The Search for Corporate Control*

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Abstract

This paper analyzes the market for corporate control and acquisitions by explicitly modeling a typical firm's choice whether to become a potential acquirer or target. I add synergistic motives to a multitask principal-agent framework with moral hazard between managers and shareholders. I argue that the terms of an M&A deal are determined not in isolation but in a market equilibrium context, therefore the merger transaction is embedded in a dynamic general-equilibrium search model. This framework links explicit and implicit incentives in a novel way. By modeling the choice explicitly I reconcile the evidence that in mergers target shareholders gain whereas acquirer shareholders seem to lose or gain nothing, yet most of the time they do not block the acquisition. Apart from that, it is shown that Golden Parachutes are an optimal form of compensation regarding merger-related incentives. The model also explains financial intermediation in the M&A market. I establish efficiency results and explain how merger waves might arise, in addition to other (testable) implications.

JEL classification: C78, D82, D83, G34, J33, G14, M52.

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I. Introduction

The considerable amount of literature on M&As has documented that in acquisitions, target shareholders seem to gain whereas their managers seem to lose, and acquirer shareholders seem to not gain or even lose while their CEOs observe the amount of resources under their control increased.[1] Given the conflicting outcomes from merging, it seems puzzling that shareholders of the acquiring firm do not block mergers more often. In other words, there seems to be an advantage from being targeted that does not vanish in equilibrium.[2] We argue that a better understanding of the market for corporate control requires analyzing how firms make the choice of engaging in activities that ultimately might result in an acquisition. This paper models the choice of willing to acquire or potentially become a target explicitly, in a friendly context. We therefore go further than existing theories (that implicitly assume the role of acquirer or target is exogenously fixed or absent) by acknowledging that managers initiate and execute such deals but shareholders still decide upon the approval of a potential merger as well as their manager's compensation scheme. In this sense, we concur with the idea posed in Jensen and Ruback (1983) that the market for corporate control is best seen as "the arena in which management teams compete."[3]

[1] In a survey of early empirical evidence Jensen and Ruback (1983) concluded that corporate takeovers generate positive gains, target firm shareholders benefit and that bidding firm shareholders do not lose. Later surveys (see Andrade, Mitchell and Stafford (2001)) concur with prior findings but acknowledge the fact that some studies find evidence on acquiring shareholder's abnormal negative returns.

On the manager side, Hartzell, Ofek and Yermack (2004) find an annual turnover rate roughly three times the non-merger-related rate observed in the literature. They estimate an unconditional probability of leaving the firm within two years or surviving with a lower position (vice chairman or other executive officer) of 91.9 per cent. Agrawal and Walking (1994) report that 45 per cent of the CEOs keep their job. Hadlock, Houston and Ryngaert (1999) find that 53 per cent of top executives leave the company within two years. Martin and McConnell (1991) find a 41.9 turnover rate in the frist year and 19 per cent during the second.

[2] Andrade *et al.* (2001) point out that

> "A third challange to the claim that mergers create value stems from the finding that all of the gains from mergers seem to accrue to the target firm shareholders. We would like to believe that in an efficient economy (...) mergers would happen for the right reasons, and that their effects would be as expected by the parties during negotiations. However the fact that mergers do not seem to benefit acquirers provides reason to worry about this analysis."

[3] As they point out:

> "(...)this is a subtle but substantial shift from the traditional view, in which financiers and activist stockholders are the parties who (alone or in coalition with others) buy control of a

But ours is not a purely managerially-driven theory. We add synergistic motives, since shareholders need to approve the merger in order for it to be successful and, more importantly, they need to incentivize their managers *via* executive compensation packages, given the potential conflict of interests. We use our model to throw light on the causes of the aforementioned apparent puzzle and other stylized facts reported by the M&A literature, while generating testable implications.

When modeling the choice of engaging in activities that ultimately define a firm as an acquirer or a target one realizes that a market analysis is needed, since the deal value does not only depend on the merging firms' characteristics but also on aggregate takeover activity. For instance, merger waves can be seen as evidence that the acquisition value has an idiosyncratic component as well as a market one.[4] By looking at the bigger picture we are able not only to analyze how the firm's decision depends on aggregate variables (i.e., the feedback between value creation and merging activity) but also to link implicit and explicit incentives.[5] In particular, if the market is a discipline device for it allows the removal of bad (target) management, then the existence of Golden Parachutes is not justified; the market should be enough to discipline bad management. Our model reconciles market discipline with the existence and optimality of golden parachutes, by considering the potential moral hazard problem stemming from the conflicting interests between managers and shareholders.

The moral hazard problem is argued in the following sense: self-interested managers are worried about what the merger signifies in terms of their future career and compensation path rather than properly internalizing the maximization of shareholder value. In general, managers of the acquiring company will also end up managing the newly constituted firm, enjoying a larger amount of resources under her control.[6] In contrast, target managers tend

company and hire and fire management to achieve better resource allocation" (p.6.)

[4]See Mitchell and Mulherin (1996) and Rhodes-Kropf, Robinson and Viswanathan (2005) for evidence on that respect.

[5]Legros and Newman (2004a) also analyze the feedback between the internal organization of firms and market-generated incentives.

[6]This is an example of what the corporate finance literature calls empire building.

to either abandon the firm or occupy a lower hierarchical position.[7] But apart from these future margins we argue that searching for a target affects the current profitability of the firm and therefore managers' incentives too. The basic idea is that managers might enjoy getting involved in new (probably more exciting) tasks, like shopping for a firm to acquire. That, in turn, affects current profits in a negative way since it diverts time and effort from focusing on the operational improvement of the firm; although it might generate a larger future inflow of profits if the merger is successful and creates value (what is often called a synergistic merger).[8] We model this feature with a simple multitask principal-agent framework, where manager activities are not observed by shareholders.

We use a search/matching-with-frictions model to approach the market equilibrium analysis.[9] This building block is justified as follows. As we have already mentioned, a dynamic general-equilibrium perspective is appealing. First, mergers happen through time and hence it is a sequential decision; in this sense it resembles the real option approach to investment (see Dixit and Pindyck (1994)). Second, given the nature of the economic phenomenon we seek to study, a search model seems to fit the story appropriately. In fact, if there is a market that clearly departs from the centralized (frictionless) market assumption, it is the market for corporate control. In our model, a manager that seeks to acquire another firm, spends time and resources to find a suitable match. With some probability, a candidate will appear along the way. This candidate will be a firm whose manager is not looking to acquire but instead is focusing on the operational improvement of the firm. The shareholders of the two firms will then face the decision of whether to go ahead with the acquisition or continue to be stand-alone companies. Finally, another important reason for the search-and-matching framework is that it allows us to look at

[7] In a sense, even if the manager is not fired following a change in control, a lower hierarchical position represents a loss, compared to when the manager was running the target company by herself. The common wisdom gives a Vice Chairman limited power.

[8] An alternative explanation for the negative impact on firm performance is to think that by willing to merge in the near future the manager decides not to undertake short-run positive NPV projects that would increase the current profitability of the company.

[9] Search models are popular in the labor economics literature, where they have been used to study the dynamics of wages and unemployment rates, primarily. For a classical textbook, see Pissarides (2000). Our model uses a search environment similar to that of Shimer and Smith (2000).

implicit incentives. An increase in the number of potential acquirers in an economy with positive synergies from merging has opposite effects on the two sides of the market. A potential target finds itself targeted more often, therefore the real option of merging has larger expected value and being stand-alone less. For a potential acquirer the effect goes in the other direction since an increase in the amount of potential acquirers lowers the mass of potential targets, other things being equal. This can also be seen as a source of aggregate externalities, common in these models. We contribute to the search literature in two ways. First, the choice of being an acquirer or a target makes the sides of the matching model endogenous (in contrast with labor applications, where being in one side of the market or the other (workers and firms) is a role given by nature, essentially). Second and more important, we study the implications of moral hazard in search models.[10]

We are able to reconcile negative (or nearly zero) abnormal returns to acquirer shareholders and the fact that they usually do not block mergers. In equilibrium, mergers are accepted if they yield a positive surplus to the shareholders of both the acquirer and the target. But they also convey information about past and present performance as well as future opportunities, the combined effect of which affects negatively the acquirer's stock price reaction upon announcement of a deal. Some theories are consistent with the first stylized fact, but not the second. Examples include Roll (1986). He argues that managers of acquiring firms pay too much for their targets on average, something that he attributes to hubris. If there actually are no gains in takeovers, the phenomenon depends on the overbearing presumption by bidders that their valuations are correct. In sum, markets are efficient, yet bidders (managers of the acquiring firm) are not.[11] A somewhat opposed view is offered in Shleifer and Vishny (2003), where markets are inefficient, causing firms to be valued incorrectly. Rational managers take advantage of this through, for instance, mergers. Our approach differs from Shleifer and Vishny (2003) in that all agents are rational but it expands their idea about the relative overvaluation of bidders; unlike their model, such

[10] Some recent effort has been done in this direction. See, for instance, Shimer and Wright (2004).

[11] An empirical exploration of this idea is Malmendier and Tate (2004).

overvaluation arises endogenously as a consequence of the firm's choice whether to become a potential acquirer or target. Finally, a more general equilibrium approach is taken in Jovanovic and Braguinsky (2004) where takeovers are driven by the fact that good projects and good managers are complements and mergers allow them to be matched together, or in McCardle and Viswanathan (1994). They are able to reconcile bidder discounts and social efficiency of takeovers, while abstracting from any managerial role in the merger process.

Rhodes-Kropf and Robinson (2004) is the first paper using the appealing features of a search model to approach the M&A market. Since they are interested in explaining the relation between market-to-book measures of acquirers and targets, the choice of the role in an acquisition (acquirer or target) is not present, that is, they do not look at the endogenous determination of the role and size of the market for corporate control, nor the potential conflicts between management and shareholders. In their model, abnormal returns from merging are always positive.

Gorton, Kahl and Rosen (2005) also account for the conflict of interests between managers and shareholders and therefore mix managerial concerns and synergistic motives.[12] In their paper, the reason why some mergers take place is the threat of being targeted by a larger firm otherwise, a new insight that is very useful in explaining why mergers sometimes happen for 'bad' reasons. However, acquirer shareholders or contracts do not play a role in their acquisition game. This assumption is crucial since if acquirer shareholders voted on the negative net present value mergers that drive abnormal returns below zero, they would not take place in equilibrium.

Whenever the market cannot self-correct or perfectly align the interests of managers and shareholders there are other mechanisms available to shareholders, like some contracts that are idiosyncratic to takeovers. An important example is the so-called Golden Parachute (henceforth GP), a severance pay contract activated when a merger (or more generally a change in control) takes place. The literature has mainly focused in other antitakeover mechanisms (such as poison pills, white knights, shark repellents, etc.), while GPs have

[12] See Harris (1994) for a two-firm static model.

attracted relatively less attention. An exception is Knoeber (1986). The traditional view on GPs is that they are undesirable because they impede the disciplinary effect imposed to "bad" managers by the market for corporate control. In his paper, Knoeber argues that they may be advantageous.[13] The reason lies in the fact that some compensation to managers is delayed. A tender offer then provides shareholders with a mechanism to opportunistically appropriate delayed compensation, hence a GP mitigates such appropriation. The advantageous-effect argument in Knoeber (1986) works for tender offers, with no management approval, but it dissipates in the case of more traditional (friendly) mergers which entail management consent, since it is unlikely that managers would agree to a merger that opportunistically extracts rents from them. We want to study the role of golden parachutes in this last case.

We find that Golden Parachutes are optimal.[14] They prove to be the most efficient way for shareholders to provide incentives to their managers, in matters related to the effort exerted in the acquisition process. Multiple equilibria arise in this situation, different distributions of the market for corporate control (relative size of acquirers versus targets) and values of the optimal contract are consistent with our definition of search equilibrium. The multiplicity in equilibria allows for the generation of endogenous cycles in M&A activity, similar to the waves found in practice. This result is interesting in the sense that, typically, multiple equilibria arise with non-linear search technologies or heterogenous agents. We use a linear search technology and firms have *ex-ante* the same value. The reason why they arise lies in the endogeneity of the market sides and its feedback to contracts.

