

Asymmetric Information and the Choice of Corporate Governance Arrangements

Lucian Arye Bebchuk*

Abstract

This paper analyzes how asymmetric information affects which corporate governance arrangements firms choose – through the design of securities and corporate charters -- when they go public. It is shown that such asymmetry might lead firms to adopting corporate governance arrangements that are commonly known to be inefficient by both public investors and those taking firms public. When higher asset value is correlated with higher private benefits of control, asymmetric information about the asset value of firms going public will lead some or all such firms to offer a sub-optimal level of investor protection. The results might help explain why charter provisions cannot be relied on to provide optimal investor protection in countries with poor investor protection, why companies going public in the US commonly include substantial antitakeover provisions in their charters, and why companies rarely restrict self-dealing or the taking of corporate opportunities more than is done by the corporate laws of their country.

Key words: adverse selection, asymmetric information, corporate governance, investor protection, security design, private benefits of control, agency costs, expropriation, minority shareholders, IPO, going public, corporate charter, contractual freedom, private ordering, takeovers, antitakeover provisions, self-dealing.

JEL classification: G30, G34, K22.

© 2003 Lucian Bebchuk. All rights reserved.

* William J. Friedman and Alicia Townsend Friedman Professor of Law, Economics, and Finance, Harvard Law School; Research Associate, NBER and CEPR (bebchuk@law.harvard.edu). I am grateful to Oren Bar-Gill for his extremely invaluable help. I also wish to thank Jesse Fried, Oliver Hart, Mark Roe, Eric Talley, and participants in workshops and conferences at Harvard, Columbia, NYU, and Princeton. I gratefully acknowledge the financial support of the John M. Olin Center for Law, Economics, and Business at Harvard Law School for its financial support and the University of Tel-Aviv for its hospitality during my visits to it.

1. Introduction

Can companies going public be relied on to adopt optimal corporate arrangements? Companies in countries with inadequate investor protection commonly do not make up for this inadequacy by adding to their charters strong investor protection arrangements taken from the laws of other countries; indeed, when these companies go public, they often choose pyramidal and dual-class structures that seem to exacerbate agency problems.¹ As to the US companies, such companies often include in their charters substantial antitakeover protections that are viewed by many researchers as excessive.² Should IPO choices be generally expected to be efficient?

In the classic and influential model of (Jensen and Meckling (1976)), founders who take their firms public adopt whatever corporate governance arrangements are most efficient. Because the price that investors will be willing to pay will reflect the quality of investor protection promised to them, the founder will internalize the adverse effects of poor investor protection on public investors who purchase shares at the IPO. Accordingly, on this standard reasoning, notwithstanding the direct benefits to the founder from higher private benefits, the founder would not benefit from arrangements that provide sub-optimal investor protection.

This paper analyzes how asymmetric information at the time that firms go public, which is not present in the Jensen-Meckling model, can lead to the adoption of inefficient corporate arrangements at the IPO stage. My focus is not on asymmetric information about which arrangements are efficient. Financial economists often assume that, when founders take firms public, the founders have an informational advantage over public investors with respect to the value of the assets of the firms going public. I will show that introducing such asymmetric information can lead to the adoption of corporate arrangements that are *commonly known* by founders and investors to be inefficient.

Consider a founder who takes a company public and plans to continue managing it afterwards, at least for the time being, and suppose that the founder has superior information about the value of the firm's assets. Even if investors recognize that a certain corporate governance arrangement will inefficiently reduce their cash flows, the amount of the reduction might depend on the value of the assets. As a result, because investors are less informed about this value, they might mis-price, either downwards or upwards, the cost to them of a bad governance arrangement or the benefit to them of a good one. Depending on their private information concerning the value of their firm's assets, some founders

¹ See LaPorta, Lopes-de-Silanes, and Shleifer (1999), Bebchuk, Kraakman and Triantis (2000).

² See Coates (1999), Daines and Klausner (2001), Field and Karpoff (2002).

consequently might expect that they will be under-charged, and some founders might expect that they will be over-charged, for a governance arrangement that operates to increase their private benefits of control. Furthermore, when investors are imperfectly informed about the value of the firm's assets, the founder will also take into account whatever inferences investors might draw concerning the value of the firm's assets. All of the above considerations, and not only the efficiency of alternative arrangements, will influence founders' choices of governance arrangements.

I will pay special attention to the case in which, for any given governance arrangement, cash flows and private benefits are positively correlated. In such a case, the analysis shows, there is no pooling equilibrium in which all firms offer the optimal level of investor protection. If such an equilibrium were to exist, investors would pay all founders offering this arrangement the same extra consideration for the arrangement even though the direct benefits of given limits on private benefits to investors, and their direct costs to founders, are greater in the case of high-value firms than in the case of low-value firms. As a result, the analysis shows, such a pooling equilibrium would be destabilized by founders with high-value projects offering arrangements with lower investor protection.

Rather than an equilibrium in which all firms choose efficient arrangements, the equilibrium in this case will involve all or some firms choosing arrangements that provide a sub-optimal level of investor protection and enable excessive extraction of private benefits. Specifically, there will be either (i) a pooling equilibrium in which all firms adopt such arrangements in order to avoid inference by investors that the firm is a low-value type, or (ii) a separating (or hybrid) equilibrium in which high-value firms adopt such arrangements and thereby signal the high value of their projects. Either way, the existence of asymmetric information will lead to the private adoption of arrangements with sub-optimal levels of investor protection by at least some of the firms going public.

To see the intuition, consider the following numerical example. Suppose that firms going public sell 50% of the shares, and that such firms are equally likely to be either of high-value type, H, or low-value type, L. The maximum value of the assets (in the absence of agency costs) would be 200 for H firms and 100 for L firms. Suppose that, under strong investor protection, no private benefits are extracted, and thus the full value of the assets will go as cash flows to shareholders, with the owner and the public shareholders each getting half them the cash flows.

Suppose that, under weak investor protection, private benefits will be inefficiently extracted. In the event of such extraction, the value of minority shares will decline by 10% of the value of the assets, and the owner will get private benefit that would increase the value of the control block by 8% of the value of the assets. Thus, weak protection would reduce the value of minority shares from 50 to 40 in

L firms and from 100 to 80 in H firms, and it would increase the value of the owner's block from 50 to 58 in L firms and from 100 to 116 in H firms.

Strong protection is thus efficient in the case of every firm, whether of H or an L type, but will it be chosen? Consider a (pooling) equilibrium in which both types of firms choose strong protection. In this equilibrium, public investors will pay 75 for the 50% of the shares, which is the average value of the cash flow that such investors will obtain (which would be 50 in L firm and 100 in H firm). As a result, the owner of an H firm would have an incentive to offer weak protection. The reason for this is that owners of H firms are not fully capturing the value of the cash flows they confer on public investors by forgoing their private benefits under weak protection. When offering strong protection, owners of H firms forgo an increase of 16 in the value of their block, but they do not capture the 20 that such protection provides for minority shares -- but only the average value of strong protection among all firms, which is 15. Therefore, if we had a pooling equilibrium, owners of H firms (but not owners of L firms) would have an incentive to deviate from it by offering weak protection accompanied with a price discount in the range between 15 and 16.

In this numerical example, the unique equilibrium is one of inefficient pooling in which not only H firms but also L firms offer weak protection. L firms would have an incentive to follow the H firms and pool with them in the offering of weak protection. The reason for this is that the owners of L firms would be better off bearing the inefficient costs of weak protection rather than forgoing the gains from being cross-subsidized in a pooling equilibrium. As will be seen in the course of the analysis, however, a separating equilibrium in which H firms but not L firms offer weak protection is possible under different parameter values.

The structure of the model is sufficiently general to permit for a wide range of choices concerning investor protection that firms going public make explicitly or implicitly. One important category of such arrangements include those that determine the level of private benefits that the founder would be able to enjoy down the road in the event that the founder remains in control. This category includes, for example, choices of whether to adopt arrangements that impose broader restrictions on self-dealing, taking of corporate opportunities, insider trading and so forth than those provided by the legal system to which the firm is subject. Here the analysis can help explain why, both in countries with poor investor protection and in countries with strong investor protection, companies rarely offer limitations on such actions beyond those provided by the country's legal system (see Bergman and Nicolaievsky (2001)).

Another important category of investor protection arrangements chosen at the IPO stage includes those arrangements that determine the likelihood that, in the future, the founder would remain in control and thus in a position to enjoy the

private benefits flowing from such control. This category includes choices of whether to adopt arrangements that separate cash flow rights and voting rights and thereby concentrate votes in the founder's hands, whether to adopt antitakeover arrangements such as staggered boards, whether to incorporate in a jurisdiction with strong antitakeover protections, and so forth. In connection with this category of arrangements, the results can help explain why most companies in the US go public with strong antitakeover charter provisions (Coates (1999), Daines and Klausner (2001), Field and Karpoff (2002), why companies going public are attracted to states with strong antitakeover protections (Bebchuk and Cohen (2002), Subramanian (2002)), and why companies in many countries choose to separate cash flow rights and voting rights even though such separation is likely to significantly raise expected agency costs (Bebchuk, Kraakman and Triantis (2000)).

Interestingly, because antitakeover provisions have long been assumed by economists to be inefficient, researchers confronting the widespread adoption of such provisions in IPO charters (see, e.g., Daines and Klausner (2001)) believed that the explanation of this phenomenon must be either (i) that these provisions are efficient after all, or (ii) that these provisions are not correctly priced by the market. In contrast, the model developed in this paper shows that such inefficient arrangement can be adopted even assuming they are correctly priced, and it thus provides a third possibility for explaining this and similar phenomena.

The results of the analysis also have implications for corporate law policy. They identify a potentially beneficial role that mandatory corporate law rules can play. It is shown that, when asymmetric information is present at the IPO stage, mandatory corporate governance rules, or at least some limits on the menu of private choices, might be efficient. The results indicate that creating an effective system of corporate governance arrangements cannot always be left to the market. In the circumstances identified by the model, it might be important for a country to have in place a set of mandatory protections for investors.³

³ In an interesting essay on corporate contracts, Ayres (1991) suggests that the introduction of asymmetric information might be able to explain the taking of additional liability by good types but will not be able to explain the trend he perceived toward greater adoption of lax corporate governance arrangements. As noted above, however, the analysis of this paper shows that introduction of asymmetric information at the IPO stage can explain the private adoption of excessively lax arrangements.

