, we study the firm level decisions about corporate governance codes in terms of transparency, and how these decisions impact the portfolio choices of small shareholders. The main motivation for this kind of approach lies in the recent empirical evidence which shows that: (i) CG at the firm level varies across countries as well as within countries (see for example Klapper and Love (2003) and Gompers et al. (2003) among others); and (ii) that corporate governance practices (either by reducing agency problems or improving monitoring of management) can boost performances. But if badly governed firms have lower stock returns and market valuation, why it is no the case that all firms adopt good governance mechanisms?

To address this question, we endogenize the decisions related to firm-level CG practices and we study under which conditions firms adopt effective measures. In particular, in the model the quality of governance is related to the quality of the information that investors have about the firms' returns. In this respect, the paper is mainly crafted for understanding the role of transparency on investment decisions. We also analyze how disclosure affects the relationship between minority shareholders and manager. The common belief is that increased transparency is unambiguously good since it reduces asymmetric information, and hence lowers the cost of raising the firm's securities and the firm's cost of capital. We argue that, from the perspective of controlling shareholders, there are likely to be both cost and benefits related to an increase in transparency, leading to a threshold level beyond which increasing transparency it is no optimal to them.

We propose a two stage game. In the first, the contract between managers

(who control the firm) and minority shareholders is written. In the second, the returns on the investment are realized and the contract is executed. Return's realizations however are known just by the managers. In contrast shareholders just observe a signal which is positively related to the returns. Each manager optimally selects the precision of the signal ex ante (i.e., our measure of CG) trading off the potential gains of expropriation against the capacity of attracting external funding. Outside investors in turn rationally formulate their asset allocation and consumption-saving decisions. At the beginning of the first period lacking an initial endowment, and needing resources to use their technology, managers go to the capital markets. The financial instrument available is equity. In common with much of the literature on optimal contracts with hidden information, we model the interaction between investors and managers as a message game. Optimal contracts are written contingent on the manager's claim and all public information. The contract is given by a contingent transfer that shareholders provide to the manager. Since managers have the possibility of misreporting their outcomes and hiding resources, shareholders will offer in equilibrium a transfer written in such a way that manager will not have incentives to lie about the returns. Moreover when shareholders receive both the claim and the signal, they choose either if to go or not to the court. If managers are caught when lying, they pay a penalty cost. This cost represents the he country level dimension of CG.

The model delivers several predictions. First, we show that the equilibrium contract (i.e., the transfer) depends negatively on the level of CG at the country and at the firm dimension implying that, when CG is low, shareholders pay an additional premium due to agency problems. Second, we find that CG practices at the firm level are an important determinant of the portfolio choice of shareholders. Indeed, firms with a higher level of CG have a higher amount of capital invested in the firm. Finally, in equilibrium CG at the firm level turns out to depend on three key variables: the market structure, firm's characteristics and country level dimension of CG.

In our model market structure is given by the level of competition in the capital market, which is measured by the number of firms demanding capital. We find that higher competition increases the level of CG at the firm level. The mechanism is simple. The higher is the number of firms in the capital market, the easier will be for the risk adverse shareholders to diversify the risk. Indeed, the higher is the number of firms, the less important is each firm in order to reach full portfolio diversification. As a result managers have less market power and they now need to offer high quality of governance in order to attract funding.

Firm's characteristics are given by the level of cash flow of the firm. We show that a higher level of cash flow increases the quality of CG at the firm level. When cash flow is high, agency problems increase because the manager has more incentives to divert the profits. Knowing this, shareholders would in turn demand fewer assets, forcing the managers to impose ex-ante stricter governance mechanism to prevent ex-post expropriation. This result is in line with the empirical results of Himmelber, Hubbard and Palia (1999) who argue that some firms find it easier to expropriate from minority shareholders due to

the nature of their operations. Thus the composition of the assets of a firm affects its contracting environment because it is easier to monitor and harder to steal fixed assets (i.e. machinery and equipment) than "soft" capital (i.e. intangibles, R&D capital, and short-term assets, such as inventories). Therefore, firms operating with higher proportions of intangible assets may find it optimal to adopt stricter governance mechanisms to signal to investors that they intend to prevent the future misuse of these assets.

The model also suggests that CG practices depend on the level of CG at the country level in a non trivial way. We show that low country-level CG implies a higher firm-level CG. This is the case since firms try to overcome the negative effects of weak legal environment, and attract investments, by practicing good corporate governance. This relationship of substitutability between country and firm level CG is in line with recent empirical evidence. Klapper and Love (2003), Durnev and Kim (2005) and Bruno and Claessens (2006). Similarly, Doidge et al. (2004) show that even though country governance is an important determinant of firm-level CG, when firms have access to global capital markets country characteristics matter less to explain the quality of governance practices at the firm level.

Finally, we test our theory by analyzing the role of competition as determinant of CG at the firm level. We found that, consistently with our predictions, firms operating in more competitive capital markets tend to display better CG practices.

The remainder of this paper is organized as follows. In section 1 we set up the economy. In section 2 we solve de optimal contract. Then, we solve the shareholder problem (section 3). In section 4 we solve the manager problem. We test our theory in section 5. Finally, we conclude and the appendix contain all the omitted proofs.

2 The Model

The model economy is populated by two kinds of individuals managers (alternately entrepreneurs or insiders) and shareholders who live for two periods. There is no population growth. Since managers have no capital endowment, to exploit the potential production possibilities they have to rise money on financial markets. Financial markets are subject to imperfection arising from the non-observability of output for financiers, but CG at the firm level can be adopted to amend these frictions. In particular, we will show that by promoting transparency, misreporting output becomes more difficult to managers.

2.0.1 The Set up

Managers

We consider an economy with n managers and m shareholders. Each manager, who is the controlling shareholder, has to raise funds to finance an investment opportunity. Moreover, we consider risk neutral managers without

initial wealth, but endowed with a risky project. The investment opportunity per unit of capital is given by $\Omega \equiv \left\{R, 0, \frac{1}{n}\right\}$. That is, an investment of capital k will return Rk (the firm cash flow before expropriation) with probability $\frac{1}{n}$ and zero with probability $1 - \frac{1}{n}$. Information technology is public, but outside financiers can not observe the outcome of the risky project. We are considering an economy which is characterized by n possible states of natures (s_n) and in each state only one firm could have strictly positive returns.

	s_1	s_2	...	s_n
Ψ_1	R	0	...	0
Ψ_2	0	R	...	0
...	...	...	...	...
Ψ_n	0	0	...	R

The Arrow security $\Psi_1 = (R, 0, 0....., 0)$ in firms one pays R if and only if state one occurs, similarly the asset Ψ_n in firm n pays if an only if state n occurs.[1]

Since entrepreneurs have no endowment, they can undertake their projects only if investors finance them. We assume managers use equity via Constrained-Pareto optimal two-period contracts. Equity is modeled as follows. Upon receiving one unit of capital, each firm i commit to pay, after cash flow is realized, dividend payouts $R^c \in \{R, 0\}$ in case of success and failure respectively, with c being the manger's claim. Entrepreneurs extracts private benefits after having raised funds and once the cash flow is realized.