We show that GPs act as barriers to merge, but if synergies are uncertain until two firms meet then the expected surplus is larger than when such a contract is not provided. We compare different scenarios with the first-best equilibrium in an efficiency analysis. In this sense, we find that in general the mass of acquirers (and thus of search) is lower compared to the first-best outcome. However, if incentives are given through performance

[13] In the empirical section, he also finds some weak evidence of such an advantageous effect.

[14] As opposed to incentivizing managers by increasing their performance-based bonuses before the merger takes place.

bonuses then there can be too much search in the economy. We close the efficiency analysis with the derivation of a golden rule for M&As.

Last but not least, the model also explains the role of financial intermediation in the market for corporate control. The basic idea is that financial advisors might be able to mitigate the frictions in the market by locating targets or synergies faster. This makes the merger lest costly, directly and indirectly by alleviating the moral hazard problem. The negative side of the coin is that, in this case, synergistic rents need to be split with a third party as well. In equilibrium, firms trade off these effects when making their decisions.

The paper is structured as follows. Section II is devoted to the description of the model. Section III solves and characterizes the equilibrium and its economic implications. Section IV starts with an analysis of abnormal returns. It then looks at the role of financial intermediation in M&As. After that, an efficiency analysis is presented, by describing a couple of first-best scenarios and comparing them to the results in Section III. It also puts the theory at work in terms of merger waves and other comparative statics. Section V concludes.

II. The Model

2.1. Agents, Preferences, Actions and Environment

The economy is populated by two types of agents, called Managers and Shareholders. Managers, each attached to a firm when the game starts, run firms owned by Shareholders. Time is continuous and the horizon is infinite.

Firms can operate as stand-alone companies or they can merge with one another. They have assets in place that deliver some revenue flow. If the firm is independent (that is, not merged), assets in place generate an instantaneous flow of f with probability p and 0 with probability $1 - p$. In case two firms merge, the joint flow is F.[15]

[15] In the basic model, F is deterministic and therefore known *ex-ante.* The variation with uncertain synergies, introduced later on, assumes that F is not known until both firms meet and before they make the decision on merging. F is assumed to be distributed according to $G(F)$.

Distribution of Firms. The total mass of existing and potential independent firms is normalized to 1. We denote u the mass of unmatched firms that comprise the market for corporate control. These companies are subject to acquisitions and are in turn divided among potential acquirers and potential targets. Since u is endogenously determined and a steady-state value (in equilibrium), we assume potential entrants (the mass of which is denoted by $n = 1 - u$) enter the market for corporate control to compensate for the fact that merged firms leave the unmatched population.[16] This set-up captures the idea that in an evolving market, as firms concentrate new ones are able to enter.[17]

Search Technology. Using terminology from the literature, this would in principle be a one-sided matching model (firms match among themselves). The endogeneity of manager actions makes it actually two-sided: only firms with opposing manager tasks (*search-not search*) meet. Since the matching occurs only with some probability it has the features of a search model. The justification of such a search structure follows. Two managers choosing to focus on internal growth, that is, on the operational improvement of the firm are reasonably not going to find each other to merge. On the other hand, a manager who actively searches is more likely to identify a target before he is identified as one. A simplified way to capture this is by assuming that searching drives the probability of being targeted down to zero.[18] Consequently, only different types can match: it is a *de facto* two-sided matching model.

We adopt a linear search technology. Firms/managers find each other at an exogenous Poisson arrival rate λ. This is a source of uncertainty and captures the fact that searching for a target is time consuming. But only two unmatched firms are able to go ahead with the deal, since once two companies merge they leave the market for corporate control. On

[16] An alternative and technically equivalent way to obtain a steady-state population of unmatched firms would be to assume that merged firms spin off with some exogenous probability.

[17] An alternative way to model this would be to assume that instead of new entrants coming into the market randomly, a pair of firms enter the market every time a merger is formed, in a way that holds the relative proportions of each side constant through time. This alternative way, would eliminate size or congestion effects, which we include to make the model richer.

[18] Indeed, adding the possibility that two potential acquirers might meet and agree to merge does not alter the qualitative results, therefore we do not consider it here.

the other hand, new entrants (n) arrive at the market exogenously at a Poisson rate δ.

Managers. Managers run the company and also face the decision of what type of merging strategy they want to carry out while they are independent. Engaging in acquiring practices affects the profitability of a stand-alone firm's current assets, the reason being that searching for a target takes time and resources away. In fact, we are facing a multitask principal-agent model: managers can spend time improving the operation of the firm or identifying acquisition targets. The more time they spend searching for targets the more they neglect the day-to-day operation of their firms in the sense of not undertaking some short-run positive NPV projects that would improve today's performance and rather waiting for future prospects of merging. We capture this simple idea in a stark way by assuming that if the manager searches, the probability of an increment in flow profits, f, is p_L, whereas when a manager focuses on running the operations of the firm (and so becomes exposed to be targeted) the probability of an increment in flow profits is p_H. Following our argument, $p_H > p_L$ and it is useful to define $\Delta p \equiv p_H - p_L$.

Managers are risk neutral and seek to maximize the present discounted value of their flow of utility

$$\mathbb{E}_0 \left[\int_0^\infty e^{-rt} U_t dt \right],$$

where U_t represents the utility derived from the compensation flow, specified in a contract R, and, if applicable, from an instantaneous private benefit (cost) flow, and r is the continuous rate of time preference. The value of such private benefits/costs depends on the action undertaken by the manager. First, if she is running a stand-alone firm, she privately obtains b as long as she is engaged in searching. This variable should be interpreted as a net private flow: the difference between private benefits and costs of searching versus not. Among such benefits we include the traditional private benefits that are freed when less effort is exerted into managing the operations of the firm (along the lines of Holmstrom and Tirole (1997) which they also interpret as opportunity costs of behaving diligently).[19]

[19] The latest evidence on private benefits corresponds to Dyck and Zingales (2004). They estimate an

In this context a less vague interpretation of such private benefits is the utility derived from shopping around for targets.[20] Therefore, we shall assume $b \geq 0$.[21]

Second, if the manager runs a merged company, the compensation flow of the CEO, motivated by increased private benefits from running a larger firm, becomes B. Without loss of generality, assume $B > b$. This feature captures what is usually called empire building. It is often argued in the literature that the larger the value of assets under the manager's control the more the private benefits enjoyed.[22]

Shareholders. Shareholders are risk neutral too. They seek to maximize the value of the firm. They delegate the choice of projects and the merging strategy to their manager, as we have already mentioned, but they keep the right to approve any merger, and they also decide what contract to offer to their management. This is commonly observed in practice, even though a CEO has some discretion over strategies and targets. In addition, CEO compensation is usually entrusted to a compensation committee that in theory acts in the shareholders' interest.

The moral hazard problem stems from assuming that managers' actions are unobservable. Since both principal and agent are risk neutral, contracts will be purely incentive

average value of control of 14%, although it ranges from -4% to 65% across countries. Note, however, that these estimates are based on block premia since they attempt to measure private benefits of control (those who accrue to the majority stockholder) and might not necessarily reflect management-perceived private benefits.

[20] In this sense, Kaplan, Mitchell and Wruck (1997) quote a corporate controller at Cooper Industries when explaining acquisition policies:

> "(...)Headquarters was focused on doing acquisitions and not on the process of managing businesses. Acquisitions and divestures chew up a tremendous amount of resources. Cooper tended to do all the work internally. All aspects of the corporate office were involved in each acquisition and divesture. Acquisitions were fun, more fun than running the business."

[21] We will challenge the positivity of b in Section 3.2.

[22] This form of modeling the manager's payoff once she is running a merged firm can be rationalized by introducing another moral hazard problem in the merged stage. If in that stage shirking is not profitable to the firm then shareholders shall offer a compensation R^A to incentivize the manager not to shirk. Such R^A would be determined by the incentive constraint

$$p_H R^A \geq p_L R^A + \widetilde{B}.$$

In equilibrium the manager receives $R^A = \widetilde{B}/\Delta p$. Finally if we define $B \equiv \widetilde{B}/\Delta p$ we obtain an equivalent framework as the one described in the model. The purpose of such simplification is to be able to focus on the pre-merger stage, when the important decisions regarding the choice of target/acquirer are made.

driven. We abstract here from the trade-off faced by shareholders between incentive provision and efficient risk-sharing.

Timeline. Before the initial period, the manager signs a contract that includes her remuneration scheme while independent and perhaps a golden parachute in case her firm is acquired and decides to leave (or is fired). From the initial period on, and while the firm is managed independently, actions are taken by the manager, the revenue flow is then realized and part of it, according to the contract, is received by her. Whenever two firms meet, the decision on matching plus the bargaining game (which sets the price of the merger) take place. After that, the net value (after compensation/benefits to the acquirer's manager and the golden parachute to the target's manager) is split among companies accordingly.

2.2 Value Functions and Steady-State Equilibrium Conditions

We start the description of the program by introducing a fundamental variable. As we have mentioned, managers of unmatched firms are either focusing on operational improvements or pursuing strategic acquisitions (searching). Shareholders are unable to observe managers' actions, therefore the optimal compensation scheme needs to be incentive-compatible.

We solve for a symmetric equilibrium where $\gamma \in [0, 1]$ is the equilibrium proportion of potential acquirers and $1 - \gamma$ the equilibrium proportion of potential targets. The importance of this is that γ reflects not only the firm's trade-off in terms of the multitask problem (by identifying, as will be clear later, the determinants of this trade-off) but also gives rise to the endogenous proportion of acquirers and size of the market for corporate control.

These proportions (or probabilities, by the law of large numbers) are conditional on the firm being unmatched. The linearity of the search technology translates into the matching function being proportional to the relative size of the opposite side. A partner is found with probability $\lambda u(1 - \gamma)$ for a potential acquirer, $\lambda u\gamma$ for a potential target. Finally, to simplify notation afterwards, it will be useful to define $\alpha \equiv \lambda u/r$ and interpret it as a measure of search frictions. The larger α the less important the search frictions are.

Let o and m be subscripts denoting the independent/not merged stage versus the merged one. We denote J_o^A the value function of a manager who runs a stand-alone firm and actively searches, and therefore exerts less effort in/chooses worse projects for the management of current assets (a potential acquirer). J_o^T then denotes the value function of a manager who focuses on the operational improvement of a stand-alone firm. Similarly, J_m^A denotes the value function of a manager running a merged company. This value is simply the present-discounted value of the compensation flow from running the merged entity, B. Conversely, were a manager successfully targeted by another she would receive the value J_m^T. In this case, the manager is fired and does not play any active role in the newly merged firm but might receive a severance package, a golden parachute, of R^T.[23] Then, using the description of the manager's problem in Section 2.1. we have

$$rJ_m^A = B, \; rJ_m^T = R^T \tag{1}$$

for the $m-$stage and

$$\begin{aligned} rJ_o^A &= p_L R_o + b + \lambda u(1-\gamma)\iota \left[J_m^A - J_o^A \right], & (2) \\ rJ_o^T &= p_H R_o + \lambda u \gamma \iota \left[J_m^T - J_o^T \right] & (3) \end{aligned}$$

for the $o-$stage, where we represent the acquisition decision (acceptance of a merger) faced by shareholders with the indicator function $\iota \in \{0, 1\}$. The indicator function takes a value of 1 if the match between two firms is to optimally be accepted in equilibrium and 0 otherwise. The contracting decision is simplified to the determination of R_o in the positive-profits state and the golden parachute R^T; R_o can be seen as a bonus to performance.[24]

[23] We choose to model the golden parachute as an infinite flow instead of a one-time fixed payment since it makes comparison with the other contracts more direct. It is without loss of generality since for any infinite flow we can find its one-time equivalent one-time payment.