In recent work on antitakeover charter provisions, Hannes (2001) raises the possibility that such provisions might be adopted by high-value firms, but not low-value firms, in order to signal high value. He suggests that, for such an outcome to arise, it is necessary to assume that the inefficiency costs of antitakeover provisions – the costs arising from inefficient management due to weakening of the takeover discipline – are not higher for firms with higher value. The costs of managerial slack are likely to arise with the size of the managed assets, however, and for this reason the analysis below does not use such or similar assumption.

Although I will focus on the case in which high cash flows are positively correlated with high private benefits of control, I will also consider and report the results for the case in which this correlation is negative. In such a case, asymmetric information would still lead to inefficient choices at the IPO stage. The distortion in this case, however, would be in the opposite direction, leading firms that go public to provide excessive levels of investor protection.⁴

The analysis is related to several lines of research. One relevant line of work involves models of how asymmetric information at the time of the IPO affects the pricing, timing, size, and very existence of the IPO. Leland and Pyle (1977) began this line of work by showing how, in the presence of asymmetric information, a risk-averse founder might retain an excessively large stake in the firm to signal the high value of the firm's projects. Franklin and Faulhaber (1989), Welch (1989), Narasimhan, Weinstein and Welch (1993) analyze how underpricing at the IPO stage can be used to signal favorable prospects. Myers and Majluf (1984) show how asymmetric information might lead to abstaining from an equity offering altogether and using debt instead.⁵

This paper adds to this literature in finance by showing that asymmetric information affects not only the above decisions but also another important set of decisions at the IPO stage, namely all the decisions concerning investor protection and corporate governance. Although the optimal design of securities at the IPO stage has been extensively studied (see, e.g., Grossman and Hart (1980), Grossman and Hart (1988)), this line of models has not considered the effects of asymmetric information at the IPO stage on security design. As will be seen, however, once asymmetric information about assets' value is introduced, such asymmetry might influence these choices for similar reason to the ones due to which it influences other IPO choices.

A second line of related research examines reasons for why firms that go public might not choose optimal corporate governance arrangements. One possible reason is externalities; because founders take into account the interests of investors purchasing shares at the IPO but not benefits to those that might seek corporate control in the future, founders might choose arrangements that excessively restrict control contests and produce a sub-optimal likelihood of a transfer of control (Grossman and Hart (1980), Bebchuk and Kahan (1990), Bebchuk and Zingales (2000)). Also, when network externalities make it desirable for IPO companies to

⁴ The possibility of excessive investor protection due to attempts by high-value firms to signal is also examined by the work of Iacobucci (2001).

⁵ Another line of signaling models – which is less directly related but is worth noting – concerns decisions in mid-stream by managers of firms that went public in the past. For example, analysis from this perspective has been done with respect to dividend decisions (Miller and Rock (1985)) and capital structure decisions (Ross (1977)).

adopt the same arrangements as others companies, the market might get “stuck” in an inefficient equilibrium (Klausner (1995), Kahan and Klausner (1997)). This paper complements this line of research by offering another reason for the possible use of inefficient corporate governance choices at the IPO stage and for the use of mandatory rules with respect to corporate arrangements.

Third, the analysis is related to the recent debate on whether private contracting can be relied on to improve corporate governance in countries with poor investor protection or even to lead to “functional” convergence among the arrangements governing companies in different countries. Some researchers take the view that private arrangements will lead to such a convergence ((see, e.g., Coffee (1999) and Gilson (2000), whereas others argue that this is not the case (see, e.g., Bebchuk and Roe (1999) and Glaeser, Johnson and Shleifer (2001)). This paper adds a factor to the balance of considerations in this debate.

Finally, the model is related to work on contracting in the presence of asymmetric information in general or in some contexts other than that of corporate governance arrangements (see, e.g., Levine (1991), Hermalin and Katz (1993). In this literature, the model by Aghion and Hermalin (1990) is closest in structure to the one used in this paper. The idea that the operation of markets afflicted by asymmetric information might be improved by mandatory rules goes back to the classic work of Rothschild and Stiglitz (1976).

The analysis of the paper is organized as follows. Section 2 presents the framework of analysis. Section 3 demonstrates that asymmetric information makes an equilibrium in which all firms choose efficient corporate governance arrangements impossible. Sections 4 and 5 analyze the two types of inefficient equilibria that might arise in the presence of the considered asymmetric information. Section 6 extends the analysis to the case in which investor protection involves discrete rather than continuous choices, and to the case in which cash flows and private benefits are negatively correlated. Section 7 concludes.

2. Framework of Analysis

2.1. Sequence of Events

As depicted in the time line below, the sequence of events is as follows.

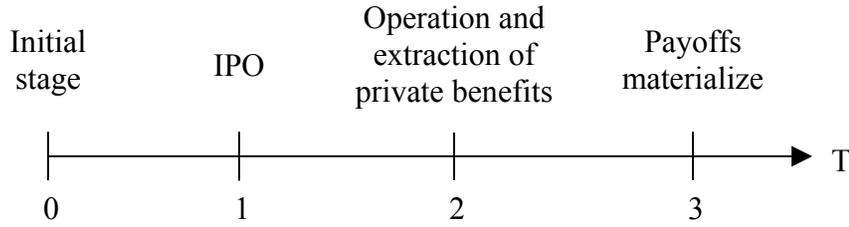
T = 0: Companies are privately held by initial owners.

T = 1: The owner takes the company public, chooses its corporate governance arrangements and sells a fraction $1-\alpha$ of the cash flow rights in the company (retaining a fraction α of these rights).

T = 2: The company operates and private benefits are extracted.

T = 3: Realization of payoffs.

Fig. 1: The Sequence of Events



I shall now turn to describing in detail the assumptions regarding each of these three stages.

2.2. T = 0: Initial Stage

At $T = 0$, companies are privately held by initial owners. There are two types of companies, H (the “good” type) and L (the “bad” type). As noted, our focus will be on the case in which cash flows and private benefits are positively correlated. (Section 6 will examine the case in which the two are negatively correlated.)

The potential value of a type-L company (in the absence of agency costs) is $V_L = v$, and the (corresponding) value of a type-H company is $V_H = (1 + \delta) \cdot v$, where $\delta > 0$. Thus, each company has a value $V \in \{V_L, V_H\}$. The proportion of type-H companies is $\mu \in (0,1)$, and the proportion of type-L companies is thus $1 - \mu$. As we shall see, the cash flows and private benefits associated with type-H will be all $(1 + \delta)$ times the corresponding variable for type-L.

2.3. T = 1: IPO

At $T = 1$, the owner takes the company public. The owner retains a share α of the company’s cash flow rights, and sells the remaining $1 - \alpha$ share of cash flow rights.⁶ Prior to this sale, the owner chooses an investor protection structure, captured by $\lambda \in [\underline{\lambda}, \bar{\lambda}]$, where λ reflects the difficulty of extracting private benefits. The bounds on the plausible level of shareholder protection can be justified as follows. The basic tenants of the legal system guarantee a minimal level of protection, $\underline{\lambda}$. The institutional and legal environment within which the company operates poses an upper bound, $\bar{\lambda}$, on the level of shareholder protection. In

⁶ It is assumed that the owner must sell $1 - \alpha$ shares, or alternatively that it is always individually rational for the owner to sell $1 - \alpha$ shares. Clearly, if the owner is neither risk averse nor subject to a liquidity constraint, he would prefer to avoid agency costs by retaining full ownership of the company.

particular, the institutional structure and the legal environment affect the ease in which private benefits can be extracted.

When selling a portion $1 - \alpha$ of the company's shares to the market, the owner offers a contract (λ, P) , where λ represents the corporate governance arrangement as defined above and P denotes the price charged for the shares. The market is assumed to have an unlimited supply of funds at the competitive rate, which for simplicity is normalized to zero. Thus, the owner will be able to sell the shares for the demanded price P , as long as P does not exceed the estimated value of the shares conditional on the market's information and beliefs.

While the market observes λ at the time of the IPO, the value of the company V is not observable by the market. If an informative separating equilibrium is obtained, the type of the company is revealed and the market will know the precise value of each company. On the other hand, if at equilibrium all of the companies pool together, the market's estimate will be based on the average value: $\bar{V} = (1 + \mu\delta) \cdot v$. I shall denote by $\hat{V} \in \{V_L, \bar{V}, V_H\}$ the market's estimate of the company's value.

2.4. T = 2: Extraction of Private Benefits

At $T = 2$, the company operates generating a value of either V_L or V_H . Also, at $T = 2$, the owner can extract private benefits of control. Specifically, if extraction of private benefits reduces the company's value by $b \cdot V$, the owner retains only $[b - L(b, \lambda)] \cdot V$. As is now conventional, it is assumed that $L(0, \lambda) = 0$, $\frac{\partial L}{\partial b} \in (0, 1)$, $\frac{\partial^2 L}{\partial b^2} > 0$, $\frac{\partial L}{\partial \lambda} > 0$ and $\frac{\partial^2 L}{\partial b \partial \lambda} > 0$.⁷ Without loss of generality, and to simplify the mathematical derivations, let $L(b, \lambda) = \frac{1}{2} \cdot \lambda \cdot b^2$. The owner extracts private benefits, so as to maximize her *ex post* payoff

$$\alpha \cdot (1 - b) \cdot V + [b - L(b, \lambda)] \cdot V = [\alpha + (1 - \alpha) \cdot b - L(b, \lambda)] \cdot V$$

Substituting $L(b, \lambda) = \frac{1}{2} \cdot \lambda \cdot b^2$, the owner's *ex post* payoff becomes:

$$(1) \quad [\alpha + (1 - \alpha) \cdot b - \frac{1}{2} \cdot \lambda \cdot b^2] \cdot V$$

⁷ This is the extraction technology introduced by Burkhardt, Panunzi, and Gromb (1997, 1998). The assumption on the cross derivative guarantees that stricter shareholder protection reduces the level of private benefits, i.e. $\frac{\partial b}{\partial \lambda} < 0$.