The equilibrium contract specifies the cost of investing in the capital market. A financing contract offered to a manager consists of a commitment to pay contingent transfer $w^i(R^c)$ and $w^i(0^c)$ in case of high or low returns respectively, that investors pay to managers once the returns are realized.

Information Structure

From the point of view of a single firm, the output realization per unit of capital invested is either high R or low 0. We assume that the output realization is private information to the managers. Thus, in the second period managers receive the returns realization and shareholders, instead, receive a binary symmetric signal with two possible values: high and low. The correlation between the signal and the realized returns are given by the following matrix

	signal = h	**signal = l**
R	p^i	$1 - p^i$
0	$1 - p^i$	p^i

Under perfect information it will be either $p^i = 1$ or $p^i = 0$, while the signal conveys no information about the realization of the project when $p^i = \frac{1}{2}$. Since

[1] We assume a perfect negative correlation among projects, so that investors have incentives to diversify their portfolio allocations. As long as there are incentives to diversify, the model goes through.

there is a perfect symmetric binary signal we assume without loss of generality that $p^i \in [\frac{1}{2}, 1]$ so that when the signal is $s = h$, then

$$p(h/s = h) = p^i > \frac{1}{2},$$

while when $s = l$, then

$$p(h/s = l) = 1 - p^i < \frac{1}{2}.$$

Since output is not observable, managers have the option of hiding some output from the shareholders. However, the better the quality of the signal received by the shareholders the easier will be to protect themselves by attempt of expropriation by part of the managers. This is the reason why we take the quality of this signal as an indicator for the quality of governance. In particular, we assume that managers decide about the quality of governance trading-off the benefit of attracting more capital against the possibility of extracting bigger informational rents from investors.

Timing

There are two periods. In the first period, the representative shareholder is endowed with an endowment of $\overline{K}$ capital, managers by contrast are endowed with a project. Once the manager chooses the level of corporate governance, each one proposes her project, $\Pi^i \equiv \left\{\Omega, p^i\right\}$, on the financial market. Second, the representative shareholder chooses how to split her endowment between consumption and investments, as well as the composition of her portfolio.

At the outset of the second period, a manager borrows k from the shareholders, invests and produces output equal to either Rk or 0. The realization of the project is private information to the manager. Then, he makes a claim about the quality of her project $R^c \in \{R, 0\}$, gives the intermediary output consistent with the claim, i.e. ($R^c k$, or $0^c k$) and receives a contingent transfer, $w^i(R^c), w^i(0^c)$. The entrepreneur has the option of hiding some of their cash flow from their shareholders. Therefore a financial contract consists of a contingent transfer $w^i(R^c)$ and $w^i(0^c)$ in case of claiming high or low returns respectively.

After that, the representative shareholder decides, on the basis of the signal, the claim and the observed p^i, whether or not to go to court. In case shareholders go to court and the manager is caught lying, the manager pays the penalty Fk. Managers end up with income denoted by $y_{i,t+1}$, if the project is of low quality $y_{i,t+1} = w^i(0^c)$. Having no endowment, an agent is unable to misreport in the low state, since this would entail surrending a level of output $Rk > 0$. If the project is of high quality, truthful reporting yields $y_{i,t+1} = w^i(R^c)$, and concealing yields $y_{i,t+1} = w^i(0^c) + [R - 0^c]k$. By misreporting the manager receives the transfer intended for low quality projects plus the hiding output. Moreover, in case shareholders decides to go to court, and managers are caught lying, manager's income becomes $y_{i,t+1} = w^i(0^c) + [R - 0^c]k - Fk$.

Finally, shareholders consume the proceeds from her investments.

As we will see later on, the constrained Pareto-Optimal contract always require the output surrendered to be consistent with the report. In turn, this imply no hiding along the equilibrium path.

The solution strategy is by backward induction. After having characterized the optimal contract that will link the manager to the shareholders and analyzed the individual's investment decision, we then move backward and study the choice of the manager regarding the design of corporate governance.

Shareholders

Differently with respect to managers, shareholders are assumed to derive utility by consuming in the two periods. In particular, we assume risk averse individuals with a Cobb-Douglas specification,

$$U_{j,t} = C_{j,t}^{1-\alpha} C_{j,t+1}^{\alpha} \qquad \forall j = 1, ...m,$$

where $C_{j,t}$ is the amount consumed in period one, and $C_{j,t+1}$ is consumption in period two. Given the symmetry among shareholders, in what follows we will concentrate on a representative shareholder. Shareholder makes the consumption-saving and a portfolio choice decision. Each shareholder is endowed with an amount of physical capital equal to $\overline{K}$. She faces the following budget constraint in the first period

$$c_t + \sum_{j=1}^{n} k_t^j = \overline{K},$$

where c_t represents the amount used for consumption of period one, and $\sum_{j=1}^{n} k_t^j$ is the amount invested in a diversified portfolio of risky assets. In the second period shareholders consume the pay off of the diversified portfolio. In fact, in case that firm i success, shareholders' income will crucially depend on the claim made by the manager as well as on the cost of investing in the firm,

$$y_{s,t+1} = R^c k_t^i - w^i(R^c),$$

where R^c represents the manager's claim; k_t^i is the amount of capital invested in asset i by the representative shareholder; and w^i represents the equilibrium contract paid by the representative shareholder to the manager i.

The shareholder receives information about the output realization from three different sources. She observes the signal, its precision and the manager's claim. Thus, when the claim and the signal differs, the shareholder goes to the court. When the manager is caught guilty he has to pay a penalty cost F.[2] We assume this cost to be proportional to the total capital invested in the project, capturing that bigger firms will have to pay a higher penalty in case managers are caught. F represents the investor's protection granted by the state, that is the country level of CG. The cost of lying is some fine F per dollar invested. We also assume that when the signal differs from the realizations and shareholders goes to court but managers were saying the truth, $F = 0$. We will show that the extent to which firms choose to improve upon the investor protection granted by the state (that is F) depends on the cost and benefits of doing so.