[24] Implicit above is the result that in the worse state of the world, i.e., when profits are zero, the firm's

To complete the characterization of the set of value functions denote π^A the flow profit accruing to the acquirer shareholders once merged (denote π^T the same variable for the target company). The profit flows π are net of managers' compensation costs. They are subject to the following resource constraint,

$$\pi^A + \pi^T = F - B - R^T.$$

Given that, the shareholders' value function once the acquisition is effective is just the present value of this profit flow,

$$rV_m^j = \pi^j, \text{ where } j \in \{A, T\}. \tag{4}$$

The Bellman equation of a stand-alone firm who observes the possibility of an M&A in the future, V_o^j, is given by

$$\begin{aligned} rV_o^A &= \max_{\iota,\, \{R\}} \left\{ p_L (f - R_o) + \lambda u(1-\gamma)\mathbb{E}\iota \left[V_m^A - \overline{V}_o^A \right] \right\}, \\ rV_o^T &= \max_{\iota,\, \{R\}} \left\{ p_H (f - R_o) + \lambda u\gamma\mathbb{E}\iota \left[V_m^T - V_o^T \right] \right\}, \end{aligned} \tag{5}$$

where $\overline{V}_o^A = V_o^A$ for a mass $1 - \phi$ of acquirers, who, if the merger is not accepted, can look for other firms to acquire in the future, and $\overline{V}_o^A = p_L(f - R_o)/r$ for the rest of acquirers, who face their last chance to merge. The mass of such 'desperate' acquirers is ϕ. We will for now assume that $\phi = 0$ in order to keep the model more tractable in analyzing the equilibrium, but we will recover this general framework in Section 4.1.

It is common in the search literature to assume that the value of matching is to be split according to a generalized Nash-bargaining solution. For that purpose we denote β the relative bargaining power of the acquirer. If we argue that acquirers have relatively more power in negotiating a merger, this would translate into $\beta > 1/2$. The bargaining game

resource constraint and the manager's individual rationality constraint ($R_o \geq 0$) imply $R_o = 0$ in that state. Also, the result that the manager receives no base salary is entirely due to the simplifying assumptions of risk neutrality and zero reservation utility.

delivers the first-order condition

$$(1-\beta)\left[V_m^A - V_o^A\right] = \beta\left[V_m^T - V_o^T\right].^{25}$$

Using the solution to the bargaining game and the above value functions we obtain

$$\frac{r\left(V_m^A - V_o^A\right)}{\beta} = \frac{r\left(V_m^T - V_o^T\right)}{1-\beta} = F - B - R^T - r(V_o^T + V_o^A). \tag{6}$$

The acceptance region is a set in the parameter space such that a merger is worth being accepted by shareholders. That condition is fulfilled whenever, for both parties, the value of merging is not less than the value of being independent, $V_m^j - V_o^j \geq 0$. From (6) we infer that the acceptance region $\mathcal{A}$ of acquirers and targets coincides. Since it is optimal to merge whenever $V_m^j - V_o^j \geq 0$, the cases for which $\iota = 1$ are those that fulfill

$$F - B - R^T - r(V_o^T + V_o^A) \geq 0. \tag{7}$$

The final step towards describing the economy consists of looking at its dynamic features. The infinite horizon calls for a steady-state of the system. According to the description of the search problem, the mass of firms in the market for corporate control (u) plus the mass of potential entrants (n) must add up one, $u + n = 1$. In a steady-state equilibrium,

[25] The first-order condition comes from solving

$$\max_{\pi}(V_m^A - V_o^A)^{\beta}(V_m^T - V_o^T)^{1-\beta}$$

subject to the resource constraint $\pi^A + \pi^T = F - B - R^T$, which is equivalent to solving its logarithmic transformation,

$$\max_{\pi} \beta \log(V_m^A - V_o^A) + (1-\beta)\log(V_m^T - V_o^A),$$

subject to the same constraint. Then it is immediate to see that

$$\partial(V_m^A - V_o^A)/\partial\pi^A = -\partial(V_m^T - V_o^T)/\partial\pi^T,$$

and the first-order condition obtains.

the time change in $u(t)$, $\dot{u}(t)$, must be zero.[26] This condition is

$$\dot{u}(t) = 0 \Leftrightarrow \delta(1-u) - 2\lambda u^2 (1-\gamma)\gamma\iota = 0. \tag{8}$$

III. Equilibrium

Having derived the ingredients to solve for an equilibrium and without any further delay we now define such a stationary equilibrium for this economy.

Definition 1 *An Equilibrium can be represented by a quintuple* ($\left\{J_i^j, V_i^j\right\}_{i=o,m}^{j=A,T}$, u^*, $\gamma^*, \iota, \mathbf{R}^*$*), where: J and V are the Bellman equations satisfying (1), (2), (3), (4) and (5), u^* is the steady-state mass of unmatched firms in (8), γ^* is the equilibrium proportion of potential acquirers and summarizes management behavior, ι represents the optimal matching decision faced by the shareholders in (7) and finally $\mathbf{R}^* = \left(R_o^*,\ R^{T*}\right)$ is the vector of optimal contracts offered to the manager. We call SEM (Search Equilibrium with Mergers) any equilibrium characterized by* $\iota = 1$ and $\gamma > 0$.

We start solving for the equilibrium of the economy by analyzing the endogenous size of the market for corporate control u. Taking γ as given, we can solve the second-order polynomial in (8) to obtain that, in a steady-state equilibrium,

$$u^*(\gamma) = \frac{-\delta + \sqrt{\delta^2 + 8\lambda(1-\gamma)\gamma\delta}}{4\lambda(1-\gamma)\gamma}. \tag{9}$$

It is easy to show that $u^*(\gamma)$ lies in $(0, 1]$.[27] The partial effects of the Poisson rates are as usual. An increase in the exogenous meeting rate (λ) reduces the size of the market for corporate control, i.e., less stand-alone companies are found in a steady state since more mergers are formed; an increase in the arrival rate of new entrants into the market

[26] It is worth stressing that looking at stationary equilibria is common in the search literature. However, non-stationary equilibria might be of interest too. We examine such equilibria in Section IV.

[27] The solution to the second-order polynomial also delivers a negative root which we disregard since it is not consistent with equilibrium since the mass of unmatched firms needs to be non-negative.

(δ) increases the steady-state mass of independent firms subject to acquisitions. Note, however, that λ affects in turn the equilibrium value of γ (through the shareholders' value functions), so there is an indirect effect that needs to be taken into account. We will disentangle this in Section IV. The effect of the relative mass of potential acquirers γ on u is perhaps more interesting. There is some sort of *Laffer* effect: if there are few potential acquirers, any parameter causing that mass to increase makes the merging rate larger and so more mergers are formed and less firms remain independent. On the other hand when γ is already high, a further increase lowers the probability of merging and so more firms remain unmatched. The mapping from the relative proportion of acquirers to the size of the market exhibits increasing and then decreasing returns. This property will become relevant when ranking different equilibria, since the effects are quite different depending on what type of returns are in place. The minimum size of the market for corporate control is reached at the point with the largest merging rate, that is, when both sides are equiprobable, $\gamma = 1/2$. The following remark summarizes these results.

Remark 1 (Comparative Statics on u^*).

$$\partial u^*/\partial\lambda < 0,\ \partial u^*/\partial\delta > 0 \text{ and } \partial u^*/\partial\gamma > (\leqq) 0 \text{ if } \gamma > (\leqq) 1/2.$$

Proof. In the appendix, based on the discussion above.

To further characterize the optimal behavior of managers and shareholders we impose some standard assumptions.

Assumption 1 $\Delta pf \geq b$. This is a natural assumption and its purpose is to bound private benefits away from profits. This assumption grants that absent any merger activity/gains it is economically efficient to focus on the operational improvement of the firm.

Assumption 2 $\alpha_{\min}\beta(F+B) + b > (\Delta p + 2\alpha_{\min}\beta) f$.[28] This assumption is sufficient to ensure not only that mergers are economically efficient under a first-best world but also

[28] From (9) we obtain that $\alpha_{\min} = \left(-\delta + \sqrt{\delta^2 + 2\lambda\delta}\right)/r$.

that the market does not break down in such a scenario.

Assumption 3 $p_H/p_L \geq 1 + \lambda/r$. This is a modified MLRP (Monotone Likelihood Ratio Property). In words, for all values of γ the expected discounted marginal value of focusing on the operational improvement of the firm is larger than the expected discounted marginal value of searching. Technically this assumption avoids a discontinuity in the incentive constraints. It is not essential for the results, yet it simplifies the exposition and analysis of the model.

3.1. Characterizing the Equilibrium Mass of Acquirers and Targets

Having characterized the steady-state size of the market for corporate control as a function of the relative mass of both sides of the market in (9) we now turn to the determination of such sides, given an arbitrary vector of contracts (the discussion of which we postpone until the next subsection). We start with an important result.

Lemma 1 *Under rational expectations, shareholders are ex-ante indifferent between being a potential acquirer or a potential target, in a Search Equilibrium with Mergers (SEM).*

Proof. Assume for a contradiction that, in equilibrium, the pre-merger value function of a potential target differs from that of a potential acquirer, i.e. $V_o^A \neq V_o^T$. If $V_o^A > V_o^T$, target shareholders can optimally deviate towards an acquiring strategy by properly incentivizing their managers. Since we are initially in equilibrium the contracts are incentive-compatible, therefore the deviation is feasible, a contradiction. By using (5) it is direct to verify that as more firms become potential acquirers the mass of this type increases and its value function decreases, turning the deviation less and less attractive, until at the limit both value functions in (5) equate. The reverse case, $V_o^A < V_o^T$, is completely symmetric. ■

The implication of Lemma 1 is important. The fact that, *ex-ante*, firms are indistinguishable in value despite their management performing fairly different tasks proves to be very useful when reconciling the pattern of stock price reactions and mergers being approved. We discuss this in detail in Section IV.

It is also useful to further characterize the acceptance region. For this purpose, recall (7) and use Lemma 1 and the set of Bellman equations to end up with a simple and intuitive necessary (and sufficient) condition for accepting mergers

$$F - 2p_H f - B - R^T + 2p_H R_o \geq 0. \tag{10}$$

This simple rule states that mergers should be accepted as long as synergies, net of compensation costs, are non-negative. The acceptance region $\mathcal{A}$ takes the form of a reservation-value rule: mergers should be accepted as long as $F \geq \widetilde{F}$.[29] It is pretty obvious from the necessary condition above that some form of technological synergies (represented by the term $F - 2p_H f$) play a crucial role but contracts might be important too, especially so when technological synergies are weak. An immediate implication of (10) is that any remuneration to the manager at the merged stage (B or R^T) shrinks the acceptance region while enlarging it whenever the compensation belongs to the stand-alone stage. That is, golden parachutes, by negatively affecting profits once the merger takes place, increase the reservation value. On the other hand, a bonus to performance (or salary) given during the stand-alone period makes mergers more attractive as they decrease the opportunity cost of merging.

We are now ready to characterize the equilibrium mass of potential acquirers (and thus of targets). Proposition 1 below contains the result.

Proposition 1 *Given a contract* (R_o, R^T)*, the equilibrium mass of potential acquirers is represented by*

$$\gamma = \max\left\{\frac{\beta\sigma(\mathbf{R}) - 1/\alpha}{2(1-\beta) + \sigma(\mathbf{R})}, 0\right\}, \; \textit{where } \sigma(\mathbf{R}) \equiv \frac{F - B - R^T - 2p_H\,(f - R_o)}{\Delta p(f - R_o)}. \tag{11}$$

[29] There is no reason to use F as the reference parameter. In fact, f could be used instead. The reservation-value rule would then imply that mergers shall be accepted as long as $f \leq \widetilde{f}$.

Proof. See appendix.

In words, Proposition 1 states that provided the economy supports a SEM then the mass of acquirers (by the law of large numbers, also the probability of being one) is increasing and concave in σ and α (which is proportional to the size of the market, u) and increasing and convex in the acquirer's relative bargaining power (β). We shall interpret σ as a measure of the relative gains from merging versus remaining a stand-alone company. In fact, the numerator in σ is the total surplus from merging (and therefore coincides with the expression for the acceptance condition $\mathcal{A}$) and the denominator is nothing but the change in profits from spending time in searching for a suitable target to focusing on operational improvements of the firm (internal growth). If this change in profits is considerable, the current opportunity cost of searching for targets is large, the relative gains of merging from the acquirer's perspective are therefore lower, and hence the probability of becoming an acquirer should be lower. On the other hand, the probability of being an acquirer depends positively on how difficult it is to find targets: the lower λu is, the lower γ is. Similarly, higher interest rates decrease the current value of future claims (in particular the option value of merging), so they drive the mass of acquirers down.