Hence, the FOC that determines the level of private benefits is:

$$\frac{\partial L(b, \lambda)}{\partial b} = \lambda \cdot b = 1 - \alpha,$$

which implies:

$$b = \frac{1 - \alpha}{\lambda}.$$

2.5. T = 3: Realization of Payoffs

At T = 3 payoffs are realized for all players. Substituting $b = \frac{1 - \alpha}{\lambda}$ into expression (1), we obtain the following expression for the owner's *ex post* payoffs:

$$(2) \left[\alpha + \frac{(1 - \alpha)^2}{2 \cdot \lambda} \right] \cdot V$$

The shareholders' *ex post* payoffs are:

$$(3) (1 - \alpha)(1 - b)V = (1 - \alpha) \left[1 - \frac{1 - \alpha}{\lambda} \right] \cdot V$$

Taking the sum of expressions (2) and (3), we see that total payoffs fall short of V . In particular, the efficiency costs due to extraction of private benefits are:

$$\frac{(1 - \alpha)^2}{2 \cdot \lambda} \cdot V.$$

The efficiency costs decline as λ increases. Thus, the efficient level of λ is equal to the maximum possible level $\bar{\lambda}$.

2.6. The Owner's Objective

The owner's *ex ante* payoffs are equal to the sum of the owner's *ex post* payoffs (expression (2)) and the price obtained in the T = 1 IPO stage, P :

$$(4) \quad \Pi(V, P, \lambda) = \left[\alpha + \frac{(1-\alpha)^2}{2 \cdot \lambda} \right] \cdot V + P$$

As explained above, the maximal price that an owner can demand depends on the market's estimate of the company's value:

$$P(\hat{V}, \lambda) = (1-\alpha) \cdot (1-b) \cdot \hat{V} = (1-\alpha) \cdot \left(1 - \frac{1-\alpha}{\lambda} \right) \cdot \hat{V}.$$

Substituting the price expression into (4) and after some rearranging, we obtain:

$$(5) \quad \Pi(V, \hat{V}, \lambda) = \left[1 - \frac{(1-\alpha)^2}{2 \cdot \lambda} \right] \cdot V + (1-\alpha) \cdot \left(1 - \frac{1-\alpha}{\lambda} \right) \cdot (\hat{V} - V).$$

The first term on the right-hand side of expression (5) represents the inefficiency loss due to extraction of private benefits. The second term represents the cross-subsidization effect that exists when the market cannot distinguish between the two types of companies. In particular, in such a case, type-L companies will receive a cross-subsidization bonus, and type-H companies will bear a cross-subsidization loss.

2.7. The Symmetric Information Case

As a benchmark, consider the case in which the market could observe the company's type, such that $V = \hat{V}$. In this symmetric information case, the owner's *ex ante* payoffs are:

$$\Pi(V, \lambda) = \left[1 - \frac{(1-\alpha)^2}{2 \cdot \lambda} \right] \cdot V.$$

The cross-subsidization effect (from expression (5)) disappears. Therefore, the owner will maximize her payoff by choosing the governance arrangement that provides for maximal shareholder protection, i.e. $\lambda = \bar{\lambda}$. Unfortunately, this efficient result does not carry over to the asymmetric information case.

3. The Non-Existence of Efficient Equilibrium

If the market could recognize the company type, the owners of both types of companies would choose the efficient governance arrangement $\lambda = \bar{\lambda}$. As is shown below, however, the efficient pooling equilibrium, where all the companies offer contracts with the governance arrangement $\bar{\lambda}$, does not constitute an equilibrium in the asymmetric information case.

Lemma 1: In the presence of asymmetric information, there is no equilibrium in which all firms choose the efficient level of shareholder protection $\lambda = \bar{\lambda}$.

Proof: If all companies choose $\lambda = \bar{\lambda}$, then with asymmetric information the market will not be able to distinguish between high value companies and low value companies. Therefore, the market's beliefs would be $\hat{V} = \bar{V}$. We rule out the efficient strategy profile, where $\lambda_H = \lambda_L = \bar{\lambda}$, by showing that it does not satisfy the Intuitive Criterion.⁸

An equilibrium satisfies the Intuitive Criterion if there does not exist a non-equilibrium contract (i.e. a deviation) such that (i) one type (type-L) of owners would be made worse off by offering this contract (compared with this type's equilibrium payoffs) no matter how the market responds, but such that (ii) the other type (type-H) would be made better off (relative to this type's expected equilibrium payoffs) by offering this contract if the market believes that it is this second type that has offered it. It is felt that "equilibria" in which such deviations (non-equilibrium contracts) exist are unreasonable, because if only one type can possibly benefit from a deviation, then, upon witnessing that deviation the market should believe that is the type against whom it is playing; but if that belief makes the deviation desirable for that type, then that type should deviate, which means that the "equilibrium" is not truly stable.

The efficient strategy profile is defined by the contract $(\bar{\lambda}, P(\bar{\lambda}))$, where $P(\bar{\lambda})$ is the competitive price, given that the market cannot distinguish between the two types of companies (i.e. the contract $(\bar{\lambda}, P(\bar{\lambda}))$ is on the pooling line - see below). Starting from the efficient strategy profile where $\lambda_H = \lambda_L = \bar{\lambda}$, type-H will wish to signal a little bit by offering a contract $(\tilde{\lambda}, \tilde{P})$ with $\tilde{\lambda} < \bar{\lambda}$ and $\tilde{P} < P(\bar{\lambda})$. The contract $(\tilde{\lambda}, \tilde{P})$ will be such that type-L will not deviate from $(\bar{\lambda}, P(\bar{\lambda}))$, even if such a deviation will lead the market to believe that she is type-H. Therefore, by the intuitive criterion, the market will believe that the deviation is by type-H.

⁸ The intuitive criterion is a widely recognized refinement of the Perfect Bayesian equilibrium. See Choi and Kreps (1987). See also Mas-Colell et al. (1995), chapter 13.

Generally, starting from a contract (λ_1, P_1) , let us examine possible deviations to a contract (λ_2, P) with $\lambda_2 < \lambda_1$. A company will deviate to such a contract *iff* $\Pi(V, P, \lambda_2) > \Pi(V, P_1, \lambda_1)$. Using equation (4), a company will deviate *iff*

$$\left[\alpha + \frac{(1-\alpha)^2}{2 \cdot \lambda_2} \right] \cdot V + P > \left[\alpha + \frac{(1-\alpha)^2}{2 \cdot \lambda_1} \right] \cdot V + P_1$$

or

$$(6) \quad P > P_1 - \frac{(1-\alpha)^2}{2} \cdot \left[\frac{1}{\lambda_2} - \frac{1}{\lambda_1} \right] \cdot V$$

From condition (6), we can derive the minimum price, above which each type of company will deviate to the contract (λ_2, P) . Let \underline{P}_H denote the minimum price, above which type-H companies will deviate. Similarly, let \underline{P}_L denote the minimum price, above which type-L companies will deviate.⁹ Since $\underline{P}_H < \underline{P}_L$, there exists a contract (λ_2, P) to which only type-H will deviate. QED

The logic of the proof can be illustrated graphically as follows. We begin by defining the pooling line, namely the boundary of the set of contracts that the market will accept given that both types of companies pool together. The maximal price in a pooling equilibrium is:

$$P = (1-\alpha) \cdot (1-b) \cdot \bar{V}$$

Thus, the pooling line is:

$$P_p(\lambda) = (1-\alpha) \cdot \left(1 - \frac{1-\alpha}{\lambda} \right) \cdot \bar{V}.$$

Note that $\frac{\partial P_p}{\partial \lambda} = \left(\frac{1-\alpha}{\lambda} \right)^2 \cdot \bar{V}$.

We next define the owner's isoprofit curve:

⁹ Since the market believes that the deviating company is of type-H, it would be willing to pay a price that is higher than these minimum values, and even a price that is higher than P_1 . But, to ensure that only type-H will deviate, the deviation contract will quote a lower price.

$$\left[\alpha + \frac{(1-\alpha)^2}{2 \cdot \lambda} \right] \cdot V + P = \pi$$

or

$$P = \pi - \left[\alpha + \frac{(1-\alpha)^2}{2 \cdot \lambda} \right] \cdot V.$$

Note that $\frac{\partial P}{\partial \lambda} = \frac{1}{2} \cdot \left(\frac{1-\alpha}{\lambda} \right)^2 \cdot V$. Namely, the isoprofit curve of type-H companies is steeper than the isoprofit curve of type-L companies.

As illustrated in figure 1, starting from any candidate equilibrium on the pooling line - contract A - type-H companies will deviate to contract C. Since contract C lies below type-L's isoprofit curve through A, type-L will not imitate type-H's deviation. Thus, the signaling attempt of type-H is credible, and the candidate pooling equilibrium breaks.