[2] Note that, as will become clear below, it is always optimal for the investors to charge this penalty if the claim does not coincide with the signal. This is the case since "penalty" costs zero for the investors and it motivates the manager not to lie.

2.0.2 The Equilibrium Contract

The incentive compatibility constraints

In our set-up the returns of the project can be either R or 0, this implies that we have to consider two incentive compatibilities constraints. When the realized returns are 0, the utility of the manager i if she tells the truth has to be higher or equal to the utility if she lies. Since managers are risk neutral this reads as follows,

$$\begin{aligned} & p^i\{w^i(0^c) + [0 - 0^c]k_t^i\} + (1 - p^i)\{w^i(0^c) + [0 - 0^c]k_t^i\} \qquad \text{(IC1)} \\ \geq \quad & (1 - p^i)\{w^i(R^c) + [0 - R^c]k_t^i\} + p^i\{w^i(R^c) + [0 - R^c]k_t^i\}, \end{aligned}$$

where the RHS is the expected utility of the manager in case she lies since, as described above, $(1 - p^i)$ represents the probability that the representative shareholder will receive a signal which confirms the claim of the entrepreneur. The inequality above can be rewritten as,

$$w^i(0) \geq w^i(R^c) - R^c k_t^i, \qquad \forall i = 1, ..., n.$$

Analogously, when the returns are high the utility of the entrepreneur reporting the truth has to be higher or equal than the utility she receives if she lies,

$$\begin{aligned} & p^i\{w^i(R^c) + [R - R^c]k_t^i\} + (1 - p^i)\{w^i(R^c) + [R - R^c]k_t^i\} \qquad \text{(IC2)} \\ \geq \quad & (1 - p^i)\{w^i(0^c) + [R - 0^c]k_t^i\} + p^i\{w^i(0^c) + [R - 0^c]k_t^i - Fk_t^i\}. \end{aligned}$$

Notice that independently of the realized returns, the best manager's strategy is to claim low returns. Indeed, when her claim is high, this strategy is implicitly self-revealing. Therefore, when manager's claim is high and the signal is low, shareholders know that managers are telling the truth and thus they do not go to court (see RHS of IC1). On the contrary, when the claim is low shareholders may conclude that managers are lying. When manager's claim is low and the signal is high, shareholders and managers go to court (see RHS of IC2) an event that occurs with probability p^i. Moreover only when the claim is low, and the signal is high shareholders decides to go to court. But then it can be that either the managers tell the truth, in that case, the manager does not pay any cost F (see the LHS of the IC1). The other possibility is that the manager is lying, but then he pays the penalty cost F (see RHS of equation IC2). The LHS shows that when the returns as well as the claim are low, and the signal is high, shareholders decides to go to court. Since the manager is not guilty, he does not pay the penalty cost Fk_t^i.

The IC2 can be written as,

$$\begin{aligned} w^i(R) \quad & \geq \quad w(0^c) + Rk_t^i - p^i F k_t^i \\ & \Leftrightarrow \quad w^i(R) - w^i(0^c) \geq [R - p^i F]k_t^i, \quad i = 1, ..., n. \end{aligned}$$

The next lemma shows which incentive compatibility are binding in equilibrium. Therefore, considering (IC1) and (IC2), we have

Lemma 1 *In equilibrium, the incentive compatibility constraint when the returns are high is binding while the incentive compatibility when the returns are low is not.*

Proof. *Take lower bound of IC2, i.e.* $w^i(R) = w^i(0) + [R - p^i F]k_t^i$, *and substitute into IC1 so that*

$$0 \geq -2p^i F k_t^i$$

Since $p^i \in [\frac{1}{2}, 1]$, *the inequality above always holds.* ■

The intuition of Lemma 1 is clear, having no endowment, a manager is unable to misreport in the low state, since that would entail surrendering a positive amount.

We are now in a position to characterize the optimal incentive scheme for manager i. To this aim we study the problem that shareholders (i.e., the principal) face when they offer a contract to the manager. In doing this we will not take into account potential coordination problem among shareholders and simply study the decisions that would be taken by a representative shareholder.

Proposition one record the equilibrium contract. Under the contingent contract W_2^i the manager i does not have incentives to lie (since by construction W_2^i is IC), and therefore the returns related to an investment in asset i will be equal to $(R-x^i)k_t^i$ if the project yields a positive realization and zero otherwise. This implies that W_2^i will guarantee to the shareholders returns strictly higher than W_1^i when the project succeeds while the returns will be the same in case of failure. As a consequence, the chosen contract in equilibrium is W_2^i,

Proposition 2 *The equilibrium contract offered by the shareholders to each entrepreneur satisfies the incentive compatibility constraints and therefore always induce truthfully behavior. In particular it is given by:*

$$W_2^i = \{w^i(0) = 0, w^i(R) = [R - p^i F]k_t^i\} \quad \textit{for every } i = 1, ..., n$$

Proof. See Appendix B. ■

Corollary 3 *The cost of the investment (per unit invested) paid by the shareholders is decreasing in our measures of CG at the country (*F*) and at the firm level* p^i.

In fact, Fp^i is the additional premium due to agency problems. Therefore, measures aimed at improving transparency and disclosure of information to the shareholders either at the country or at the firm level (that is either a higher F or p^i respectively) reduce the cost of outside-finance. This result is consistent with the empirical papers, even though our mechanism is different (see, for instance, Shleifer and Wolfenzon (2000), Himmelberg et al. (1999), Castro et al., (2004)). In their model when investor protection (country-level CG) is perfect, since insiders are risk averse, managers would optimally diversify fully idiosyncratic risk and to steal nothing. By contrast, under imperfect investor protection,

by retaining a higher fraction of equity insiders can credibly commit to lower rates of stealing, but are forced to bear higher levels of diversifiable risk, which implies that risk sharing is not complete and thus the cost of capital increases. Therefore, their empirical predictions are first, the weaker is investor protection the higher is the concentration of inside equity ownership. And second, the higher is the concentration of inside ownership the higher is the implied cost of capital. Then, there is a negative correlation between investor protection and cost of capital. In our model, this correlation is also negative, but not through ownership concentration (notice that in our model managers are risk neutral), but through additional premium paid by the representative shareholder to the manager to induce him no to lie diverting the firm's profits. Therefore, investors pay more when CG is low because they recognize that with this extra payment for the manager, more of the firm's profits would come back to them as interest or dividends as opposed to being expropriated by the manager who control the firm. Therefore, better minority shareholders protection (that is, higher CG) will be likely to lower their cost of investing in the firm.