Note that γ is bounded above by β and so it is always below one. Moreover, it is increasing in R_o and decreasing and strictly convex in R^T. Other things equal, giving incentives through R_o increases the mass of acquirers, whereas giving them *via* golden parachutes has the opposite effect. The reason again is that the first way of compensating takes place during the stand-alone stage and so reduces the current opportunity cost of searching. Golden Parachutes, on the other hand, are given once the companies have merged, reducing the surplus appropriated by acquirers. From an econometrician's point of view, the adoption of GPs should decrease the probability of becoming an acquirer and increase the likelihood of being targeted, other things being equal.

According to Proposition 1, the existence of merging activity at an aggregate level

($\gamma > 0$) requires $\alpha\beta\sigma(\mathbf{R}) > 1$ or

$$\alpha\beta\left[F - B - R^T - 2p_H\left(f - R_o\right)\right] > \Delta p(f - R_o). \tag{12}$$

By inspecting (12), the existence of acquisitions in equilibrium then requires that the relative expected gains of merging (σ) captured by the acquirer (β) and corrected by search frictions (α) exceed unity. This *ex-ante* condition is more demanding than the acceptance region $\mathcal{A}$ described in (10). This is because the decision on merging takes place once the parties meet, it is an *ex-post* condition. To be more concrete, (12) includes the fact that the merger is time consuming due to the search structure of the model and that the acquirer extracts only a share β of the surplus. The acceptance region $\mathcal{A}$ is a necessary (and sufficient) condition to accept a merger but it is not sufficient to guarantee the existence of a SEM. The term inside the brackets in the expression above corresponds to (10) and is therefore positive since otherwise mergers would not be accepted in equilibrium. But the condition in (12) is more demanding than just the non-negativity of net synergies. It implicitly defines a larger cutoff value for the joint profit flow F, or equivalently lower bounds for search frictions (α), the acquirer bargaining power (β) and/or the "unmatched" revenue flow (f). If the condition fails to hold, the market for corporate control breaks down in the sense that firms never merge in equilibrium, even though, since the parameter values fall into $\mathcal{A}$, it might be optimal to accept the acquisition.[30]

3.2. Characterizing Optimal Contracts

In practice, and more so since the 90's, severance payments when a change in control takes place have become more common. Using data from the Investor Responsibility Research Center (IRRC) we find that golden parachute provision to senior executives has steadily increased from 50.4 percent of firms in 1990 to 73.4 percent in 2004. Figure 1 depicts the sustained growth in GP adoption.

[30] To our knowledge the non-break-down condition is new to search models, due to the endogeneity of the sides of the matching market.

[Figure 1 about here]

Figure 1 draws attention on the increased popularity of golden parachutes among public companies and therefore motivates to a greater extent the question of whether these contracts are optimal from the shareholders' perspective, given their current widespread use. In this section we show that under certain conditions the answer is yes.

In a hypothetical context where explicit contracts could not be signed, a simple inspection of the manager's Bellman equations shows that it would be difficult to sustain an equilibrium where firms merge. In fact the threat of being fired and the empire building effect of larger benefits shape managerial incentives towards searching, i.e., they all wish to acquire. However, implicit incentives are active: if only one side of the matching market exists, nobody is able to find any target. In fact, future private benefits have no expected value (use (2) and substitute for $\gamma = 1$). Then if search costs do not exceed private benefits of searching before merging (that is, $b \geq 0$) it still continues to be strictly better for managers to pursue strategic acquisitions, albeit economically inefficient from the firm's value maximization perspective.[31] Indeed, shareholders would like to be targeted, since that yields higher firm value. This moral hazard problem can be (partially) corrected by the use of an appropriate compensation scheme.

We now characterize the optimal contract along with the rest of the equilibrium aggregate and individual endogenous variables (recall Definition 1).

[31] As we can see from (5) and (6).

Using (1), (2), (3), (4), (5) and (6) we can rewrite the program as

$$rV_o = \max_{\iota,\ \{R_o,\ R^T\}} \left\{ \begin{array}{c} p_H\left(f - R_o\right) + \alpha\gamma(1-\beta)\iota\left[\left(F - B - R^T\right) - 2rV_o\right], \\ p_L\left(f - R_o\right) + \alpha(1-\gamma)\beta\iota\left[\left(F - B - R^T\right) - 2rV_o\right] \end{array} \right\} \qquad (\mathcal{P})$$

subject to

$$(LL) \quad : \quad f \geq R_o,\ F - B - R^T \geq 0,$$

$$(IR) \quad : \quad R_o \geq 0,\ R^T \geq 0,$$

$$(IC^T) \quad : \quad p_H R_o - \lambda u\gamma\iota\left[J_o^T(R_o, R^T)\right] \geq p_L R_o + b + \lambda u(1-\gamma)\iota\left[J_m^A - J_o^A(R_o, R^T)\right],$$

$$(IC^A) \quad : \quad p_L R_o + b + \lambda u(1-\gamma)\iota\left[J_m^A - J_o^A(R_o, R^T)\right] \geq p_H R_o - \lambda u\gamma\iota\left[J_o^T(R_o, R^T)\right].$$

The program $(\mathcal{P})$ consists of choosing the optimal vector $(R_o^*, R^{T*})$and the merging decision ι that maximizes the objective function subject to (LL), (IR), (IC^T) and (IC^A).

We focus on the case where mergers occur in equilibrium. The solution to $(\mathcal{P})$ in this case is summarized in the proposition below.

Proposition 2 *In a SEM, the unique optimal contract is to provide a GP. That is,*

$$\left(R_o^*,\ R^{T*}\right) = \left(0,\ \theta(u,\gamma)\left[b + \alpha(1-\gamma)B\right]\right), \qquad (13)$$

$$\text{where } \theta(u,\gamma) \equiv \frac{1+\alpha\gamma}{\alpha\gamma\left[1+\alpha(1-\gamma)\right]}.$$

Proof. See appendix.

A merger provides a contractible contingency upon which the shareholder can rely, if needed. We have just shown that it is actually optimal to do so. An optimal scheme consists of using GPs as the mechanism through which management is motivated. The effect of a golden parachute on V_o is divided in two parts. First, a future negative direct effect on V_o that comes from the fact that merging is less profitable and from the fact that potential targets extract some additional rents from the merger as they only bear a share $(1-\beta)$ of the decreased profitability, whereas using R_o instead accrues entirely to them. Secondly, a positive indirect effect that comes from the alleviation of the incentive constraint. The positive effect is, in absolute value, larger than the negative one.

The economic intuition behind the result in Proposition 3 is a combination of two facts. On the one hand, compensation given during the merged stage is *de facto* shared between acquirer and target, as once they approve the merger they bargain over the surplus that the new company produces. As we have mentioned earlier in the analysis, golden parachutes reduce such a surplus. Target shareholders have to pay only $(1-\beta)$ of each unit given through GPs whereas they would have to pay the entire amount if they were to use R_o. On the other hand, a GP is a more efficient incentive provider because its marginal effect on the manager's utility is larger than the marginal impact of pre-merger compensation. The reason is that a golden parachute is a contingent contract, therefore it is more powerful in providing incentives. The corporate governance policy implication that stems from this result is clear: if a manager needs to be remunerated against pursuing acquisitions because that might harm the operation of the firm, then it is better to include a GP provision in the contract than it is to increase the bonus attached to profits before the merger takes place.

The optimal GP is a decreasing and in general convex function of the proportion of acquirers. As the number of acquirers increases so does the value of being targeted and receiving a severance payment.[32] Since each dollar spent in GPs is worth more to the manager in expected value, the incentive constraint is relaxed and the optimal R^T is lower. On the other hand, when $\gamma \to 0$ the optimal GP tends to infinity since the value function of the potential acquirer also tends to it. On the other hand, when $\gamma \to 1$ the value function of the acquirer tends to $\frac{\lambda+r}{\lambda}b$, which is zero when $b = 0$. In this last case, no explicit incentives are needed. This is summarized in the following corollary.

Corollary 1 *Assume for simplicity $b = 0$. Then*

$$\lim_{\gamma \to 0} R^{T*}(u,\gamma) = +\infty,\ R^{T*}(u,1) = 0.$$

[32] This statement already accounts for the feedback between γ and u.

$$\frac{\partial R^{T*}}{\partial \gamma} < 0 \; \forall \gamma; \text{ if } \alpha < 1, \; \frac{\partial^2 R^{T*}}{\partial \gamma^2} > 0.^{33}$$

Proof. See appendix.

It is useful, at this point, to compare our result with the literature on implicit incentives, also known as 'career concerns' when it comes to executive compensation.[34] Gibbons and Murphy (1992) find that in a CARA-Gaussian framework explicit incentives from the optimal compensation contract are strongest for workers close to retirement because career concerns are weakest for these workers. A look at the manager's value functions reveals that when no explicit incentives are available, a manager focusing on the operational improvement of the firm has weakest implicit incentives when $\gamma \to 0$.[35] This is again caused by the relative scarcity effect that comes from the search structure of the model: as γ becomes smaller, the expected value of being an acquirer increases (being on the 'short' side is advantageous). It is then when explicit incentives need to be stronger; recall that R^{T*} becomes arbitrarily large as γ approaches zero (Corollary 2). This result resembles that in Gibbons and Murphy (1992) in the following sense. Proposition 2 and its corollary yield a similar result: explicit incentives are strongest when implicit incentives are weaker, that is, when γ becomes arbitrarily closer to zero. Implicit incentives operate in our model through the cross-section: the distribution of sides in the market, rather than the time dimension, which is the main mechanism in Gibbons and Murphy (1992).

Remark 2 *If $b + (1-\gamma)B < 0$, the optimal contract consists of a "Golden Propellant" as opposed to a Golden Parachute.*

Remark 2 poses a limit to the optimality of golden parachutes, by acknowledging that they are in part based on the assumption that managers enjoy searching for potential targets and building empires. More concretely, the assumption $B > b > 0$ reflects common

[33] In the case where $\alpha > 1$, $\exists\, \gamma \equiv \gamma_1$ such that $\forall\, \gamma \leq \gamma_1$, $\frac{\partial^2 R^{T*}}{\partial \gamma^2} \geq 0$ and $\forall \gamma > \gamma_1$, $\frac{\partial^2 R^{T*}}{\partial \gamma^2} < 0$.

[34] See Bolton and Dewatripont (2005), Ch.10, for an extensive treatment of implicit incentives and career concerns.

[35] Indeed, $rJ_o^T(\gamma = 0, \mathbf{R} = \mathbf{0})$=$rJ_o^T(\gamma = 1, \mathbf{R} = \mathbf{0}) = 0$ and $rJ_o^A(\gamma = 0, \mathbf{R} = \mathbf{0}) = (b + \lambda B/r)/(1 + \lambda/r) > rJ_o^A(\gamma = 1, \mathbf{R} = \mathbf{0}) = b$.

wisdom and casual evidence. An alternative would be to assume a manager who enjoys sitting in his office and 'just' running the firm ($b < 0$) instead of looking for targets; or a manager for whom a larger firm is more a headache than the prospect of more resources to enjoy ($B < 0$). In these situations, an optimal contract would seek to properly incentivize potential acquirers instead of potential targets, and it would act more like a propellant than a parachute. Such contracts are extremely rare, but during the acquisition of Compaq by Hewlett-Packard, the media reported that Carly Fiorina, the CEO of Hewlett-Packard, would receive around $70 million if the deal with Compaq was successful.[36]

It is also worth remarking that the optimal size of a golden parachute would be positive even if management faced no threat of being fired or no empire building motives (i.e., $B = 0$). As long as there were private benefits from searching for targets, there would be a reason to adopt a positive golden parachute, since the shareholders would still need to give proper incentives to management in order for them to improve the operational performance of the firm.