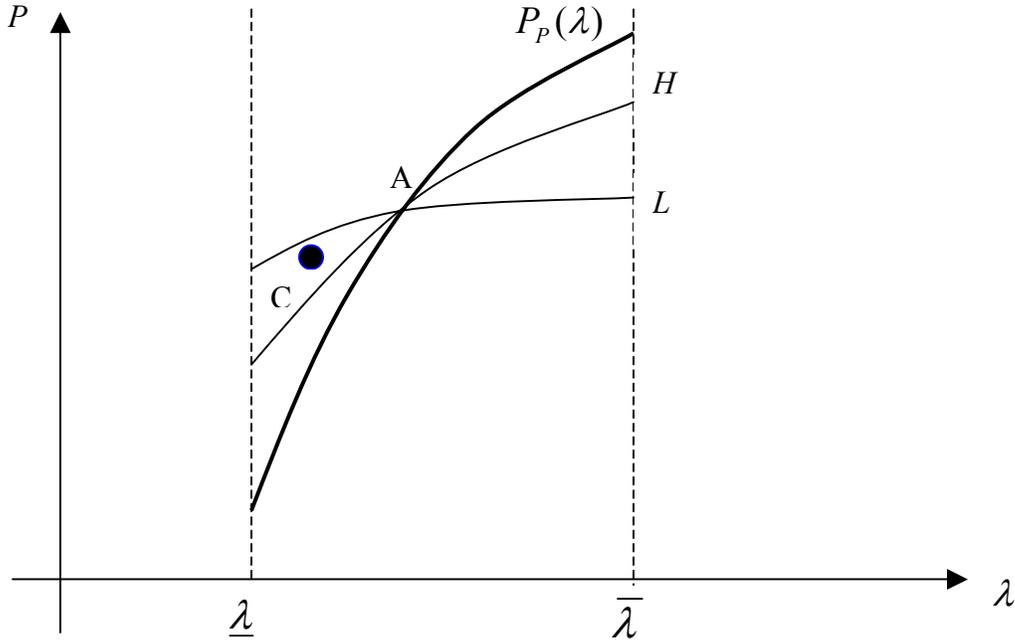


Fig. 1: Breaking efficient pooling equilibria

The logic of lemma 1 similarly rules out any candidate pooling equilibrium in which $\lambda > \underline{\lambda}$. Therefore, the only remaining candidate for a pooling equilibrium is

the strategy profile in which both types choose the least efficient provision, i.e. $\lambda_H = \lambda_L = \underline{\lambda}$.

4. Equilibrium with Suboptimal Protection by all Firms

4.1. Conditions for an Inefficient Pooling Equilibrium

Proposition 1: If owners of type-L companies prefer the contract $(\underline{\lambda}, P_p(\underline{\lambda}))$ to their symmetric information contract $(\bar{\lambda}, P_L(\bar{\lambda}))$, or equivalently if

$$(7) \quad (1-\alpha) \cdot \left(1 - \frac{1-\alpha}{\underline{\lambda}}\right) \cdot (\bar{V} - V_L) > \left[\left(1 - \frac{(1-\alpha)^2}{2 \cdot \bar{\lambda}}\right) - \left(1 - \frac{(1-\alpha)^2}{2 \cdot \underline{\lambda}}\right) \right] \cdot V_L,$$

then the unique equilibrium is the pooling equilibrium in which both type-H companies and type-L companies offer the inefficient contract $(\underline{\lambda}, P_p(\underline{\lambda}))$.

Remark: The intuition for this result, whose detailed proof is omitted, is as follows.

(i) *Existence:* At $(\underline{\lambda}, P_p(\underline{\lambda}))$ there is no more room for signaling. Thus, type-H will not deviate. The question is whether type-L will deviate. The only alternative for the owner of a type-L company is to offer her symmetric information contract $(\bar{\lambda}, P_L(\bar{\lambda}))$. As long as the cross-subsidy gain in the pooling equilibrium outweighs the efficiency gains from switching to the symmetric information contract, type-L will not deviate.¹⁰

(ii) *Uniqueness:* By Lemma 1, the equilibrium described in proposition 1 is the only feasible pooling equilibrium. To rule out a separating equilibrium, first note that at any separating equilibrium type-L will offer her symmetric information contract $(\bar{\lambda}, P_L(\bar{\lambda}))$. If type-H offers (λ', P') , then incentive compatibility implies that type-L prefers $(\bar{\lambda}, P_L(\bar{\lambda}))$ to (λ', P') . However, this equilibrium is dominated by the pooling equilibrium described in proposition 1. By condition (7), type-L prefers $(\underline{\lambda}, P_p(\underline{\lambda}))$ to $(\bar{\lambda}, P_L(\bar{\lambda}))$. Type-H also prefers $(\underline{\lambda}, P_p(\underline{\lambda}))$ to the separating contract (λ', P') . To see this, note that if type-L prefers $(\underline{\lambda}, P_p(\underline{\lambda}))$ to (λ', P') (since type-L prefers $(\underline{\lambda}, P_p(\underline{\lambda}))$ to $(\bar{\lambda}, P_L(\bar{\lambda}))$ and $(\bar{\lambda}, P_L(\bar{\lambda}))$ to (λ', P')), then necessarily type-H also prefers $(\underline{\lambda}, P_p(\underline{\lambda}))$ to (λ', P') , since the added inefficiency of a lower λ is less costly to type-H.¹¹

¹⁰ Condition (7), which insures that type-L will not deviate, i.e. $\Pi(V_L, \hat{V} = \bar{V}, \underline{\lambda}) > \Pi(V_L, \hat{V} = V_L, \bar{\lambda})$, implies $\Pi(V_H, \hat{V} = \bar{V}, \underline{\lambda}) > \Pi(V_H, \hat{V} = V_L, \bar{\lambda})$. Thus, type-H will not deviate either.

¹¹ Similar argumentation can be used to rule out the possibility of a hybrid equilibrium.

Figure 2 illustrates the conditions for a unique inefficient pooling equilibrium. The contract B_L in figure 2 is type-L's symmetric information contract.¹²

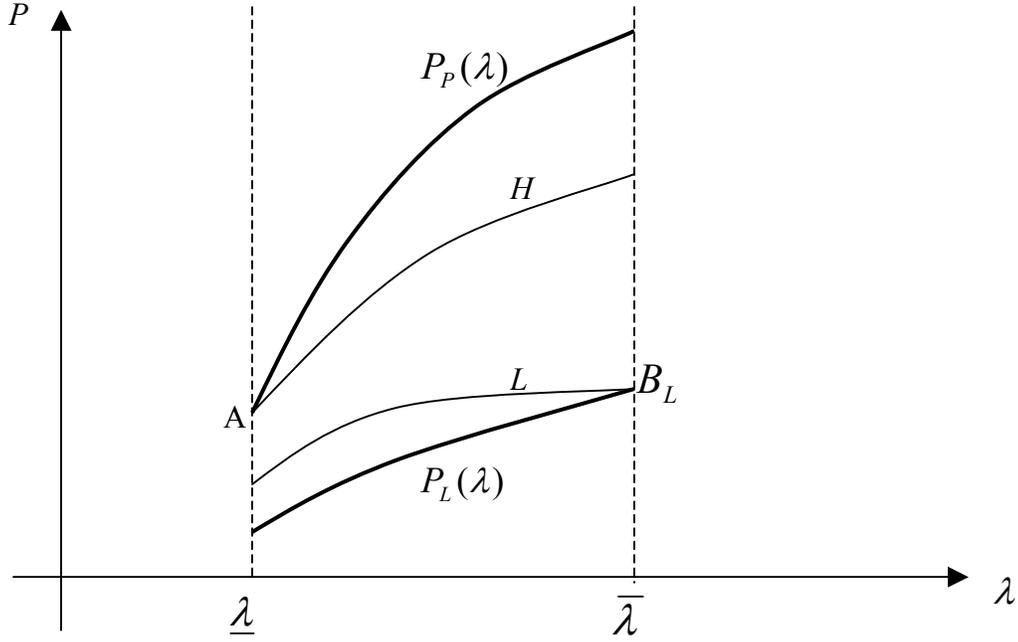


Fig. 2: A unique inefficient pooling equilibrium

Corollary 1: The pooling equilibrium in which owners of both type-H companies and type-L companies offer the inefficient contract $(\underline{\lambda}, P_p(\underline{\lambda}))$ is more likely to emerge as the unique equilibrium, when -

- (i) the difference in value between type-L companies and type-H companies is large, i.e. for high δ .
- (ii) The proportion of type-H companies is large, i.e. for high μ .
- (iii) the potential loss from adopting an inefficient charter provision is small, i.e. when the efficiency gap between $\underline{\lambda}$ and $\bar{\lambda}$ is small.

¹² For a graphical derivation of type-L's symmetric information contract, note that the maximal price in such a contract is: $P = (1 - \alpha) \cdot (1 - b) \cdot v$. Thus, the highest price that a type-L company can offer, for a given charter provision, is: $P_L(\lambda) = (1 - \alpha) \cdot \left(1 - \frac{1 - \alpha}{\lambda}\right) \cdot v$. Note that

$\frac{\partial P_L}{\partial \lambda} = \left(\frac{1 - \alpha}{\lambda}\right)^2 \cdot v$. Recall that type-L's isoprofit curve is: $P = \pi - \left[\alpha + \frac{(1 - \alpha)^2}{2 \cdot \lambda}\right] \cdot v$. Note that

$\frac{\partial P}{\partial \lambda} = \frac{1}{2} \cdot \left(\frac{1 - \alpha}{\lambda}\right)^2 \cdot v$.

(iv) The amount of shares sold, $1 - \alpha$, is small.

Remarks: The intuition for this result, which is based on condition (7), is as follows:

(i) As the difference between the values of type-L and type-H companies increases, the cross-subsidization effect increases. This means that type-L companies will find it desirable to mimic the low level of shareholder protection offered by type-H companies, even at the expense of adopting the inefficient provision.¹³

(ii) As the proportion of type-H companies increases, type-L companies have more to gain by mimicking type-H companies (i.e. the cross-subsidy gain increases), even at the expense of adopting the inefficient provision.¹⁴

(iii) When the cost of adopting an inefficient provision is small, type-L companies will find it desirable to mimic the low level of shareholder protection offered by type-H companies, even if the gains from cross-subsidization are modest.¹⁵

(iv) A reduction in the amount of shares sold, $1 - \alpha$, reduces the (privately) optimal level of private benefits, and thus reduces the efficiency costs from extraction of private benefits. An additional (linear) reduction in efficiency costs takes place, since fewer shares are sold. Hence, the overall reduction in efficiency costs is more than linear in the amount of share sold. Next, consider the impact of a reduction in the amount of shares sold on the cross-subsidization effect. On the one hand, if fewer shares are sold, the cross-subsidy gain is (linearly) smaller. On the other hand, if fewer shares are sold leading to a smaller reduction in value due to inefficient extraction of private benefits (see above), there is more value to be transferred through cross-subsidization. Hence, the cross-subsidization effect is less than linearly decreasing in the amount of shares sold (and it might even be increasing in the amount of shares sold). Therefore, when fewer shares are sold the inefficient pooling equilibrium is more likely to be obtained.¹⁶

¹³ Formally, by rearranging condition (7) we obtain: $\left(1 - \frac{1 - \alpha}{\underline{\lambda}}\right) \cdot \mu\delta > \frac{1 - \alpha}{2} \cdot \left(\frac{1}{\underline{\lambda}} - \frac{1}{\bar{\lambda}}\right)$. Thus,

condition (7) is more easily satisfied as δ increases.