The deadweight cost associated with the extraction of private benefits increase the cost of outside funds for the manager. As a result, managers for which access to capital markets is important have incentives to find ways to commit to expropriate fewer private benefits. The literature has shown that by increasing their ownership of cash flow rights, managers make the extraction of private benefits more costly because they pay for more of these private benefits out of the shares they own. As the extraction of private benefits become more costly, it is optimal for managers to consume fewer such benefits. Firms can also make extraction of private benefits more costly through better governance. For instance, by increasing the firm's transparency, managers make it easier for outsiders to measure their consumption of private benefits and to take actions to reduce it. In this paper, we allow for a role for corporate governance.

From an empirical point of view, Leuz and Verrechia (2000) document that firms' cost of capital decreases when they voluntarily increase transparency.

The representative shareholder attempts to maximize utility under the constraint given by the incentive compatibility of the entrepreneur.

Corollary 4 *The shareholders' expected utility is increasing in the level of corporate governance, either at the country or at the firm level.*

Since a higher level of corporate governance at the firm and at the country level, implies a higher level of investor protection, shareholder always prefer higher quality of corporate governance to a lower one.

Furthermore, since expected returns of the shareholders are strictly increasing in F, if the shareholder decide the choice of choosing F whenever her claim is at odds with the signal (i.e., if we let the shareholders choose between $F = 0$ or $F > 0$), these ones will always opt for the former possibility. The higher is n the lower is the probability of success. As a result, the utility of the shareholders in expected terms decreases too.

2.0.3 Portfolio Choice

Shareholder j solves the problem

$$\begin{aligned} Max_{\{c_t,(k_t^i)_1^n,c_{t+1}\}} \quad E(U_{t,j}) &= E_t(c_t^{1-\alpha}c_{t+1}^{\alpha}), \\ st. \qquad c_t + (\sum_{i=1}^{n} k_t^i) &\leq \overline{K} \\ c_{t+1} &\leq y_{j,t+1} \\ y_{j,t+1} &= \begin{cases} Rk_t^i - w^i(R) & if \quad s_1 \\ \quad ... & ... \quad ... \\ Rk_t^i - w^i(R) & if \quad s_n \end{cases} \end{aligned}$$

The solution is given by,

Proposition 5 *The amount of equity that the representative shareholder invests in the firm i is given by*

$$(k_t^i)^* = \frac{(\frac{p^i}{\widetilde{p}})^{\frac{\alpha}{1-\alpha}}}{(n-1) + (\frac{p^i}{\widetilde{p}})^{\frac{\alpha}{1-\alpha}}} \alpha \overline{K} \tag{1}$$

Proof: See Appendix B.

This equation has the interpretation of an equity supply schedule. Notice that since $k_t^{i*}(p^i)$, foreign investors internalize manager's behavior, so that the level of corporate governance will affect their investment decisions. The amount of investment in asset i is characterized in the following corollary,

Corollary 6 *The stock of capital invested in firm i is decreasing with the numbers of firms and increasing with p^i.*

The more interesting result tells us that the higher the quality of the signal and thus the quality of CG at the firm level, the higher will be the capital invested in this company (since the higher are the expected profits)[3]. That is, our model tell us that better CG enables firms to access capital markets on better terms, which is valuable from firms intending to raise funds. Consistent with our result, recent research by La Porta et al. (1997, 2003) links strong investor protection laws with broader and deeper capital markets, a more dispersed shareholder base, and more efficient allocation of capital across firms. Their research suggests that countries with poor investor protection have significantly smaller equity and debt markets.

The fact that a higher level of CG implies more amount of capital invested in the firm is also in line with the empirical evidence provided by Himmelberg, Hubbard and Love (2002). Using firm-level date from Worldscope for 38 countries, they estimate that the fraction of equity owned by insiders depends negatively on investor protection. That is, the weaker is investor protection, the higher is the concentration of inside equity ownership.

[3] This is so even though there is the opposite effect due to decreasing marginal utility function in consumption.

3 Determination of Quality of Governance

After having characterized the optimal contract and the shareholder's investment decision, we are now in a position to move backward and study the choice of the manager regarding the design of corporate governance.

All the m shareholders will sing the same contract with the entrepreneur, so the expected utility of the entrepreneur i ($E(U^i)$) is

$$E(U^i) = \frac{1}{n}\{(R - p^i F)k^i_{t,1} + ... + (R - p^i F)k^i_{t,m}\} + (1 - \frac{1}{n})0,$$

where $k^i_{t,1}$ is the amount invested by shareholder one in firm i at time t. Summing up among all shareholders,

$$E(U^i) = (\frac{R}{n} - \frac{p^i F}{n})\sum_{s=1}^{m} k^i_{t,s} = (\frac{R}{n} - \frac{p^i F}{n})mk^i_t$$

The last equality is given by the fact that $\sum_{s=1}^{m} k^i_{t,s}$ is the total amount of capital invested by all shareholders in the firm i at time two. By substituting the optimal value of $(k^i_t)^* = \frac{(\frac{R-x^i}{R-\widetilde{x}})^{\frac{\alpha}{1-\alpha}}}{(n-1)+(\frac{R-x^i}{R-\widetilde{x}})^{\frac{\alpha}{1-\alpha}}}\alpha\overline{K}$, the expected utility of the entrepreneur i

$$E(U^i) = \frac{1}{n}(R - p^i F)\alpha\overline{K}\frac{(\frac{R-R+p^i F}{R-R+\widetilde{p}F})^{\frac{\alpha}{1-\alpha}}}{(n-1) + (\frac{R-R+p^i F}{R-R+\widetilde{p}F})^{\frac{\alpha}{1-\alpha}}}$$