Finally, the reason why in our model a golden parachute ameliorates the moral hazard problem comes from aligning incentives during the pre-merger stage, as opposed to during the acquisition negotiations. In fact, the classical agency view has been to argue that without such contracts, management would negotiate lower takeover premia for their shareholders or oppose takeover attempts regardless of shareholder's interest (see Jensen (1988) and Machlin, Choe and Miles (1993)). Note that our agency conflict emphasizes tasks that are done before the merger takes place instead.

We finally use Proposition 1 to complete the characterization of the equilibrium and solve for the conditional mass of acquirers

$$\gamma^*(u^*, R^{T*}) = \frac{\beta\sigma(\mathbf{R}^*) - 1/\alpha}{2(1-\beta) + \sigma(\mathbf{R}^*)} \text{ where } \sigma(\mathbf{R}^*) \equiv \frac{F - B - R^{T*} - 2p_H f}{\Delta p f}. \tag{14}$$

Figure 2 below depicts the optimal contract in (13) versus the rational expectations

[36] Source: "Making a Corporate Marriage Work." February 7th., 2005. *The Financial Times Limited.*

equation for the mass of acquirers given in (14). The intersections represent a Search Equilibrium with Mergers. It suggests that when a SEM exists, there might be more than one equilibria.

[Figure 2 about here]

Proposition 3 *A SEM for this economy exists provided F is large enough ($F > \widehat{F}$). Multiple equilibria might arise in this case. The characterization of such equilibria follows.*

i) the threshold $\widetilde{F}$ that defines the acceptance region is met so it is optimal for firms to merge, i.e., $\iota = 1$.

ii) $(u^*, \gamma^*, R_o^*, R^{T*})$ jointly solve the system formed by (9), (14) and (13),

iii) the firm value functions in the different stages are given by

$$\begin{aligned} rV_o &= \frac{p_H f + \alpha^*\gamma^*(1-\beta)\left(F - B - R^{T*}\right)}{1 + 2\alpha^*\gamma^*(1-\beta)}, \\ rV_m^A &= \frac{\beta + \alpha^*\gamma^*(1-\beta)}{1 + 2\alpha^*\gamma^*(1-\beta)}\left(F - B - R^{T*}\right) - \frac{2\beta - 1}{1 + 2\alpha^*\gamma^*(1-\beta)} p_H f, \\ rV_m^T &= \frac{(1-\beta)(1+\alpha^*\gamma^*)}{1 + 2\alpha^*\gamma^*(1-\beta)}\left(F - B - R^{T*}\right) + \frac{2\beta - 1}{1 + 2\alpha^*\gamma^*(1-\beta)} p_H f.\text{[37]} \end{aligned}$$

If, on the contrary, $F \in [\widetilde{F}, \widehat{F}]$ a SEM is not guaranteed and the only possible equilibrium of the economy might involve no mergers. In this last case, $(u^*, \gamma^*, R_o^*, R^{T*}) = (1, 0, \frac{\lambda/r}{1+\lambda/r}B, 0)$ and firm value is $p_H(f - \frac{\lambda/r}{1+\lambda/r}B)/r$. Finally, whenever $F < \widetilde{F}$, $\iota = 0$. Then, $(u^*, \gamma^*, R_o^*, R^{T*}) = (1, 0, 0, 0)$ and firm value is $p_H f/r$.

Proof. See appendix.

Some comments about the value of the firm are in order. First, albeit obvious, V_o incorporates the real option value of merging, provided it is best to accept a merger. Just

[37] Rearranging we obtain that

$$\begin{aligned} r(V_m^A - V_o) &= \frac{\beta}{1 + 2\alpha^*\gamma^*(1-\beta)}\left[F - 2p_H f - B - R^{T*}\right] \geq 0, \\ r(V_m^T - V_o) &= \frac{(1-\beta)}{1 + 2\alpha^*\gamma^*(1-\beta)}\left[F - 2p_H f - B - R^{T*}\right] \geq 0. \end{aligned}$$

like it incorporates the present discounted real option value of future investments. The option value of merging is represented by the second summand in rV_o and is proportional to the net joint profitability from merging $(F-B-R^{T*})$. Note, precisely, that $rV_m^A+rV_m^T = F-B-R^{T*}$. When the bargaining power is unbalanced, the value of the firm once merged depends on past performance (f). When $\beta > 1/2$, the acquirer has relatively more power in negotiating the deal, and past performance affects positively the target merged value (negatively the acquirer merged value). This is so because past performance reduces the surplus the firms bargain over, past profits increase the opportunity cost of merging. When β is large this effect is born by acquirers to a larger extent. Assume, for instance, that $\beta = 1$. This implies $V_m^T = V_o$. So the acquirer pays the target just the ex-ante value of the firm, V_o, which obviously depends on f. Since it is a zero-sum game, this explains why f affects positively V_m^T but negatively V_m^A. However, if both parties have the same relative bargaining power $(\beta = 1/2)$ then $rV_m^A = rV_m^T = \left(F - B - R^{T*}\right)/2$, as we would intuitively expect. In this case, the value of an acquirer or target once merged, rV_m^j, does not depend on α, γ or the past performance of the firm.

A look again at Figure 2 reveals that one candidate equilibrium has a smaller (larger) mass of acquirers (targets) and a larger golden parachute, while the other has a larger (smaller) proportion of acquirers (targets) and a relatively reduced GP. The economic explanation follows. Given that the relative proportion of potential acquirers is small, being on the short side of the market gives a search advantage and so a larger R^T is needed in order to give proper incentives. A larger GP is also consistent with shareholder indifference (RE equation) since GPs reduce the merging surplus which is positively related to γ. The same reasoning applies to the equilibrium with a larger proportion of potential buyers and a diminished value of GPs. It is worth emphasizing, given what we have just argued, the substitutability of markets and contracts. At the beginning of the section we claimed the necessity of contracts to properly incentivize managers not to be too prone to be an acquirer (and also to avoid the market from breaking down when mergers are value-creating). Once they are in place, such contracts interact with market forces and in equilibrium they balance each other. In contrast with other optimal contracting models in general equilibrium (see, for instance, Holmstrom and Tirole (1993)) it is not possible to separate market equilibrium analysis from the optimal contracting one.

Jensen and Ruback (1983) mention that "the higher average returns (to targets with managerial opposition to takeovers) could arise because only the more highly profitable takeovers are pursued" (p.37). Our model, albeit not focusing on management-opposed takeovers, also reflects this truncation phenomenon. Essentially, a GP shrinks the acceptance set compared to the benchmark case by raising the reservation value $\widetilde{F}$. To show this formally, assume that synergies are unknown until the two firms meet but its value is learnt after meeting and before they decide whether to accept the acquisition, and that they are distributed according to $G(F)$ on $(0, \infty)$. Then the expected acquirer gain from merging measured by the conditional expectation of $V_m^A - V_o$ is larger when GPs are offered (the same applies for targets). The counterpart of passing up opportunities to merge that could be optimal in the absence of a GP (in the sense that they would meet the acceptance condition) is that by deterring low-valued mergers, shareholders obtain larger conditional gains when merged. This is summarized in Proposition 4.

Proposition 4 *Golden Parachutes act as a barrier to merge. However the ex-ante firm value is larger when they are provided. With uncertain synergies, GPs deliver firms larger expected gains from merging, compared to a benchmark case with no GPs.*

Proof. See appendix, based on the discussion above.

This truncation effect is a testable implication of the model. Looking at a cross-section of mergers, Proposition 4 implies that an economy adopting golden parachutes should enjoy larger abnormal returns from acquisitions. Along these lines, Lambert and Larcker (1985) find that the adoption of GPs is associated with a positive security market reaction. However, they do not estimate the effects of golden parachutes on abnormal returns from merging.

To summarize, we have shown that it is optimal from the shareholders' point of view to provide golden parachutes. We have shown that in general, mergers take place not only when they are optimally accepted by both sides but also when search frictions and the relative bargaining power of acquirers make it profitable to search for strategic acquisitions. In comparing both scenarios (with and without golden parachutes) we have shown that golden parachutes act as a barrier to merge in the sense of Aghion and Bolton (1997) but provide larger expected gains from merging.

IV. Analysis

This section applies the theory presented in the previous ones. We start rationalizing the evidence on abnormal returns and stock price reaction in light of our model. We then turn to suggest how financial intermediation is economically justified in the market for corporate control. Then, we present a traditional efficiency analysis by looking at different first-best considerations. We compare such outcomes with the results in Section III. Finally we briefly talk about how merger cycles and merger booms and busts can potentially be explained by looking at non-stationary equilibria or by considering comparative statics on different parameters.

4.1. On Stock Price Reaction and Abnormal Returns

Empirical evidence suggests that "mergers seem to create value for shareholders overall, but the announcement period gains from mergers accrue entirely to the target firm shareholders" (Andrade *et al.*, (2001)). It seems then that if mergers are not profitable to acquiring firm shareholders, they should block mergers more often than they do. In what follows we provide an explanation for this somewhat puzzling stylized fact and comment on how this explanation is supported by the empirical evidence.

The first element to note in this analysis is that in our model mergers are beneficial to both acquiring and target shareholders since $V_m^A - \overline{V}_o$ and $V_m^T - V_o$ are both non-negative. Otherwise the matching condition would be violated and rational shareholders would not accept to merge. We shall label this effect "value creation". If we only take into account the value creation effect, then clearly both stock price reactions should be non-negative and proportional to the net value of synergies and the bargaining parameter β ($1-\beta$ for targets).[38]

On the other hand, by Lemma 1, the initial firm value, V_o, is the same for all firms if no other heterogeneity component is introduced in the model. This value is based on expectations over the (present discounted) value of cash flows and potential synergies. Before a merger announcement, firms have equal value. Candidate targets or acquirers cannot be distinguished, since the only information the market possesses (if informationally efficient) is the relative size of each group ($1-\gamma$ and γ respectively).

4.1.1. A Heuristic Decomposition

To illustrate the main idea behind the consequences of the model in terms of abnormal returns, first let us look at an economy with myopic investors first. In fact, it is plausible to think that at the early stages of a firm all possible future merger real options are not factored in the stock price. In practice, some events, especially corporate restructuring like an M&A, are particularly hard to forecast, for they occur in an unexpected manner and are usually surrounded by secrecy. The implication of this is that the stock market price of an independent firm will be closer to current dividend/profit yields than to V_o. If investors cannot observe managerial strategies relating to mergers (it is a well-known fact that confidentiality clauses are signed when a potential acquirer initiates movements towards a potential target), then they will estimate it using γ, so the stock price P will be the weighted average of current profits,

$$rP = \gamma p_L f + (1-\gamma) p_H f.$$

[38] Using Proposition 3,

$$\begin{aligned} r(V_m^A - V_o) &= \frac{\beta}{1+2\alpha^*\gamma^*(1-\beta)}\left[F - 2p_H f - B - R^{T*}\right] \geq 0, \\ r(V_m^T - V_o) &= \frac{1-\beta}{1+2\alpha^*\gamma^*(1-\beta)}\left[F - 2p_H f - B - R^{T*}\right] \geq 0. \end{aligned}$$

On the merger announcement date, a key piece of information is unveiled: the market learns who was focusing on the operational improvement of the firm in the past and who was using some of his human capital to search for a suitable target to acquire. The stock prices will then jump to $P^A = \pi^A/r$ for the acquirer and $P^T = \pi^T/r$ for the target, where, since the merger is accepted, $\pi^T > p_H f$ and $\pi^A > p_L f$. However, the stock price P is a convex combination of current dividends, $p_H f > rP > p_L f$. Therefore, whereas the target firm's stock price rises because $rP < p_H f < rP^T$, the acquirer's stock price might drop because $rP > p_L f < rP^A$. For the acquirer, two forces go in opposite directions: the value creation effect pushes the stock price up but the information effect that comes from the moral hazard problem drives the stock price down since investors recognize that the acquirer was relatively overvalued, and hence it would be willing to accept less profitable mergers. This is consistent with the empirical finding that targets appear as net winners whereas acquirers seem to not gain (the two forces might cancel each other). It can be shown that the more distant the sides are (that is, the further γ is from 1/2) the more asymmetric the jumps in stock price are. For example if firms are very likely to be acquirers, then P is closer to $p_L f$ and so the announcement abnormal jump for the target needs to be larger in order to correct prior beliefs. The same logic applies when γ is small. On the other hand, the jump is larger the larger the difference in expected profits (Δpf), i.e., the worse the moral hazard problem, the more sizeable the jump.