¹⁴ Formally, condition (7) is more easily satisfied as μ increases. See the restatement of condition (7) in note 15, *id.*

¹⁵ Formally, by rearranging condition (7) we obtain: $\mu\delta > \frac{1 - \alpha}{2} \cdot \left(\frac{1 + 2\mu\delta}{\underline{\lambda}} - \frac{1}{\bar{\lambda}}\right)$. Thus,

condition (7) is more easily satisfied as the gap between $\underline{\lambda}$ and $\bar{\lambda}$ decreases.

¹⁶ Formally, condition (7) is more easily satisfied as $1 - \alpha$ decreases. See the restatement of condition (7) in note 17, *id.*

4.2. The Effect of mandatory Rules

Proposition 2: If the absence of any mandatory rules would result in the inefficient pooling equilibrium, i.e. if condition (7) is satisfied, then -

- (i) Adopting any mandatory rule that would set a minimum level of shareholder protection $\lambda_R > \underline{\lambda}$ would make the owners of both type-L and type-H companies better off.
- (ii) The optimal mandatory rule would impose $\lambda_R^* = \bar{\lambda}$.

Remark: The intuition for this result, whose detailed proof is omitted, is as follows. First, note that a minimal level of investor protection $\lambda_R > \underline{\lambda}$ induces a new unique pooling equilibrium $(\lambda_R, P_p(\lambda_R))$ (if type-L companies prefer the pooling contract $(\underline{\lambda}, P_p(\underline{\lambda}))$ to their symmetric information contract, they surely prefer the pooling contract $(\lambda_R, P_p(\lambda_R))$ to their symmetric information contract - the efficiency loss in the new pooling equilibrium is smaller and the cross-subsidization effect is larger). Owners of both type-L companies and type-H companies are better off, as they both enjoy the efficiency gains from increased investor protection.¹⁷

By varying the minimal mandatory level of investor protection λ_R , the law may select among the possible pooling equilibria $(\lambda_R, P_p(\lambda_R))$ where $\lambda_R \in [\underline{\lambda}, \bar{\lambda}]$. Owners of both type-L companies and type-H companies would prefer the pooling equilibrium with the highest level of investor protection. Therefore, $\lambda_R^* = \bar{\lambda}$.

¹⁷ Although we are comparing two pooling equilibria, the cross-subsidization effects are not identical. In particular, owners of type-L companies gain more, and owners of type-H companies lose more, from subsidization in the new pooling equilibrium. In essence, this is an “income” effect - the higher level of shareholder protection increases the pie, creating more room for cross-subsidization. Still, the mandatory restriction induces a Pareto improvement. Namely, owners of type-H companies, who lose from increased over-subsidization, are more than compensated by the enhanced efficiency. Graphically, looking at figure 2, *supra*, it is clear that owners of type-H companies are better off at any point on the pooling line where $\lambda > \underline{\lambda}$.

5. Equilibrium with Sub-optimal Protection by Some Firms

5.1. Conditions for Inefficient Separating or Hybrid equilibrium

Proposition 3: If owners of type-L companies prefer their symmetric information contract $(\bar{\lambda}, P_L(\bar{\lambda}))$ over both the contract $(\underline{\lambda}, P_p(\underline{\lambda}))$ (i.e. if condition (7) is not satisfied), and the contract $(\underline{\lambda}, P_H(\underline{\lambda}))$, i.e. if

$$\Pi(V_L, \hat{V} = \bar{V}, \underline{\lambda}) < \Pi(V_L, \hat{V} = V_H, \underline{\lambda}) < \Pi(V_L, \hat{V} = V_L, \bar{\lambda}),$$

then an inefficient separating equilibrium results, in which

- (i) the owners of type-L companies offer their symmetric information contract, $(\bar{\lambda}, P_L(\bar{\lambda}))$; and
- (ii) the owners of type-H companies offer a contract $(\tilde{\lambda}, P_H(\tilde{\lambda}))$, where $\tilde{\lambda}$ is the highest level of investor protection for which owners of type-L companies would prefer the contract $(\bar{\lambda}, P_L(\bar{\lambda}))$ over the contract $(\tilde{\lambda}, P_H(\tilde{\lambda}))$, where $\tilde{\lambda}$ is defined by:

$$\tilde{\lambda} = \frac{1 + 2 \cdot \delta}{2 \cdot \delta / (1 - \alpha) + 1 / \bar{\lambda}} \in (\underline{\lambda}, \bar{\lambda}).$$

Proof: First, note that if the market recognizes a type-H company, it will accept a contract with a maximal price of:

$$P = (1 - \alpha) \cdot (1 - b) \cdot V_H$$

Thus, when recognized, the best contract price a type-H company can offer, for a given charter provision, is:

$$P_H(\lambda) = (1 - \alpha) \cdot \left(1 - \frac{1 - \alpha}{\lambda}\right) \cdot V_H.$$

Note that $\frac{\partial P_H}{\partial \lambda} = \left(\frac{1 - \alpha}{\lambda}\right)^2 \cdot V_H$.

The market will accept any contract $(\lambda, P_H(\lambda))$ offered by a type-H company, as long as type-L companies do not mimic the type-H contract. Thus, from this set of contracts, type-H companies will choose the contract with the highest λ for which type-L companies still prefer their symmetric information contract. Thus, the best separating equilibrium satisfies: $\Pi(V_L, \hat{V} = V_L, \bar{\lambda}) = \Pi(V_L, \hat{V} = V_H, \tilde{\lambda})$ or

$$\left[1 - \frac{(1-\alpha)^2}{2 \cdot \tilde{\lambda}}\right] \cdot V_L = [\alpha \cdot V_L + (1-\alpha) \cdot V_H] + \frac{(1-\alpha)^2}{2 \cdot \tilde{\lambda}} \cdot (V_L - 2 \cdot V_H)$$

or

$$\tilde{\lambda} = \frac{2 \cdot (V_H - V_L) + V_L}{2 \cdot (V_H - V_L) / (1-\alpha) + V_L / \tilde{\lambda}} = \frac{1 + 2 \cdot \delta}{2 \cdot \delta / (1-\alpha) + 1 / \tilde{\lambda}}$$

It can be easily verified that $\tilde{\lambda} = \frac{1 + 2 \cdot \delta}{2 \cdot \delta / (1-\alpha) + 1 / \tilde{\lambda}} \in (\underline{\lambda}, \bar{\lambda})$. QED

The separating equilibrium is illustrated in figure 3.

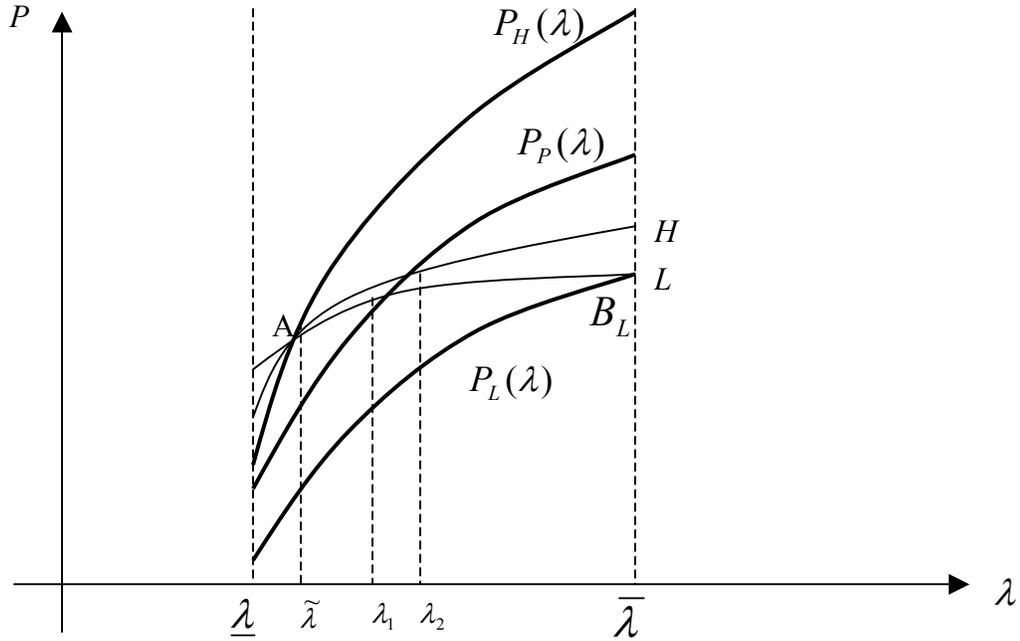


Fig. 3: A unique inefficient separating equilibrium

Proposition 4: If the non-restrictive equilibrium is the inefficient separating equilibrium, then -

- (i) If owners of type-H companies prefer the pooling contract $(\bar{\lambda}, P_p(\bar{\lambda}))$ over the separating contract $(\tilde{\lambda}, P_H(\tilde{\lambda}))$, then there exists a mandatory restriction, setting a minimum level of shareholder protection $\hat{\lambda} > \underline{\lambda}$, that makes the owners of both type-L and type-H companies better off.

- (ii) If owners of type-H companies prefer the separating contract $(\tilde{\lambda}, P_H(\tilde{\lambda}))$ over the pooling contract $(\bar{\lambda}, P_p(\bar{\lambda}))$, then there exists a mandatory restriction, setting a minimum level of shareholder protection $\hat{\lambda} > \underline{\lambda}$, that increases overall efficiency, but does not induce a Pareto improvement. In particular, the restriction will make the owners of type-L companies better off but will make the owners of type-H companies worse off compared to the non-restrictive equilibrium.

In both cases, the optimal mandatory rule would impose $\lambda = \bar{\lambda}$.