Let us know consider the entrepreneur's decision. He has to choose the quality of the corporate governance, i.e. the quality of the signal that the shareholder will receive, in order to attract investors. Clearly he faces a trade-off: better signals will attract more capital but will decrease the informational rents that she enjoys due to the informational asymmetries on the state of the economy. Technically the entrepreneur's problem is given by

$$Max_{p^i}\ E(U^i) = \frac{1}{n}(R - p^i F)m(k^i_t)^*,$$

$$s.t. \quad (k^i_t)^* = \frac{(\frac{p^i}{\widetilde{p}})^{\frac{\alpha}{1-\alpha}}}{(n-1) + (\frac{p^i}{\widetilde{p}})^{\frac{\alpha}{1-\alpha}}}\alpha\overline{K}.$$

By FOC ,

$$Fk^{i*}_t = (R - p^i F)\frac{\partial k^{i*}_t}{\partial p^i}$$

The left hand side is the marginal cost of better governance and the right hand side is the marginal benefit. Since $p^i = p\ \forall i = 1, ...n$,the optimal value of p^* is

$$p^* = \frac{R}{F}\left(\frac{(n-1)\alpha}{\alpha(n-1) + (1-\alpha)n}\right), \tag{2}$$

notice that the parameter needs to satisfied $\frac{1}{2} \leq p^* \leq 1$. Therefore, $A1$ always holds

$$\frac{1}{2} \leq \frac{R}{F}\left(\frac{(n-1)\alpha}{\alpha(n-1)+(1-\alpha)n}\right) \leq 1. \tag{A1}$$

The next proposition shows that if the level of CG is an interior maximum, then the determinants on CG are given by the level of product market competition of the firm, the country-level CG and the returns of the firm.

Proposition 7 *Under A! the determinants of CG are given by the following conditions,*

$$p^* = \frac{R}{F}\left(\frac{(n-1)\alpha}{\alpha(n-1)+(1-\alpha)n}\right), \tag{3}$$

Moreover the following comparative statics holds:

i) CG at the firm level is strictly decreasing with the degree of market competition, n ii) CG at the firm level is strictly increasing with the level of corporate profits of the firm, R iii)CG at the firm level is strictly decreasing with the country level dimension of CG, F.

First, our model shows that more competition lead to substantial improvements in the quality of governance. The mechanism through which more competition increases CG at the firm level is via portfolio diversification and "monopoly power" of the manager. That is, in our model risk averse shareholders like to reduce the risk of investing by diversifying the portfolio. As the number of firms operating in the market increases, the number of securities in shareholder's portfolio increases too. In fact, in our model more competition means more developed CM, which implies easier portfolio diversification. Therefore, this implies that each manager has "less monopoly power" with respect to the shareholders, and then the only possibility of attracting capital for the firm is by increasing CG.

Most of the literature (theoretical as well as empirical) studies how do product market competition and CG interact when affecting firm productivity. The theoretical literature is quite controversial. On the one hand, the traditional view shows that product market competition, and thus low industry concentration, is a mechanism that can impose discipline on a firm's management. Competition by reducing a firms' profit margins, would limit the opportunities available to managers for expropriating wealth from investors and would force firms run by wasteful managers out of business (see Vives, 2000). Also, product market competition would force firms to improve their CG systems as part of their cost minimizing efforts (Stigler 1958). Thus, as the economic environment becomes competitive, firms find themselves under greater pressure to eliminate inefficient governance systems and to provide better protection to their investors (see Allen and Gale 2000). As a result, economies characterized by a high level of competition should also enjoy a better CG system and a higher level of investor protection. On the other hand, Aghion and Howit (1997) and Aghion and al. (1999) propose a model in which competition appears as a substitute

to "good" CG (measured by financial pressure) at the firm level. Similarly, Bolton, 1995 and Stiglitz, 1999 argue that competition turned out to be more important than ownership (CG) and it should have been put in the center of the transformation strategy from the very beginning. That is, product market competition can be considered as a substitute for efficient CG.

Little empirical evidence has been done concerning the relationship between product market competition and control. In fact, some empirical papers studies the interaction of CG and product market competition in determining productivity at the firm level. Nickell et al. (1997) are the first to analyzed this questions. They estimate the effects of competition, shareholders control and debt levels on firm-level productivity growth in the UK., including interactions terms. Their results show a positive influence of product market competition, ownership control and financial pressure on productivity growth. Moreover, they find that competition and control can be considered as (weak) substitutes in a panel of British firms; a recent paper by Januszewski et al. (2000) find an ambiguous result on a panel of German firms.

Theoretical and empirical analysis of the effects of product market competition and corporate governance on firm performance do not provide us with a clear prediction. By contrast our paper does not concentrates on firm performance. Indeed, the objective is to study the determinants of CG. Our paper is in line with the complementary view where the effectiveness of CG would be enhanced by market competition, and vice-versa. In such case, product market competition alone might not be sufficient to reduce productive inefficiencies in an environment with poor CG. In fact, we obtain that competition and CG are complements but the procedure is quite different. In the traditional literature more competition implies less profits and then less possibility of diverting output, which implies higher CG. By contrast, in our model more competition entail more possibilities to diversify the portfolio, so the only way that firm have to differentiate among competitors is by increasing their CG. In this way managers would attract more capital.

Second, in our model the penalty cost F is interpreted as the parameter that represents the level of public or country level of CG. Therefore, a higher penalty cost involve better institutions and more specifically, better investor protection. We study the relationship between country and firm-level CG. We show that the better the "public governance" the smaller the quality of governance at the firm level.In general, the relationship between the country level legal infrastructure and firm-level corporate governance mechanism is far from obvious. One supposition is that firms in countries with weak laws would want to adopt better firm-level governance to counterbalance the weaknesses in their country's law and their enforcement and signal their intentions to offer greater investor rights. This would suggest a negative correlation between the strength of firm-level governance and country-level laws. A second possibility is that in countries with weak laws the degree of flexibility of firms to affect their own governance is likely to be smaller (i.e. the firm is likely be constrained by the country-level legal provisions), which would imply a positive correlation.

Our results suggest that firms in countries with poor investor protection can improve their corporate governance, which may improve their performance and valuations. Our result do not attempt to imply that firm-level corporate governance is a replacement for country-level judicial reform. Our result is consistent with the evidence provided by Klapper and Love (2002). They show that firm-level corporate governance provisions matter more in countries with weak legal environments. These results suggest that well governed firms benefits more in bad corporate governance environments, and that firms can partially compensate for ineffective laws and enforcement by establishing good corporate governance and providing credible investors protection.