The argument in this section is related to Myers and Majluf (1984), which is generalized in Bolton and Dewatripont (2005). Like in their model, the stock price reaction is driven by the ex-post misvaluation of the firm; in our case not because it reveals a bad state of nature but because it reveals a relatively poor performance by the acquirer in the past.

4.1.2. A General Analysis

Rather than introducing an assumption like myopia, consider the more general model outlined in Section II. As we explained, at the time of announcement it is revealed to the market who acquires what. In addition, as a consequence of the relatively poorer performance, an acquirer might face its last opportunity to merge. In fact, the assumption that if the merger is not approved the acquirer can always go back to its stand-alone value V_o is pretty strong. We relax it by allowing some acquirers to face a last chance to merge. If the acquirer turns out to be a 'desperate' one for he is facing a one-time chance to realize synergies through a merger, shareholders correct their priors and a stock price drop might take place if the information effect dominates. If, on the other hand, the candidate acquirer is not a desperate type, then the value creation effect pushes its stock price up unambiguously. Let us examine this in more detail. Recall ϕ is the mass of acquirers that face a last-chance deal. Then the shareholder Bellman equation in a SEM can be rewritten as

$$rV_o = \max_{\{R\}} \left\{ \begin{array}{c} p_H\left(f - R_o\right) + \lambda u \gamma \mathbb{E}\left(V_m^T - V_o\right), \\ p_L\left(f - R_o\right) + \lambda u(1-\gamma)\phi \mathbb{E}\left(V_m^{DA} - p_L(f - R_o)/r\right) + \lambda u(1-\gamma)(1-\phi)\mathbb{E}\left(V_m^A - V_o\right) \end{array} \right\},$$

where V_m^{DA} is the value function of a merged acquirer who was facing the last chance to merge and V_m^A is the value of a merged acquirer who could have faced future acquisitions. The program is subject to the usual conditions. In particular, note that if mergers are accepted in equilibrium, $V_m^A - V_o \geq 0$, so a desperate acquirer will always accept the merger, since $V_m^{DA} - p_L(f - R_o)/r > V_m^A - V_o \geq 0$.[39] Once a meeting takes place the market learns not only who is the target and the acquirer but also the acquirer's type.

Note that, ex-ante, all firms have the same value and so the reference stock price is V_o. At the announcement date, the type of acquirer is unveiled. For those who have the last chance to merge (mass ϕ), the acquisition might be bad news despite the fact that the surplus is non-negative: when compared to V_o a drop in price occurs when β is small enough (the negative information effect dominates the positive value creation effect). For the rest of the acquirers (mass $1-\phi$) the value creation effect pushes the stock price up. On average,

$$\mathbb{E}(V_m - V_o \mid t = t_a) = \phi\left(V_m^{DA} - V_o\right) + (1-\phi)(V_m^A - V_o), \tag{15}$$

[39]Indeed, $\left(V_m^{DA} - p_L f/r\right) - \left(V_m^A - V_o\right) = \beta\left(V_o - p_L f/r\right) \geq 0$, therefore if $V_m^A - V_o \geq 0$ then $V_m^{DA} - p_L f/r \geq 0$.

where the first summand in (15) can be negative and the second is positive (pure value creation effect). This is summarized in the following result.

Proposition 5. *The acquirer's stock price might react negatively upon the announcement of a merger. On average, abnormal returns can be zero or negative. This is more likely when ϕ is large and/or β is small.*

Proof. See appendix.

As we have argued, the disclosure of the willingness to merge conveys information on what growth strategy the manager has been pursuing for the firm. In our model, the revelation of being a potential acquirer has a negative effect: the manager of such a firm has been exerting less effort towards improving the operation of her company so that she can focus on an acquisition that might not pay as expected. However, and this is crucial, all acquirer shareholders are willing to accept the merger. Therefore, we find consistency between observing low (negative or zero) acquirer abnormal returns in a world were M&As are optimally approved by shareholders.

This explains the cross-sectional evidence: if the value of synergies is large enough and companies have plenty of future opportunities to merge, both firms experience abnormal positive returns. If not, acquiring firms might experience negative abnormal returns and target companies positive ones. On aggregate, this is consistent with low (or close to zero) abnormal returns to acquiring shareholders but positive abnormal returns to target shareholders, and shareholders willing to accept the acquisition.

Morck, Shleifer and Vishny (1990) find evidence that bidder abnormal returns are lower when their managers performed poorly prior to the acquisition. This evidence is consistent with the argument that acquirer managers might run their firms relatively worse than targets and that this is crucial in understanding the pattern of abnormal returns during the merger process.

Moeller, Schlingemann and Stulz (2005) find that the losses of acquiring-firm shareholders result from relatively few serial acquirers. They explain that, according to Jensen

(2003), it is possible that the acquisition demonstrates to investors that the acquiring firm's strategy of growing through acquisitions is no longer sustainable and will not create as much value as they believed previously. This argument is similar to the mechanism that delivers negative abnormal returns in our model: when the deal is announced, those firms facing the last chance to merge are the ones that might be overvalued and might experience negative abnormal returns.

Finally, let us compare the model with the findings in Rhodes-Kropf, Robinson and Viswanathan (2005). Consider a situation where $\widetilde{F}_{\phi} < F < \widetilde{F}_{1-\phi}$. That is, the joint flow value for the merged company is such that only 'desperate' acquirers accept to merge. As we have already argued, the acceptance region for such a type is wider. This implies that overvalued acquirers are the ones that trigger successful deals, whereas the ones that are not overvalued form the unsuccessful pool of acquisitions. This is consistent with Rhodes-Kropf *et al.* (2005) who find that misvaluation is higher in successful bids than in failed bids, something that might appear as counterintuitive at first. Related to this, the model predicts that in a scenario where no mergers are accepted, the announcement of a deal would only carry the informational component of it and the 'desperate' type would experience more negative abnormal returns than in a search equilibrium with mergers.

4.2. On the Role of Financial Advisors in Mergers and Acquisitions

In practice, financial advisors play an important role in M&A deals. Financial services companies, like investment or commercial banks, advise both targets and acquiring firms on a variety of issues, from pricing/valuation to the integration process itself (see, for a recent empirical study, Allen et al.(2000)). In light of the framework presented in sections II and III, we here stress the role of financial advisors in facilitating the search process that might ultimately conclude with an acquisition. It is known that often times a firm that wishes to acquire will contact a financial advisor in order to identify the best target (in other cases, a financial advisor might be the one contacting a potential acquirer, or the target might initiate such contacts).

Along the lines of Rubinstein and Wolinsky (1987), what justifies, in economic terms, the existence of intermediaries (they call them "middlemen") in a market with frictions like ours is the time-consuming nature of locating a counterpart which whom to make a transaction (search cost). As long as middlemen can shorten the time period that sellers and buyers have to wait until they are able to transact, they will extract some economic surplus in return.

Financial intermediation can be incorporated in our framework as follows. Let us simplify the model from Section II by eliminating the managerial problem. Let us also simplify the dynamics by assuming that every time a merger is formed and two firms leave the market, two identical ones enter. Therefore, we do not need to worry about determining u, since the system is always in a steady state. Furthermore, let us also assume symmetric relative bargaining power ($\beta = 1/2$ when to agents bargain, $\beta = 1/3$ when the number is three).

The market for corporate control works as follows. Firms face now not only whether to search for synergies or not, but in the case they decide to search whether they want to do that task by themselves or hire a financial advisor to do the search on their behalf. If they choose the latter, they can, like targets, focus on the operational performance of the firm and current profitability is not hurt by choosing to acquire, however, the financial advisor will appropriate some of the gains from merging. Advisor's ability to identify synergies/targets will also play an important role: the better these middlemen are, relative to acquirers, at searching, the more likely the acquirer will choose to outsource that task to financial advisors, since the option value of merging increases with such ability (ability is reflected in higher arrival rates for matches).

A typical firm's value function is now

$$rV_o = \max \left\{ \begin{array}{c} p_H f + \lambda\gamma \left(V_m^T - V_o\right) + \theta\mu \left(V_m^{TF} - V_o\right), \\ p_H f + \theta(1-\gamma-\mu) \left(V_m^{AF} - V_o\right), \\ p_L f + \lambda(1-\gamma-\mu) \left(V_m^A - V_o\right) \end{array} \right\};$$

where λ and θ are Poisson arrival rates depending on who (acquirers or financial advisors respectively) do the search. The proportion of acquirers searching is denoted by γ, μ is the equilibrium proportion of acquirers outsourcing the search to financial advisors, leaving the mass of targets at $1-\gamma-\mu$. We denote V_m^{AF} (V_m^{TF}) the acquirer's (target's) value function from merging when a financial advisor is involved and V_m^A (V_m^T) the value from merging when there is no middleman involved.

Denote $\nu \equiv \theta/\lambda$ the relative search (dis)advantage of a financial advisor versus an acquiring firm. The following proposition characterizes the equilibrium, leaving the details in the appendix.

Proposition 6 *There exists cutoff values for the relative advantage of middlemen ν, $\widehat{\nu}$ and $\widetilde{\nu}$ such that*

i) *If $\nu \in (\widehat{\nu}, \widetilde{\nu})$ there is a well-defined equilibrium of merging activity where both acquirers and financial advisors search for targets ($\mu > 0$, $\gamma > 0$).*

ii) *If $\nu \geq \widetilde{\nu}$ the only possible equilibrium is such that only financial advisors search ($\gamma = 0$, $\mu > 0$).*

iii) *If $\nu \leq \widehat{\nu}$ either only one type searches ($\{\gamma > 0,\ \mu = 0\}$ or $\{\gamma = 0,\ \mu > 0\}$) or the market for corporate control breaks down ($\mu = \gamma = 0$).*

In case both types of search coexist, the equilibrium mass of acquirers that search directly or use financial advisors is given by

$$\begin{aligned}\mu(\gamma) &= \frac{1-\gamma}{2} - \frac{3\lambda\gamma}{4\theta} \text{ and} \\ \gamma(\mu) &= 1 - \mu + \frac{r\Delta pf}{\theta(F-2p_L f)/3 - \lambda(F-2p_H f)/2}, \text{ respectively.}\end{aligned}$$

Proof. See appendix.

The proposition above is very intuitive. First, if financial advisors are much better at identifying good deals, the increased firm value due to a smaller opportunity cost of searching more than offsets the loss from the fact that gains from merging are being split among three parties instead of just two; in this case, only financial advisors search. This result is in line with Rubinstein and Wolinsky (1987). On the opposite side, if such search advantage does not exist only one agent will search, depending on the remaining parameters of the model (in particular, the extend of the moral hazard problem *versus* merger gains). Finally, for a middle range of relative arrival rates, both direct search by acquirers and outsourcing to financial advisors coexist, some acquirers search by themselves others are helped by financial intermediaries. The exact mass of those who choose one or the other (or none, in the case of targets) depends again on the value of the parameters. A look at the equations determining the equilibrium γ and μ, reveals the existence of negative partial cross derivatives. That is, the larger the number of acquirers that search directly, the lower the number of those who hire financial advisors, and viceversa. Also notice that the larger $\nu(=\theta/\lambda)$ is the larger μ is and the lower γ is, as one would expect. The extend of the moral hazard problem also affects the equilibrium values, an increase in p_H benefits the outsourcing option since Δpf reflects the opportunity cost of searching and matching directly. This translates naturally into a lower γ and a larger μ.