Remark: The intuition for this result, whose detailed proof is omitted, is as follows.

(i) If owners of type-H companies prefer the pooling contract $(\bar{\lambda}, P_p(\bar{\lambda}))$ over the separating contract $(\tilde{\lambda}, P_H(\tilde{\lambda}))$, then the isoprofit curve of type-H through $(\tilde{\lambda}, P_H(\tilde{\lambda}))$ intersects the pooling line. This occurs at $\lambda_2 < \bar{\lambda}$ in figure 3. In this scenario, there exists a pooling equilibrium $(\lambda, P_p(\lambda))$ with $\lambda > \lambda_2$, where the efficiency gains for type-H, as compared to $(\tilde{\lambda}, P_H(\tilde{\lambda}))$, outweighs the cross-subsidization loss to type-H in the pooling equilibrium. Since the owners of type-L companies clearly prefer a shift to the pooling equilibrium, legal restrictions would provide a Pareto improvement.

Put differently, if without restrictions owners of both type-H companies and type-L companies prefer the pooling contract $(\bar{\lambda}, P_p(\bar{\lambda}))$ over their respective separating contracts $(\tilde{\lambda}, P_H(\tilde{\lambda}))$ and $(\bar{\lambda}, P_L(\bar{\lambda}))$, then the mandatory restriction would facilitate a mutually beneficial outcome that is otherwise impossible to obtain.

(ii) If owners of type-H companies prefer the separating contract $(\tilde{\lambda}, P_H(\tilde{\lambda}))$ over the pooling contract $(\bar{\lambda}, P_p(\bar{\lambda}))$, then the isoprofit curve of type-H through $(\tilde{\lambda}, P_H(\tilde{\lambda}))$ does not intersect the pooling line. This means that for owners of type-H companies the efficiency gains from moving to the imposed pooling outcome are outweighed by the cross-subsidization loss.

Indeed, owners of type-H companies lose from the mandatory restriction, but owners of type-L companies clearly gain from the imposed pooling outcome. Moreover, overall efficiency is increased. To demonstrate the efficiency enhancing potential of a mandatory restriction, consider the optimal restriction imposing $\lambda = \bar{\lambda}$. While type-L companies chose $\lambda = \bar{\lambda}$ even without the restriction, type-H companies now move from $\lambda = \tilde{\lambda} < \bar{\lambda}$ to $\lambda = \bar{\lambda}$. Since the sole efficiency concern in

the present setting involves sub-optimal investor protection, the mandatory restriction is clearly efficient.¹⁸

We now proceed to identify the conditions under which a hybrid equilibrium results and to demonstrate the efficiency enhancing potential of mandatory restrictions under these conditions.

Proposition 5: If owners of type-L companies prefer their symmetric information contract $(\bar{\lambda}, P_L(\bar{\lambda}))$ over the contract $(\underline{\lambda}, P_p(\underline{\lambda}))$ (i.e. if condition (7) is not satisfied), but prefer the contract $(\underline{\lambda}, P_H(\underline{\lambda}))$ over their symmetric information contract, i.e. if

$$\Pi(V_L, \hat{V} = \bar{V}, \underline{\lambda}) < \Pi(V_L, \hat{V} = V_L, \bar{\lambda}) < \Pi(V_L, \hat{V} = V_H, \underline{\lambda}),$$

then the outcome is an inefficient hybrid equilibrium in which

- (i) all of the owners of type-H companies offer the contract $(\underline{\lambda}, P^h)$; and
- (ii) some of the owners of type-L companies offer the contract $(\underline{\lambda}, P^h)$, while others offer their symmetric information contract, $(\bar{\lambda}, P_L(\bar{\lambda}))$,

where P^h is defined by

$$\Pi(V_L, \hat{V} = V_L, \bar{\lambda}) = \Pi(V_L, P^h, \underline{\lambda}).$$

Remark: The intuition for this result, whose detailed proof is omitted, is as follows. Recall that in proposition 3 equilibrium owners of type-H companies could fully separate by offering a contract with a sufficiently low λ . Under the conditions described in proposition 4, however, even if type-H companies set $\lambda = \underline{\lambda}$, still type-L companies would prefer mimicking the type-H contract rather than sticking to their symmetric information contract (see figure 4 below). Of course, this preference reverses when a sufficiently high proportion of type-L companies have adopted the type-H contract. The reason is that the cross-subsidy gain dissipates as more type-L companies pool with the type-H companies. At equilibrium, a balance is struck, where the subsidy gain is equal to the efficiency loss so that type-L companies are indifferent between their symmetric information contract and the type-H contract.¹⁹

¹⁸ This result would have to be qualified in a model where the market cannot supply unlimited funding. In such a model, it may be efficient to fund only type-H companies. Hence, signaling (resulting in a separating equilibrium) may be *ex ante* efficient, and imposing a pooling outcome through mandatory restrictions may not be optimal.

¹⁹ The equilibrium proportion of type-L companies that mimic their type-H counterparts is derived as follows. Let q denote the proportion of type-L companies that choose the type-H contract $(\underline{\lambda}, P^h)$, and let $1-q$ denote the proportion of type-L companies that choose their

The hybrid equilibrium is illustrated in figure 4.

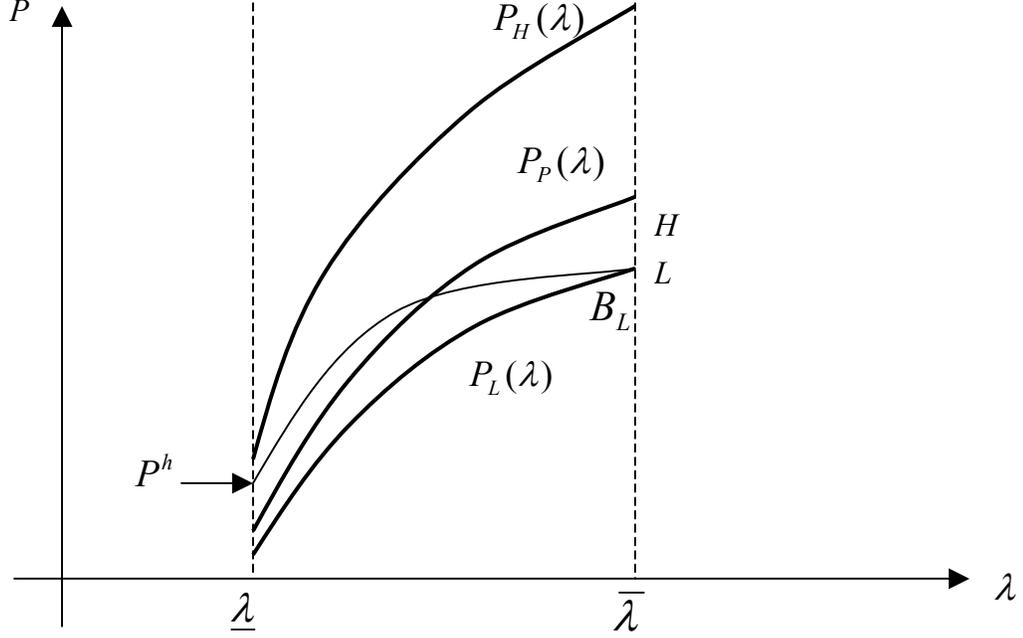


Fig. 4: A unique inefficient hybrid equilibrium

Proposition 6: If the non-restrictive equilibrium is the inefficient hybrid equilibrium, then -

- (ii) If owners of type-H companies prefer the pooling contract $(\bar{\lambda}, P_p(\bar{\lambda}))$ over their no-restriction contract $(\underline{\lambda}, P^h)$, then there exists a mandatory restriction, setting a minimum level of shareholder protection $\hat{\lambda} > \underline{\lambda}$, that makes the owners of both type-L and type-H companies better off.
- (ii) If owners of type-H companies prefer the no restriction contract $(\underline{\lambda}, P^h)$ over the pooling contract $(\bar{\lambda}, P_p(\bar{\lambda}))$, then there exists a mandatory

symmetric information contract. Denoting by $\theta(q)$ the market's posterior probability that it is a type-H company offering the contract $(\underline{\lambda}, P^h)$, given that the contract $(\underline{\lambda}, P^h)$ is offered, rational expectations imply that $(q \cdot (1 - \mu) + \mu) \cdot \theta(q) = \mu$, or $\theta(q) = \frac{\mu}{q \cdot (1 - \mu) + \mu}$. Since,

$P^h = (1 - \alpha) \cdot \left(1 - \frac{1 - \alpha}{\underline{\lambda}}\right) \cdot (\theta(q) \cdot V_H + (1 - \theta(q)) \cdot V_L)$, we can now solve for q by substituting $\theta(q)$ and using the condition $\Pi(V_L, \hat{V} = V_L, \bar{\lambda}) = \Pi(V_L, P^h, \underline{\lambda})$ that determines the value of P^h .

restriction, setting a minimum level of shareholder protection $\hat{\lambda} > \underline{\lambda}$, that increases overall efficiency, but does not induce a Pareto improvement. In particular, the restriction will make the owners of type-L companies better off but will make the owners of type-H companies worse off compared to the non-restrictive equilibrium.

In both cases, the optimal mandatory rule would impose $\lambda = \bar{\lambda}$.

Remark: The intuition for this result, whose detailed proof is omitted, resembles the intuition provided for proposition 4.

6. Extensions

6.1. Discrete Provisions

Thus far the analysis has assumed a continuum of possible charter provisions $\lambda \in [\underline{\lambda}, \bar{\lambda}]$. Arguably, the coarse nature of charter provisions does not enable the fine-tuning of the level of shareholder protection that a continuous model suggests. Therefore, Section 6.1 studies an extension where shareholder protection can be implemented *via* charter provisions only at discrete levels. In particular, let $\lambda \in \{\underline{\lambda}, \bar{\lambda}\}$. The choice between the two provisions, $\underline{\lambda}$ and $\bar{\lambda}$, can be thought of as a company's choice whether to adopt a classified board as part of its governance structure. The possible outcomes in the discrete model are summarized in the following proposition.