Third, our model shows that higher corporate profits, in turn, increases the incentives to improve corporate governance. Klapper and Love (2003) and Gompers et al. (2003) found a positive and strong correlations between CG at the firm level and firms' returns. In fact they concludes that higher CG implies higher returns (Gompers et al. (2003)). In our model by contrast we found that the causality goes in the other direction, that is better returns implies better CG. This is so because, when the return are high, agency problems increases because the manager has more incentives to lie. Since this implies that shareholders would demand less assets for this particular firm, the firm would find it optimal to impose ex-ante stricter governance mechanism to prevent ex-post expropriation. Recently, Kedia and Philippon (2005) have studied the dynamics of accounting frauds. Consistent with this model, they show that firms with weak governance are more likely to commit frauds, that these frauds are more likely to happen in a boom.

If we consider an industry in which profits fluctuate with the business cycle and during an upswing profits increase while profits decrease in a recession. R may be interpreted as the profits of the firm (R is the return on asset i per unit invested), so that in an upswing R is high. Then we would obtain that in a boom the quality of governance improves. Therefore, an interesting extension of this model would be to work on a dynamic extension a la Gali to study the effects of business cycles on corporate governance.

A second extension may be to endogenize R. In real world these returns differ across industries, and depend on ability of the manager, the size of the firm etc. Himmelber, Hubbard and Palia (1999) argued that some firms would find it easier to expropriate from minority shareholders due to the nature of their operations; therefore, these firms would find it optimal to impose ex-ante stricter governance mechanisms to prevent ex-post expropriation. For example, the composition of the assets of a firm will affect its contracting environment because it is easier to monitor and harder to steal fixed assets (i.e. machinery and equipment) than "soft" capital (i.e. intangibles, R&D capital, and short-term assets, such as inventories.) Therefore, firms operating with higher proportions of intangible assets may find it optimal to adopt stricter governance mechanisms to signal to investors that they intend to prevent the future misuse of these assets.

4 Testing the Model

[To be completed]

5 Conclusions

Empirical works show that measures of corporate governance at the firm level are correlated with firm's performance. It is therefore important, from a theoretical point of view, to understand which factors determine the quality of governance. To this end, we endogenize the choice of governance practices at the firm level. In our model managers need investors in order to finance the firms, and they have private information on the firms' returns. Conversely, investors only observe a signal that is correlated with the returns. Managers optimally decide about the quality of the signal (and therefore about the "quality of governance") trading off the possibility of expropriating a bigger share of the profits against the opportunity of rising more capital on the market.

The main prediction of the model is that more competition among firms implies a better "quality of governance" at the firm level, it also leads to bigger capital markets. We also show that firms in countries with poor investor protection can improve their corporate governance.

6 References

Acemoglu D. and S. Robinson (2005), "Unbundling Institutions," *Journal of Political Economy*, 113, 949-995

Aghion, P., M. Dewatripont and P. Rey (1999), "Competition, Financial Discipline and Growth," *Review of Economics Studies*, 66, 825-852.

Aghion, P. and P. Howit (1997), "A Shumpeterian Perspective on Growth and Competition," in Kreps D. and K. F. Wallis (eds.) Advance in Economics and Econometrice: Theory and Applications, Cambridge Univeristy Press.

Alchian, A. (1959), "Uncertainty, Evolution, and Economic Theory", *Journal of Political Economy*, 58, 211-221.

Allen, F. and Gale, D. (2000) "Corporate Governance and Competition" in X. Vives (ed.), Corporate Governance, Cambridge University Press, Cambridge, UK.

Berkowitz, D., Pistor and J. Richard (2002) "Economic Development, Legality and the transplant effect " European Economic Review.

Bolton, P. and Ernst-Ludwig von Thadden (1998) "Blocks, Liquidity and Corporate Control," *Journal of Institutional and Theoretical Economics*, 154, 177-223.

Castro, C., G. Clemmenti and G. Mcdonald (2004), "Investor Protection, Optimal Incentives and Economic Growth," *Quaterly Journal of Economics,* 119(3), 1131-1175

Craig Doidge, G. Andrew Karolyi, Renè M. Stulz (2006), "Why do Countries Matter so much for Corporate Governance?", *Journal of Financial Economics*, forthcoming.

Franklin Allen, Jun Qian, Meijun Qian (2005), "Law, Finance and Economic Growth in China," *Journal of Financial Economic,* 77, 57-116.

Gompers, P. L. Ishii, and A. Metrick (2003), "Corporate Goverance and Equity Prices, " *Quartely Journal of Economics*, 118, 1076-155.

Himmelberg, Hubbard and Love (1999), "Investor Protection, Ownership and the Cost of Capital," mimeo.

Himmelberg, Hubbard and Palia (1999), "Understanding the determinants of managerial ownership and the link between ownership and performance," *Journal of Financial Economics*, 53, 353-384.

International Country Risk Guide, 2000.

Januszewski, S.L., Köke F.J. and Winter J.K. (2000), "Product Market, Competition and Corporate Governance and Firm Performance: An Empirical Analysis for German," mimeo.

Kedia, S. and T. Philippon (2005) "The Economics of Fraudulent Accounting," mimeo.

Klapper, L.F and Inessa Love (2003), "Corporate Governance, Investor Protection, and Performance in Emerging Markets," *Journal of Corporate Finance,* 195, 1-26.

La Porta R., F. López de Silanes, R. Vishny and A. Shleifer (1997), "Legal Determinants of External Finance," *Journal of Finance*, 52, 1131-1150.

La Porta R., F. López de Silanes, R. Vishny and A. Shleifer (1998), "Law and Finance," *Journal of Political Economy*, 106, 1113-1155.

La Porta R., F. López de Silanes, R. Vishny and A. Shleifer (1999), "Corporate Ownership around the World," *Journal of Finance*, 54, 471-517.

La Porta R., F. López de Silanes and A. Shleifer (2006), "What Works in Security Law?," *Journal of Finance*, 41, 1-32.

Leuz, C. and R. E. Verrecchia, "The Economic Consequences of Financial Reporting and Disclosure Regulation," Journal of Accounting Research, 2000, 38 (suplement), 91-124.

Shleifer, A. and R. W. Vishny, (1997), "A Survey of Corporate Governance," *Journal of Finance* 52, 737-83.

Shleifer, A. and D. Wolfenzon (2002), "Investor Protection and Equities Markets," *Journal of Financial Economics*, 66, 3-27.