4.3. On Efficiency

We start our analysis by looking at the first-best equilibrium. We are interested in looking at the scenario where there is no moral hazard. That is, assuming that projects are observable and verifiable, how do aggregate variables and individual decisions change, compared to the equilibria characterized in Section III. The first-best is still a decentralized equilibrium, but there is no asymmetry of information, therefore incentive constraints are not part of the optimization program. Importantly, a social planner incorporates private benefits into shareholders' value. Merger surpluses are now

$$\frac{r\left(V_m^A - V_o\right)}{\beta} = \frac{r\left(V_m^T - V_o\right)}{(1-\beta)} = F + B - 2rV_o.$$

It is immediate to see that, compared to (6), B now amplifies net gains instead of lowering them. Due to Assumption 1 and 2, the acceptance condition is met.[40] These assumptions also guarantee that the parameters of the model are able to sustain a SEM, that is, a strictly positive γ and $\iota = 1$. Since agents (managers) are risk neutral and there is no need to give them incentives, the vector of contracts is, of course, zero-valued. Therefore at this point there are two endogenous variables that need to be solved for. First, the steady-state size of the market for corporate control, u, is still given by (9). By Lemma 1 and Proposition 1, an equilibrium is given by

$$\gamma^{FB}(u^*) = \frac{\beta\sigma^{FB} - 1/\alpha^*}{2(1-\beta) + \sigma^{FB}} \textit{ where } \sigma^{FB} \equiv \frac{F - 2p_H f + B}{\Delta p f - b}. \tag{16}$$

Proposition 7 *In a SEM, the relative gains from merging, σ, are larger than in the first-best scenario, $\sigma^{FB} > \sigma_{GP}$. If market-size effects are not too important (i.e. u does not vary a lot among different scenarios) there is too little search when golden parachutes are provided.*

Proof. See appendix.

Figure 3 illustrates the proposition above, that is, that golden parachutes make mergers less attractive than socially desired. In general, efficiency considerations in search models conclude that there is too little search in the economy.

[Figure 3 about here]

Another important insight can be gained from Proposition 7. Mergers are socially efficient even though they might generate non-positive technological synergies. As long as $\alpha\beta\,(F - 2p_H f + B) > \Delta p f - b$, which can be fulfilled even in the case when synergies before compensation are non-existent (i.e. $F - 2p_H f = 0$), $\gamma > 0$.[41] In that case, mergers would be purely driven by empire building motives coming from larger private benefits of control.

[40] The acceptance condition is now $B - 2p_H f + B \geq 0$, which is satisfied under Assumption 2.
[41] This is not true with asymmetric information.

This is intuitive since shareholders do not always internalize them but they would in a first-best world. Paradoxically enough, moral hazard rules out (socially efficient) mergers that arise solely by empire building motives.

We shall now approach the efficiency discussion differently. In the analysis above, we removed the moral hazard problem while maintaining the decentralized nature of the equilibrium. That is, we solved for a symmetric equilibrium where shareholders are *ex-ante* indifferent between being an acquirer or a target, which in turn pins down the equilibrium mass (or probability) of each side of the market as a function of the different parameters of the model. A social-planner problem would be slightly different since the rational expectations break-even condition in Lemma 1 does not need to apply. In other words, a social planner could assign different pre-merger value functions to acquirers and targets if that maximizes the sum of all agents' present discounted value. Note that we still constrain ourselves to steady-state equilibria. This amounts to maximizing the average present discounted value of all firms, $\gamma V_o^A + (1-\gamma)V_o^T$. Equivalently,

$$\max_{\gamma,\pi^A,\pi^T}\left\{\gamma\left[\frac{p_L f + b + \alpha(1-\gamma)\pi^A}{1+2\alpha(1-\gamma)}\right] + (1-\gamma)\left[\frac{p_H f + \alpha\gamma\pi^T}{1+2\alpha\gamma}\right]\right\},$$

subject to the steady state condition in (9), and to the resource constraint to whom we attach the Lagrange multiplier ρ,

$$\pi^A + \pi^T = F + B.$$

The first-order condition with respect to γ reads

$$\frac{p_L f + b + \alpha(1-\gamma)\pi^A}{1+\alpha(1-\gamma)} + \alpha(1-\gamma)\frac{\pi^T - p_H f}{(1+\alpha\gamma)^2} = \frac{p_H f + \alpha\gamma\pi^T}{1+\alpha\gamma} + \alpha\gamma\frac{\pi^A - p_L f - b}{(1+\alpha(1-\gamma))^2}. \quad (17)$$

On the other hand, the first-order condition with respect to the share each firm gains out of the merger, π^A and π^T, reads

$$\frac{\alpha\gamma(1-\gamma)}{1+\alpha(1-\gamma)} - \rho = 0, \quad (18)$$

$$\frac{\alpha\gamma(1-\gamma)}{1+\alpha\gamma} - \rho = 0. \quad (19)$$

The two conditions above imply $\overline{\gamma} = \frac{1}{2}$. Using this result in (17) yields

$$\overline{\pi}^T = \frac{F+B}{2} - \frac{1+\overline{\alpha}}{\overline{\alpha}^2}(\Delta pf - b)$$

$$\overline{\pi}^A = \frac{F+B}{2} + \frac{1+\overline{\alpha}}{\overline{\alpha}^2}(\Delta pf - b).$$

The first-order condition in (17) brings the marginal effects of γ to zero. A marginal increase in the mass of acquirers affects both sides merging probabilities and the discounting factor in opposite directions. But a marginal increase in the mass of acquirers also affects the way firm values are weighted out. A larger γ gives acquirers more weight in the objective function. More importantly, this problem controls for the search externalities that each side of the market imposes to the other. These margins are not taken into account by the agents in the decentralized equilibrium of Section III. Moreover, the first-order conditions in (18) and (19) together imply that the sides should be equal in mass, otherwise marginally increasing the payoff to one side would result in a total surplus increase. Interestingly enough, $\gamma = \frac{1}{2}$ also maximizes the aggregate merging rate (recall Remark 1). Therefore our social planner solution coincides with an M&A "golden rule", since at that value the acquisition rate is maximized.

Finally, note that if Assumption 1 holds, $\Delta pf - b > 0$; then the acquirer obtains a larger piece of the merged entity, to compensate for lower pre-merger flow profits. We summarize the results in this section in the following proposition.

Proposition 8 *The solution to the social planner's problem maximizes takeover activity, that is $\overline{\gamma} = 1 - \overline{\gamma} = \frac{1}{2}$. The profits of the merged company are split unequally to compensate for the asymmetry in pre-merger profitability.*

Proof. Based on the discussion above.

4.4. On Merger Waves: Nonstationarity and Other Comparative Statics

The model is potentially able to generate waves *via* endogenously-created cycles. The existence of endogenous cycles in the context of search models has been treated in Diamond and Fudenberg (1989), Shimer and Smith (2001) and Burdett and Coles (1998), among others. In relation to this, Diamond and Maskin (1981) consider a non-steady-state example of search and breach of contracts. Unfortunately the existing literature on endogenous cycles in search models is not general enough to provide conditions under which such cycles exist.

The existence of cycles is possible in our model due to the multiplicity of equilibria when golden parachutes are provided. As we advanced in the introduction, the endogeneity of the sides of the matching model and its relation with an optimal contract allows for multiplicity, despite the fact that the search technology is linear and there is no source of heterogeneity. With an appropriate set of conditions the economy might be involved in a cycle that 'travels' around the two equilibria, one with a large GP and a low mass of potential acquirers and the other with a lower GP but a larger mass of acquirers. Since the merging rate depends upon that mass, this phenomenon could generate booms and busts in merging activity. This result highlights that trends in managerial compensation might play a role in explaining part of the phenomenon of merger waves.

Apart from relying on the existence of endogenously-generated merger waves, some exogenous changes in the parameters of the model can explain some of the booms that have occurred during different episodes of merger waves. We study this in detail in the next subsections, as well as some other comparative statics, for robustness.

4.4.1. Changes in the Poisson Arrival Rate λ

In the context of our model, λ can be interpreted as an exogenous variable capturing how easy or difficult it is for firms to contact each other. Such variables affecting the arrival rate of potential candidates range from geographical considerations to legal ones.

Imagine, for instance, the elimination of capital controls and the opening of a country to foreign direct investment or a legal reform towards easing merger activity. The literature has cited deregulation as one of the main causes driving mergers (see Holmstrom and Kaplan (2001)). One way we can incorporate this into our framework is by arguing that deregulation would allow firms to be part of the market for corporate control and thus be engaged in searching activities. Moreover, opening the barriers to foreign capital enlarges the pool of candidates that a potential acquirer shall target, causing an increase in the likelihood of finding one. These are just some examples that could drive λ up.

An increase in the arrival rate of partners makes search frictions less important. Using Remark 1 this produces a direct size effect reducing the pool of unmatched firms since the merging rate increases. On the other hand, by Proposition 1 the γ function also shifts up since the acquirer perceived gains from merging go up. If we start from an initial mass of acquirers $\gamma_0 < 1/2$ then this reinforces the direct size effect and u unambiguously decreases. If, on the other hand, $\gamma_0 > 1/2$ the overall size effect is not conclusive. Using Proposition 2 we find that the increase in λ relaxes the incentive constraint, shifting down the R^T function. The multiplicity of equilibria makes it possible to observe two different outcomes. If initially the economy was in an equilibrium with a low mass of potential acquirers and a highly-valued GP, then γ is driven further down and R^T increases. The logic behind this result is that when mergers are perceived as more attractive by managers, larger GPs need to be adopted to keep incentives in place. This makes the market equilibrium mass of acquirers shrink since larger GPs can overcome the positive effect on shareholder value, that is driven by less search frictions. In contrast, if the initial equilibrium was such that GPs are low and the mass of acquirers large, then easing search on the long side of the market does allow for a reduced GP and given that, shareholders of potential acquirers are more willing to merge. This drives γ further up.

The effect on the merging rate, the variable that measures aggregate merging activity in the economy, is ambiguous. This rate (the flow at which two firms merge) is given by

$2\lambda u^2\gamma(1-\gamma)$. Using (9) we can then rewrite the merging rate as

$$\delta\left(1+2\frac{\delta-\sqrt{\delta^2+8\lambda\delta\gamma(1-\gamma)}}{8\lambda\gamma(1-\gamma)}\right).$$

Totally differentiating the expression we obtain that if we are in an equilibrium with $\gamma_0 > 1/2$ then the merging rate increases, and so there is a boom in M&As at the aggregate level. If the initial situation is a low mass of acquirers then the merging rate can either increase or decrease.

4.4.2. New entrants with larger $\mathbf{p}_H$

An interesting thought experiment is to look at the changes in the economy as new entrants have projects with higher quality. In particular, assume that the mass of new entrants n enters the market for corporate control with a larger p_H, that is, focusing on internal growth is more likely to be successful. The incentive constraint in that case is alleviated since managers face a larger opportunity cost of taking on the search strategy. Therefore, the optimal GP can be reduced. These firms are initially likely to be targets, since the LHS of (5), at the initial γ and R^T values, is larger. This is realistic; look at, for example, young firms in the software industry. These are usually firms with high potential value and they might represent a break-through discovery that is expected to bring in large benefits. It is often observed that they end up being acquired by Microsoft or another large high-tech company, as our model would predict. As the market evolves through time, the 'old' p_H is eventually substituted away and the new steady-state SEM is such that both equilibria are further apart from each other, one with even larger GPs and a lower mass of acquirers, the other with even lower GPs and a larger mass of acquirers.

4.4.3. Changes in the Acquirer's Bargaining Power

It is worth stressing the role of the bargaining power variable in our analysis. An increase in the bargaining power of the acquirer does not affect the incentive constraint. On the other hand, the rational expectations equation (11) in Proposition 1 is affected. Direct computation shows that $\partial\gamma^*/\partial\beta > 0$. The result is obvious. If the acquirer is able to extract a larger fraction out of the merger, the market is able to sustain a larger mass of such a type in equilibrium. If we then take into consideration the IC constraint we conclude that if the mass of acquirers was already large initially, a further increase in γ alleviates the constraint and thus allows for a lower size of R^T. On the other hand, if γ was initially small then the incentives to be on the short side (acquirer) are so large that an increase in value of the GP is needed to prevent targets from shirking. This is illustrated in Figure 4 below.

[Figure 4 about here]

V. Concluding Remarks

This paper provides a framework that allows us to analyze issues related to friendly mergers and acquisitions.