Proposition 7: When $\lambda \in \{\underline{\lambda}, \bar{\lambda}\}$ -

- (i) An efficient pooling equilibrium - in which all companies offer $(\bar{\lambda}, P_p(\bar{\lambda}))$ -- will be obtained *if and only if*

$$\Pi(V_H, \hat{V} = \bar{V}, \bar{\lambda}) > \Pi(V_H, \hat{V} = V_H, \underline{\lambda})$$

or

$$\delta < \frac{1 - \alpha}{2(1 - \mu)} \cdot \left(\frac{1 + \delta}{\underline{\lambda}} - \frac{1 + (2(1 - \mu) - 1)\delta}{\bar{\lambda}} \right).$$

- (ii) An inefficient pooling equilibrium - in which all companies offer $(\underline{\lambda}, P_p(\underline{\lambda}))$ -- will be obtained *if and only if*

$$\Pi(V_L, \hat{V} = \bar{V}, \underline{\lambda}) > \Pi(V_L, \hat{V} = V_L, \bar{\lambda}) \text{ and } \Pi(V_H, \hat{V} = \bar{V}, \underline{\lambda}) > \Pi(V_H, \hat{V} = V_L, \bar{\lambda})$$

or

$$\delta > \frac{1-\alpha}{2\mu} \cdot \left(\frac{1+2\mu\delta}{\underline{\lambda}} - \frac{1}{\bar{\lambda}} \right)$$

- (iii) A separating equilibrium – in which type-L companies offer $(\bar{\lambda}, P_L(\bar{\lambda}))$ and type-H companies offer $(\underline{\lambda}, P_H(\underline{\lambda}))$ -- will be obtained *if and only if* –

$$\Pi(V_L, \hat{V} = V_L, \bar{\lambda}) > \Pi(V_L, \hat{V} = V_H, \underline{\lambda}) \text{ and } \Pi(V_H, \hat{V} = V_H, \underline{\lambda}) > \Pi(V_H, \hat{V} = V_L, \bar{\lambda})$$

or

$$\frac{1-\alpha}{2} \cdot \left(\frac{1+\delta}{\underline{\lambda}} + \frac{-1+\delta}{\bar{\lambda}} \right) < \delta < \frac{1-\alpha}{2} \cdot \left(\frac{1+2\cdot\delta}{\underline{\lambda}} - \frac{1}{\bar{\lambda}} \right).^{20}$$

Remarks: The intuition for this result, which is proved in the Appendix, is as follows:

(i) An efficient pooling equilibrium results when the cost of choosing an inefficient provision is sufficiently high to prevent owners of type-H companies from signaling by deviating to the inefficient provision. Recall that the possibility of an efficient pooling equilibrium was ruled out in the continuous provisions model (see lemma 1) because type-H companies always found it profitable to signal by slightly reducing λ . This small reduction induced only a negligible efficiency loss, but prevented a significant cross-subsidy loss. Here, in the discrete provisions model, such “small” signals are unavailable. To signal, type-H companies must incur a significant efficiency loss. This opens the door for the possibility of an efficient pooling equilibrium.

(ii) An inefficient pooling equilibrium results when the cross-subsidization effect is sufficiently large, compared to the cost of choosing an inefficient provision, to prevent a deviation by owners of type-L companies.²¹

(iii) A separating equilibrium, in which type-L companies offer $(\bar{\lambda}, P_L(\bar{\lambda}))$ and type-H companies offer $(\underline{\lambda}, P_H(\underline{\lambda}))$, results when – (a) the cross-subsidization effect is not sufficiently high, compared to the cost of choosing an inefficient provision, to warrant a deviation by type-L companies; and (b) the cross-subsidization effect is sufficiently high, compared to the cost of choosing an inefficient provision, that type-H companies will not deviate.

²⁰ We abstract from the possibility of hybrid equilibria in the discrete model.

²¹ This also ensures that the extra cross-subsidization loss to type-H, given a deviation, is sufficiently large, compared to the cost of choosing an inefficient provision that owners of type-H companies will not deviate.

Proposition 8:

- (i) If the unrestrictive equilibrium is the inefficient pooling equilibrium, where all companies offer v , then a mandatory rule that sets a minimum level of shareholder protection $\lambda_R = \bar{\lambda}$ makes the owners of both type-L and type-H companies better-off.
- (ii) If the unrestrictive equilibrium is the separating equilibrium, where type-L companies offer $(\bar{\lambda}, P_L(\bar{\lambda}))$ and type-H companies offer $(\underline{\lambda}, P_H(\underline{\lambda}))$, then a mandatory rule that sets a minimum level of shareholder protection $\lambda_R = \bar{\lambda}$ makes the owners of both type-L and type-H companies better-off.

Remark: The intuition for this result, whose detailed proof is omitted, is based on the intuition described for the results in propositions 2 and 4.

6.2. Negative Correlation between Cash Flows and Private Benefits

Thus far we have assumed that high-value types – firms with higher cash flows for shareholders (for a given corporate governance arrangement) also provide higher private benefits for the founder. I now turn to examine the opposite case in which there is a negative correlation between cash flows and private benefits. In this case, the deviation produced by asymmetric information will be in the opposite direction – i.e., in the direction of excessive protection of investors by some or all firms.

Let us suppose that both L-type and H-type types have the same potential value of assets V , but that the firms differ in the probability in which the opportunity to extract private benefit arises. (We earlier assumed this probability to be 1.) Suppose that the probabilities are $P_H < P_L$. In this case, private benefits and cash flows will be negatively correlated; in the H-firm, less private benefits will be extracted, leaving more for cash flows going to investors.

To study this possibility we need to change the specification used earlier for the efficiency costs. The assumption that the costs are $\frac{1}{2} \times b^2$ implies that the optimal level of b is $b=0$ and it is always good to increase λ (without bound) to reduce b as much as possible – which means that no λ would be excessive

To explore our subject, let us therefore assume that the cost are $\frac{1}{2} \times (b^2 - b)$. With this specification, for any $b < 1$ the extraction of private benefit is beneficial on the margin – and it begins to be inefficient only for $b > 1$.

Accordingly, the optimal λ that will induce $b=1$ is $\lambda^* = 1 - \alpha$. As before we assume that λ can be set initially in the range $[\underline{\lambda}, \bar{\lambda}]$ which contains the optimal

level $\lambda^*=1-\alpha$. Proceeding in similar way to the one used in reaching earlier results, the following can be established:

Proposition 9: (i) In the case of negative correlation between cash flows and private benefits, there is no equilibrium in which all firms choose the efficient level of investment protection $\lambda^*=1-\alpha$.

(ii) The equilibrium will be one in which all or some firms choose an excessive level of investment protection, $\lambda > \lambda^*$.

7. Conclusion

Financial economists have studied how asymmetric information about the future cash flows of firms that go public affects the size, pricing, timing, and very existence of equity offerings. This paper shows that the kind of asymmetric information generally assumed to exist when firms go public might also affect the IPO-stage choices of corporate governance arrangements.

When such asymmetry is present, founders would not be solely concerned with the question of which governance arrangements would be most efficient. Even when investors recognize that a chosen governance arrangement is most efficient, the extra amount that they would be willing to pay for shares would depend on their expectations concerning the value of the firm's assets. Furthermore, these expectations might themselves be influenced by the choice of a governance arrangement. Because a founder will take the above considerations into account, they cannot be generally expected to adopt the governance arrangements that they and investors know to be most efficient.

The analysis of this paper has focused on the case in which cash flows and private benefits are positively correlated. In this case, some or all firms going public will provide sub-optimal levels of investor protection. As was discussed, these results might help explain observed patterns and might provide a rationale for mandatory corporate law rules. The analysis has also identified the distortions in the direction of excessive investor protection that might arise when cash flows and private benefits are negatively correlated. In addition to these particular results, however, the model indicates that, going forward, it would be useful for researchers to take into account that corporate governance choices of IPO firms might be influenced (and possibly distorted) by the presence of asymmetric information.

Appendix

Proof of Proposition 7:

(i) An efficient pooling equilibrium, where all companies offer $(\bar{\lambda}, P_p(\bar{\lambda}))$:

There cannot be an efficient pooling equilibrium that satisfies the intuitive criterion, if type-H companies can effectively signal by deviating to the inefficient charter provision. In the continuous model such signaling was always possible. In particular, type-H companies could always signal “a little bit”, by deviating to an infinitesimally lower λ , and thus avoid significant efficiency costs. Such costless signaling is not possible in the discrete model. In the discrete model, signaling is costly, and if the cost is high enough type-H companies will remain at the efficient pooling equilibrium.