Stigler, George (1958) "The Economies of Scale," *Journal of Law and Economics*, 1, 54-71.

Stiglitz, Joseph (1985) "Credit Markets and the Control of Capital," *Journal of Money, Credit and Banking*, 17, 133-152.

Vives, X. (2000), "Corporate Governance: Does it matter?" in X. Vives (ed.), Corporate Governance, Cambridge University Press, Cambridge, UK.

7 Appendix A

In the current version of the model if managers are caught guilty they pay a penalty F but they can keep the returns on the project that they hided to the shareholders. This implies that shareholders derive no effective benefits from denouncing the managers (ex post they are in fact indifferent between denouncing or not) but, in equilibrium, it is optimal for them to denounce the managers whenever the claim is low while the signal is high because it is the only way to induce the managers reveling the truth about the returns**.** As it is clarified in the main body of the paper, in fact, if shareholders dismiss courts then it will become optimal for the managers always claim low returns implying an expected payoff of zero for the shareholders independently from the state of nature. In this sense denoucing the managers to the court played simply an *instrumental* role.

Interestingly, the main results of the model are robust to modelling changes in the functioning of the courts. Suppose that if managers are found guilty by the courts they are also forced to pay to the shareholders the due returns. In this case shareholders are no more ex post indifferent between denouncing or not the managers and, if going to the courts is costless, they will always denounce the manager whenever the claim is low (creo que esto no es cierto) and independently on the signal (indeed in this case whenever the probability of high realization is different from zero going to the courts assure to the shareholders an higher expected payoffs than not going). As a consequence in equilibrium managers will always say the truth independently on the quality of the signal which, consequently, looses importance.

However, if recurring to the courts is costly shareholders will always face a trade-off between paying the costs hoping to recover part of the returns and not doing so; clearly, the signal becomes crucial in this context since if the signal is high the expected returns of recurring to the courts will be higher since the probability of recovering returns is higher. In particular, the results of our model are unchanged if these courts' costs are high enough to discourage a denunciation whenever the signal is low while are low enough the incentivate a legal action when the signal is high.

Notice also that in this context, the better the quality of the signal the higher will be the expected returns of recurring to the courts. This implies that the conditions on the courts' cost will also represent a constraint in the decision problem of the manager regarding the quality of signal.

8 Appendix B

Proof of Proposition 2.

By condition (IC2) we know that what determines the manager's revelation decision is the gap between wages, that is $w^i(R) - w^i(0)$, and not their absolute values. This implies that the representative shareholder will always set $w^i(0) = 0$. As a consequence, the optimal wage scheme offered to manager i will be one of the followings,

(i) $W_1^i = \{w^i(0) = 0, w^i(R) = 0\}$ for every manager $(i = 1, ..., n)$, if inducing sincere behavior is too costly.

(ii) $W_2^i = \{w^i(0) = 0, w^i(R) = [R - p^i F]k_t^i\}$ for every manager $(i = 1, ..., n)$, where $w^i(R)$ comes from the (IC2) once we substitute for $w^i(0) = 0$, if inducing sincere behavior is worth.

This means that shareholders can choose W_1^i, pay nothing and do not give any incentive to the manager behaving truthfully or they can choose W_2^i which represents the cheapest possible incentive compatible scheme. We now compare the expected gains of each one of this two equilibrium contract candidates.

If W_1^i is chosen, the expected utility for the representative shareholder of buying investing an amount k_t^i in the asset i is equal to

$$\begin{aligned} E\{U_{j,t}(T_i/W_1^i)\} &= C_t^{1-\alpha}[\frac{1}{n}\{(1-p^i)k_t^{i\alpha}(0-0)^\alpha + p^i k_t^{i\alpha}(0-0)^\alpha\} + \\ &\quad (1-\frac{1}{n})\{(1-p^i)k_t^{i\alpha}(0-0)^\alpha + p^i k_t^{\alpha i}(0-0)^\alpha\}], \end{aligned}$$

With probability $\frac{1}{n}$ the returns of firm i under the contract W_1^i are high (R), however, since we are now analyzing the utility of the representative shareholder when the IC contract is not in place, the manager will always optimally claim that the returns are low. This implies that, whatever the outcome of the shock, the profits redistributed to the shareholders will be always equal to zero. Then,

the expected shareholders utility becomes,

$$E\{U_s(T_i/W_1^i)\} = C_t^{1-\alpha}0 = 0.$$

Let us now denote as x^i the cost per unit of capital paid by representative shareholder to the manager to induce him not to lie. That is

$$x^i \equiv R - p^i F \Rightarrow w^i(R) = [R - p^i F]k_t^i = x^i k_t^i$$

Under the optimal contract, the expected returns related to an investment k_t^i in firm i are therefore given by

$$\begin{aligned} E\{U_s(T_i/W_2^i)\} &= C_t^{1-\alpha}[\frac{1}{n}\{(1-p^i)(R-x^i)^\alpha k_t^{i\alpha} + p^i(R-x^i)^\alpha k_t^{i\alpha}\} + \\ &\quad (1-\frac{1}{n})\{(1-p^i)(0-0)^\alpha k_t^{i\alpha} + p^i(0-0)^\alpha k_t^{\alpha i}\}], \end{aligned}$$

which becomes

$$E\{U_s(T_i/W_2^i)\} = C_t^{1-\alpha}\frac{1}{n}(p^i F k_t^i)^\alpha.$$

Observe that owners' expected returns is increasing in the level of corporate governance, at the firm and at the country level.

Q.E.D.

Proof of Proposition 5.

.Plugging in the utility function the budget constraint, the utility function may be re-arrange as $U_{t,j} = c_t^{1-\alpha}[V(k_t^i, ..., k_t^i)]^\alpha$ with V being a sub-utility function which is defined over a large, and potential number of differentiated assets or firms, indexed from 1 to n. The expected utility of the representative risk averse shareholders become

$$E(U_{t,j}) = [\overline{K} - \sum_{i=1}^{n} k_t^i]^{1-\alpha}[\sum_{i=1}^{n}\frac{1}{n}((R-x^i)k_t^i)^\alpha]$$

Utility maximization leads to demand function for the different assets i. Notice that the representative shareholders has to choose: i) how to divide the total stock of capital between consumption for the first period and investment in assets that will finance the consumption in the second period and ii) how to divided the amount of capital invested K_t among the n different projects or assets available on the financial market (i.e. choosing k_t^i $\forall i = 1, ...n$).

Step 1: Choose between consumption and saving.

Remark 1: Since all firms are symmetric, $w^i = w$ $\forall i = 1, ...n$. Then, the expected utility may be rewrite as

$$E(U) = [\overline{K} - \sum_{i=1}^{n} k_t^i]^{1-\alpha}(R-x)^\alpha\frac{1}{n}[\sum_{i=1}^{n}(k_t^i)^\alpha].$$

Remark 2: Moreover, we know that in equilibrium $k_t^i = k_t \ \forall i = 1, ...n$. Therefore, $\sum_{i=1}^{n} k_t^i = nk_t = K_t$. Then, $\sum_{i=1}^{n} \frac{1}{n}(k_t^i)^\alpha = \frac{n}{n} k_t^\alpha = (\frac{K_t}{n})^\alpha$.

The shareholder problem becomes

$$Max_{K_t} \ E(U) = [\overline{K} - K_t]^{1-\alpha}(R-x)^\alpha n^{-\alpha} K_t^\alpha.$$

$$FOC: \quad \frac{\partial U}{\partial K_t} = 0 \Longleftrightarrow (1-\alpha)K_t - \alpha[\overline{K} - K_t] = 0 \Longleftrightarrow K_t^* = \alpha\overline{K}.$$

Notice that K_t^* is a proportion of the total amount of capital, and this is true even if in equilibrium $x^i = 1$.(Due to the Cobb-Douglas utility function, $K_t^* > 0$ and $c_t^* = (1-\alpha)\overline{K} > 0$.

Step 2: Portfolio allocation: choose k_t.

The shareholders' problem is given by

$$Max_{k_t^i} \ E(U) = [(1-\alpha)\overline{K}]^{1-\alpha}\frac{1}{n}[(k_t^i)^\alpha(R-x^i)^\alpha + \sum_{i=1}^{n-1}(k_t^i)^\alpha(R-x^i)^\alpha]$$

$$s.t. \ \sum_{i=1}^{n} k_t^i = \alpha\overline{K} \ .$$

Remark 1. In equilibrium all firms are symmetric and then $x^i = x \ \forall i = 1, ...n$. Define $\widetilde{x} = \frac{1}{n-1}\sum_{i=1}^{n-1} x^i$.

Remark 2. In equilibrium $k_t^i = k_t \ \forall i = 1, ...n$. Therefore, $\sum_{i=1}^{n-1}(k_t^i)^\alpha = (\alpha\overline{K} - k_t^i)^\alpha$. Or similarly, each member of the sum is $(\frac{\alpha\overline{K}-k_t^i}{n-1})^\alpha + ... + (\frac{\alpha\overline{K}-k_t^i}{n-1})^\alpha$.

The maximization problem is given by

$$Max_{k_t^i} \ E(U) = [(1-\alpha)\overline{K}]^{1-\alpha}\frac{1}{n}[(k_t^i)^\alpha(R-x^i)^\alpha + (R-\widetilde{x})^\alpha(\alpha\overline{K}-k_t^i)^\alpha(n-1)^{1-\alpha}].$$

$$FOC: \frac{\partial U}{\partial k_t^i} = 0 \Longleftrightarrow (k_t^i)^{\alpha-1}(R-x^i)^\alpha = (R-\widetilde{x})^\alpha(\alpha\overline{K}-k_t^i)^{\alpha-1}(n-1)^{1-\alpha},$$

$$(k_t^i)^* = \frac{(\frac{R-x^i}{R-\widetilde{x}})^{\frac{\alpha}{1-\alpha}}}{(n-1) + (\frac{R-x^i}{R-\widetilde{x}})^{\frac{\alpha}{1-\alpha}}}\alpha\overline{K},$$

with $x^i = R - p^i F$ and $\widetilde{x} = R - \widetilde{p}F$, and where $\widetilde{p} = \frac{1}{n-1}\sum_{i=1}^{n-1} p^i$.

Q.E.D.

Remark

Finally, notice that the investors's marginal utility of income is equalized across states. This is the usual condition for a risk-neutral party optimally insuring a risk-averse individual. That is, the investor's utility is equalized across states. Current literature on this fields shows that the introduction of asymmetric information leads to imperfect risk-sharing (see for example, Marcet and Marimon (1992), Castro et al. (2003)). However, we obtain that even though there is asymmetric information risk sharing is perfect. This is so because we are implicitly assuming that there is a market for every contingent asset and this serves the purpose of transferring wealth across the states of the world that will be revealed in the future. These markets open (first period) before the resolution of the uncertainty (second period). What is being sold (from the point of view of the manager) in the market for the contingent commodities is commitments to receive amounts R when state s occurs. Therefore, our equilibrium results in a Pareto optimal allocation of risk. Hence, at equilibrium, shareholders insure completely; that is shareholder j's equilibrium consumption does not vary across the s states of the world. Indeed, the indirect utility of the shareholders is

$$E(U) = [(1-\alpha)\overline{K}]^{1-\alpha}\frac{1}{n}[(k_t^i)^\alpha(R-x^i)^\alpha +^\alpha (R-\widetilde{x})^\alpha \sum_{i=1}^{n-1}(k_t^i)]^\alpha,$$

since $(k_t^i)^* = \frac{(\frac{p^i}{\widetilde{p}})^{\frac{\alpha}{1-\alpha}}}{(n-1)+(\frac{p^i}{\widetilde{p}})^{\frac{\alpha}{1-\alpha}}}\alpha\overline{K}$, and $p^i = \widetilde{p}$

$$E(U) = [(1-\alpha)\overline{K}]^{1-\alpha}\frac{1}{n}(R-x)^\alpha[(\frac{\alpha\overline{K}}{n})^\alpha + (n-1)(\frac{\alpha\overline{K}}{n})^\alpha],$$

$$E(U) = [(1-\alpha)\overline{K}]^{1-\alpha}(R-x)^\alpha(\frac{\alpha\overline{K}}{n})^\alpha = [(1-\alpha)\overline{K}]^{1-\alpha}[\alpha\overline{K}]^\alpha(\frac{p^iF}{n})^\alpha.$$

$$E(U) = (1-\alpha)^{1-\alpha}\alpha^\alpha(\frac{p^iF}{n})^\alpha\overline{K} = \varphi\overline{K}.$$

Therefore, shareholders are like risk neutral with respect to the initial endowment $\overline{K}$. That is in equilibrium the allocation of risk is Pareto optimal.