Signaling is too costly when $\Pi(V_H, \hat{V} = \bar{V}, \bar{\lambda}) > \Pi(V_H, \hat{V} = V_H, \underline{\lambda})$ or

$$\begin{aligned} \left[1 - \frac{(1-\alpha)^2}{2 \cdot \bar{\lambda}}\right] \cdot V_H + (1-\alpha) \cdot \left(1 - \frac{1-\alpha}{\bar{\lambda}}\right) \cdot (\bar{V} - V_H) &> \left[1 - \frac{(1-\alpha)^2}{2 \cdot \underline{\lambda}}\right] \cdot V_H \\ (1-\alpha) \cdot \left(1 - \frac{1-\alpha}{\bar{\lambda}}\right) \cdot (V_H - \bar{V}) &< \frac{(1-\alpha)^2}{2} \left[\frac{1}{\underline{\lambda}} - \frac{1}{\bar{\lambda}}\right] \cdot V_H \\ \left(1 - \frac{1-\alpha}{\bar{\lambda}}\right) \cdot (1-\mu)\delta &< \frac{1-\alpha}{2} \cdot \left[\frac{1}{\underline{\lambda}} - \frac{1}{\bar{\lambda}}\right] \cdot (1+\delta) \\ \delta &< \frac{1-\alpha}{2(1-\mu)} \cdot \left(\frac{1+\delta}{\underline{\lambda}} - \frac{1+(2(1-\mu)-1)\delta}{\bar{\lambda}}\right). \end{aligned}$$

(ii) An inefficient pooling equilibrium, where all companies offer $(\underline{\lambda}, P_p(\underline{\lambda}))$:

Given the specified beliefs that only type-L companies deviate from the inefficient pooling equilibrium, this equilibrium can be sustained *if and only if*

$$\Pi(V_L, \hat{V} = \bar{V}, \underline{\lambda}) > \Pi(V_L, \hat{V} = V_L, \bar{\lambda}) \text{ and } \Pi(V_H, \hat{V} = \bar{V}, \underline{\lambda}) > \Pi(V_H, \hat{V} = V_L, \bar{\lambda}).$$

Substituting -

$$\begin{aligned} \Pi(V_L, \hat{V} = \bar{V}, \underline{\lambda}) &= \left[1 - \frac{(1-\alpha)^2}{2 \cdot \underline{\lambda}}\right] \cdot V_L + (1-\alpha) \cdot \left(1 - \frac{1-\alpha}{\underline{\lambda}}\right) \cdot (\bar{V} - V_L) \\ \Pi(V_L, \hat{V} = V_L, \bar{\lambda}) &= \left[1 - \frac{(1-\alpha)^2}{2 \cdot \bar{\lambda}}\right] \cdot V_L \\ \Pi(V_H, \hat{V} = \bar{V}, \underline{\lambda}) &= \left[1 - \frac{(1-\alpha)^2}{2 \cdot \underline{\lambda}}\right] \cdot V_H + (1-\alpha) \cdot \left(1 - \frac{1-\alpha}{\underline{\lambda}}\right) \cdot (\bar{V} - V_H) \\ \Pi(V_H, \hat{V} = V_L, \bar{\lambda}) &= \left[1 - \frac{(1-\alpha)^2}{2 \cdot \bar{\lambda}}\right] \cdot V_H + (1-\alpha) \cdot \left(1 - \frac{1-\alpha}{\bar{\lambda}}\right) \cdot (V_L - V_H) \end{aligned}$$

we obtain the condition specified in the proposition.

(iii) A separating equilibrium, where type-L companies offer $(\bar{\lambda}, P_L(\bar{\lambda}))$ and type-H companies offer $(\underline{\lambda}, P_H(\underline{\lambda}))$:

This equilibrium can be sustained *if and only if*

$$\Pi(V_L, \hat{V} = V_L, \bar{\lambda}) > \Pi(V_L, \hat{V} = V_H, \underline{\lambda}) \text{ and } \Pi(V_H, \hat{V} = V_H, \underline{\lambda}) > \Pi(V_H, \hat{V} = V_L, \bar{\lambda})$$

Substituting -

$$\begin{aligned} \Pi(V_L, \hat{V} = V_L, \bar{\lambda}) &= \left[1 - \frac{(1-\alpha)^2}{2 \cdot \bar{\lambda}} \right] \cdot V_L \\ \Pi(V_L, \hat{V} = V_H, \underline{\lambda}) &= \left[1 - \frac{(1-\alpha)^2}{2 \cdot \underline{\lambda}} \right] \cdot V_L + (1-\alpha) \cdot \left(1 - \frac{1-\alpha}{\underline{\lambda}} \right) \cdot (V_H - V_L) \\ \Pi(V_H, \hat{V} = V_H, \underline{\lambda}) &= \left[1 - \frac{(1-\alpha)^2}{2 \cdot \underline{\lambda}} \right] \cdot V_H \\ \Pi(V_H, \hat{V} = V_L, \bar{\lambda}) &= \left[1 - \frac{(1-\alpha)^2}{2 \cdot \bar{\lambda}} \right] \cdot V_H + (1-\alpha) \cdot \left(1 - \frac{1-\alpha}{\bar{\lambda}} \right) \cdot (V_L - V_H) \end{aligned}$$

we obtain the condition specified in the proposition.

QED

References

- Aghion, Philippe and Benjamin Hermalin (1990), "Legal Restrictions on Private Contracts Can Enhance Efficiency," *Journal of Law, Economics, and Organization*.
- Allen, Franklin and Gerald R Faulhaber (1989), "Signaling by Under-pricing in the IPO Market," *Journal of Financial Economics*, 23, 303-23.
- Ayres, Ian (1991), "The Possibility of Inefficient Corporate Contracts," *Cincinnati Law Review*, 60, 387-417.
- Bebchuk, Lucian and Alma Cohen (2002), "Firms Decisions where to Incorporate," Harvard Law School Olin Discussion Paper No. 351 (2002), available at <http://papers.ssrn.com/abstract=304386>
- Bebchuk, Lucian A. and Marcel Kahan (1990), "A Framework for Analyzing Legal Policy Toward Proxy Contests," *California Law Review*, 78, 1071-1136.
- Bebchuk, Lucian A., Reinier Kraakman, and George Triantis (2000), "Stock Pyramids, Cross-ownership, and Dual Class Equity," in *Concentrated Corporate Ownership* (R. Morck, ed.), pp. 295-315.
- Bebchuk, Lucian A. and Mark Roe (1999), "A Theory of Path Dependence in Corporate Governance and Ownership," *Stanford Law Review*, 52, 127-170.
- Bebchuk, Lucian A. and Luigi Zingales (2000), "Ownership Structures and the Decision to Go Public," in *Concentrated Corporate Ownership*, pp. 55-75.
- Bergman, Nittai and Daniel Nicolaievsky (2002), "Investor Protection and the Coasean View," working paper, Harvard University.
- Burkhart, Michael, Denis Gromb, and Fausto Panunzi (1998), "Why Higher Premia Protect Minority Shareholders," *Journal of Political Economy*, 106, 172-204.
- Burkhart, Michael, Denis Gromb, and Fausto Panunzi (1997), "Large Shareholders, Monitoring, and the Value of the Firm," *Quarterly Journal of Economics*, 112, 693-728.
- Coates, John C. IV (1999), "Measuring the Domain of Mediating Hierarchy: How Contestable Are U.S. Public Corporations?," *Journal of Corporation Law*, 24, 837.
- Coffee, John (1999), "The Future as History: The Prospects for Global Convergence in Corporate Governance and Its Implications,"
- Cho, I-K and Kreps, David M. (1987), "Signaling Games and Stable Equilibria," *Quarterly Journal of Economics*, 102, 179-221.
- Daines, Roberts and Michael Klausner (2001), "Do IPO Charters Maximize Firm Value? Antitakeover Protection in IPOs," *Journal of Law, Economics and Organization*, 17, 83-120.
- Field, Laura and Jonathan Karpoff (2002), "Takeover defenses at IPO Firms," *Journal of Finance*.

- Gilson, Ronald (2000), "Globalizing Corporate Governance: Convergence of Form or Function," Stanford Law and Economics Olin Working Paper No. 192.
- Glaeser, Edward, Simon Johnson, and Andrei Shleifer (2001), "Coase versus the Coasians," *Quarterly Journal of Economics*, 116, 853-899.
- Grossman, Sanford J. and Oliver D. Hart (1980), "Takeover Bids, The Free-Rider Problem, and the Theory of the Corporation," *Bell Journal of Economics*, 11, 42-64.
- Hannes, Sharon (2001), "Why Would Entrepreneurs of Better ventures adopt Takeover Provisions that are Harmful for the Public Shareholders?," unpublished manuscript, Tel-Aviv University School of Law.
- Hermalin, Benjamin E. and Michael L. Katz (1993), "Judicial Modification of Contracts between Sophisticated Parties: A More Complete View of Incomplete Contracts and Their Breach," *Journal of Law, Economics & Organization*, 9, 230-255.
- Iacobucci, Edward (2001), "Toward a Signaling Explanation of the Private Choice of Corporate Law," unpublished manuscript, University of Toronto.
- Kahan, Marcel and Michael Klausner (1997), "Standardization and Innovation in Corporate Contracting (or "The Economics of Boilerplate")," *Virginia Law Review*, 83, 713-.
- Klausner, Michael (1995), "Corporations, Corporate Law, and Networks of Contracts," *Virginia Law Review*, 81, 757-.
- LaPorta, Rafael, Florencio Lopez-de-Silanes, and Andrei Shleifer (1999), "Corporate Ownership around the World," *Journal of Finance*, 54, 471-517.
- Leland, Hayne E. and David H. Pyle (1977), "Informational Asymmetries, Financial Structure, and Financial Intermediation," *Journal of Finance*, 32, 371-87.
- Levine, David (1991), "Just-cause Employment Policies in the Presence of Worker Adverse Selection," *Journal of Labor Economics*, 9, 294-305.
- Mas-Colell, Andreu, Michael D. Whinston, and Jerry R. Green, (1995), *Microeconomic Theory* (Oxford University Press).
- Miller, Merton and Kevin Rock (1985), "Dividend Policy under Asymmetric Information," *Journal of Finance*, 40, 1031-.
- Myers, Stewart and N. Majluf (1984), "Corporate Financing and Investment Decisions when Firms have Information that Investors Do not Have," *Journal of Financial Economics*, 187-.
- Narasimhan, Jegadeesh, Mark Weinstein, and Ivo Welch (1993), "An Empirical Investigation of IPO Returns and Subsequent Equity Offerings," *Journal of Financial Economics*, 34, 153-175.

- Rothschild, Michael and Joseph Stiglitz (1976), "Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Competition," *Quarterly Journal of Economics*, 90, 629-650.
- Ross, Stephen A. (1977), "The Determination of Financial Structure: The Incentive-Signaling Approach," *Bell Journal of Economics*, 8, 23-.
- Subramanian, Guhan (2002), "The Influence of Antitakeover Law: should Firms Opt Out of Antitakeover Legislation?," *University of Pennsylvania Law Review*.
- Symposium on Contractual Freedom in Corporate Law (1989), *Columbia law Review*, 89, 1395-1775.
- Welch, Ivo (1989), "Seasoned Offerings, Imitation Costs, and the Underpricing of Initial Public Offerings," *Journal of finance*, 44, 421-449.
- Welch, Ivo (1996), "Equity Offerings Following the IPO: Theory and Evidence," *Journal of Corporate Finance: Contracting, Governance & Organization*, 2, 227-59.