We have argued that once the choice of roles in an acquisition is modeled there is a tension between future synergistic gains from merging and the pre-merger performance of the firm in the sense that, in order to capture synergies, firms (potential acquirers) need to incur some costs. This helps explaining why acquirer shareholders do not block mergers, despite the fact that on the day of announcement of an acquisition the acquirer stock price might react negatively. Our theory also predicts that the more difficult it is to merge the worse is such a reaction, as the manager needs to waste more resources towards a merger that might ultimately fall below expectations. We find that a more severe moral hazard problem affects the price reaction in a negative way too.

The model suggests that there is a link between takeover activity and CEO compensation. This comes from the conflict of interests between managers and shareholders regarding mergers. Managers need to be incentivized in order to act in shareholders' interest. We find that the most efficient way to provide incentives is through GPs. This is robust to the manager risk-neutrality assumption; it can be shown that in a CARA-Gaussian framework the optimal contract involves a GP and a bonus tied to performance.

Our result is somewhat opposed to the common wisdom that GPs harm shareholders. It is directly testable by looking at whether firms adopting golden parachutes are more likely to gain larger abnormal returns following an acquisition. Machin, Choe and Miles (1993) find evidence on that respect, for the period 1973-1988. A related hypothesis is whether a GP increases (decreases) the probability of being an acquirer (target).

Despite the over-eagerness of managers to become acquirers and to avoid being fired or downgraded, both markets and explicit compensation packages act as incentive devices. The answer to the question of whether the economy is immersed in too many mergers is ambiguous if a bonus to performance is used to incentivize managers. This conclusion is reached after the efficiency analysis. In fact, a bonus, by cutting down pre-merger profits, might make mergers more attractive than they socially are. Depending then on the parameter values of the model, different scenarios might arise. On the other hand, the adoption of golden parachutes predicts (under some conditions) less search than the first-best solution.

Finally, our framework also provides a way to explain financial intermediation withing the market for corporate control. Essentially, a financial advisor might have an advantage in searching for synergies. This alleviates the moral hazard problem for the acquirer, however it comes at a cost: the financial advisor will obtain part of the synergy gain.

These findings pose new challenges in terms of empirical hypotheses which we seek to test in a follow-up paper. For instance, estimating the effects of golden parachutes in both merger gains and the likelihood of becoming a target/acquirer and to empirically disentangle the linkage between abnormal returns, past performance, merging activity and macroeconomic variables.

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Figure 1. Firms Adopting Golden Parachutes

Source. Investor Responsibility Research Center (IRRC). According to Gompers, Ishii and Metrick (2002), the IRRC tracks more than 93 percent of the total capitalization of the combined New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and Nasdaq.

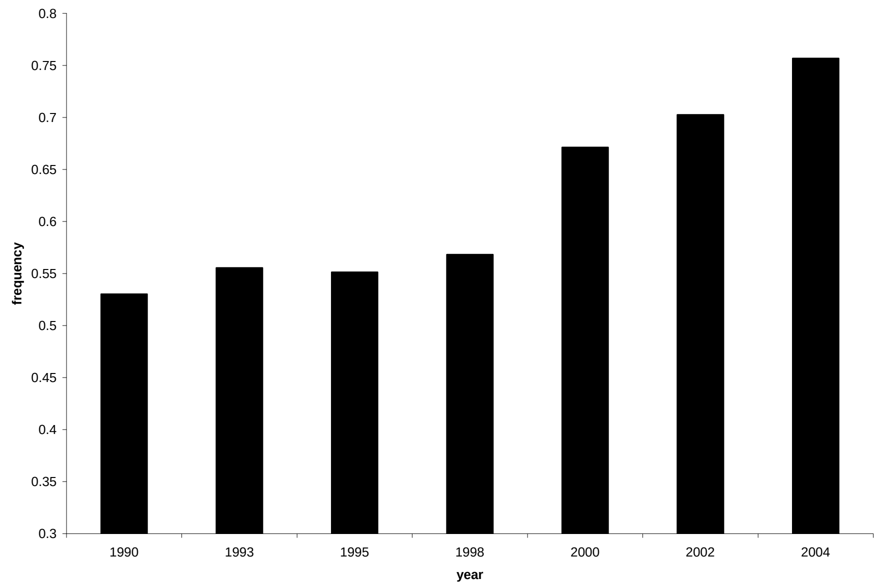


Figure 2. *SEM* for General Model

Note. Illustration of the equilibrium system of equations, $b = 0$. RE denotes the rational expectations equation in (14) and IC the incentive constraint in (13).

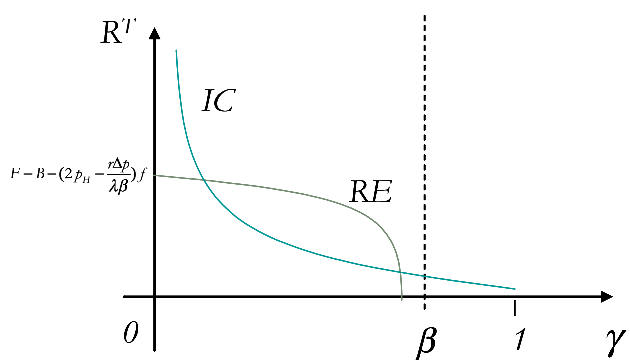


Figure 3. Comparison of Equilibria

Note. The picture shows the numerical computation of the two equilibrium equations of the model, in terms of γ and contracts. Benchmark means no GPs. The steady-state eqn. for u is included. Moreover, the following parameter values are used: $\beta = 0.8$, $\lambda = 0.07$, $\delta = 0.07$, $r = 0.04$, $b = 0$, $B = 0.1$, $f = 2$, $F = 4.75$, $p_H = 0.75$, $p_L = 0.25$.

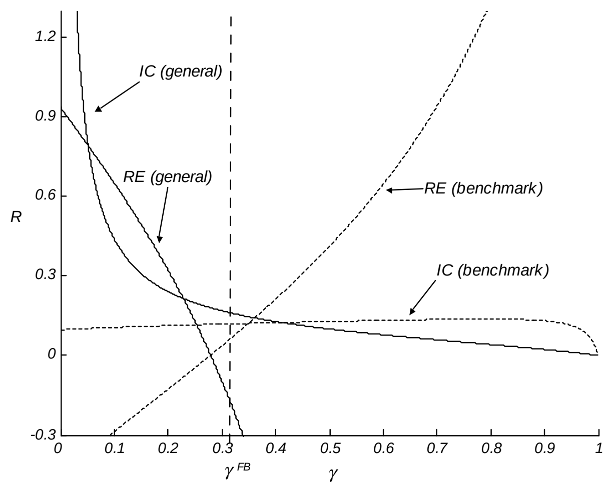


Figure 4. Effects of Increasing β

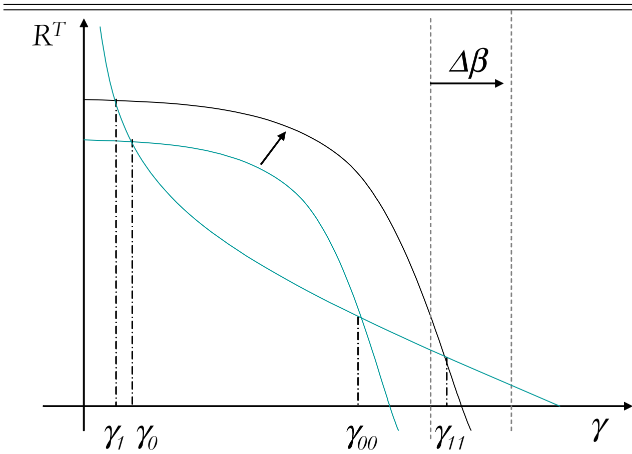
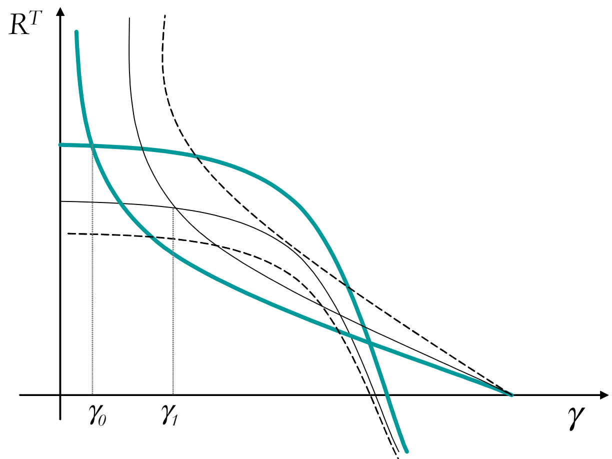


Figure 5. Effects of Increasing Private Benefits, B

Note. The picture represents the two possible outcomes of an increase in private benefits. The thick line represents the original outcome. The dashed line is the case where the market breaks down as a result of such increase, whereas the thin solid line is the case where the two equilibria come closer.



Proof of Remark 1.

Define $\mathcal{Q}(u) \equiv -2\lambda(1-\gamma)\gamma u^2 - \delta u + \delta$. Then $\mathcal{Q}(u^*) = 0$, u^* being the positive root of the quadratic. Using the Fundamental Theorem of Calculus and differentiating the quadratic expression totally we have that for an arbitrary parameter q in the quadratic equation $\mathcal{Q}$ it is the case that

$$\frac{\partial \mathcal{Q}}{\partial u}\frac{\partial u^*}{\partial q} + \frac{\partial \mathcal{Q}}{\partial q} = 0, \tag{A.1}$$

where all the derivatives are evaluated at u^*. The next step consists of realizing that $\partial\mathcal{Q}/\partial u < 0$, so to find the sign of $\partial u^*/\partial q$ we just need to obtain the sign of $\partial \mathrm{Q}/\partial q$. For λ, $\partial\mathcal{Q}/\partial\lambda = -2(1-\gamma)\gamma u^2 < 0$ so $\partial u^*/\partial\lambda < 0$ in order to fulfill (A.1). We proceed in a similar way with δ. Since $\partial\mathcal{Q}/\partial\delta = 1 - u > 0$ then $\partial u^*/\partial\lambda > 0$. Finally, for γ, $\partial\mathcal{Q}/\partial\gamma = -2\lambda(1-2\gamma)u^2$ which is negative when $\gamma < 1/2$, positive when $\gamma > 1/2$ and zero when $\gamma = 1/2$. This means that $\partial u^*/\partial\gamma > 0$ when $\gamma > 1/2$, $\partial u^*/\partial\gamma < 0$ when $\gamma < 1/2$ and $\partial u^*/\partial\gamma = 0$ when $\gamma = 1/2$. ■

Proof of Proposition 1.

The proof basically involves manipulating the shareholder's value function (5). Assume that mergers are worth being carried out, $\iota = 1$. Use the result from the bargaining game that relates $V_m^A - V_o$ and $V_m^T - V_o$ in (6). Next note that we can solve for V_o using the term on the left inside the brackets of (5) to obtain that

$$rV_o = \frac{1}{1 + 2\alpha\gamma(1-\beta)}\left[p_H(f - R_o) + \alpha\gamma(1-\beta)\left(F - B - R^T\right)\right].$$

This in turn means that the surplus from merging is

$$r(V_m^T - V_o) = \frac{(1-\beta)}{1 + 2\alpha\gamma(1-\beta)}\left[F - B - R^T - 2p_H f + 2p_H R_o\right].$$

Take the two expressions inside the brackets of (5), use the equation above and equate them to obtain

$$
\begin{aligned}
p_H\left(f-R_o\right)+\lambda u\gamma\left[V_m^T-V_o\right] &= p_L\left(f-R_o\right)+\lambda u(1-\gamma)\left[V_m^A-V_o\right] \\
\Delta p(f-R_o) &= \left(\lambda u(1-\gamma)\frac{\beta}{1-\beta}-\lambda u\gamma\right)\left[V_m^T-V_o\right] \\
&= \alpha(\beta-\gamma)\frac{F-B-R^T-2p_Hf+2p_HR_o}{1+2\alpha\gamma(1-\beta)}.
\end{aligned}
$$

Now, define $\sigma(R)\equiv\frac{\left[F-B-R^T-2p_Hf+2p_HR_o^H\right]}{\Delta p(f-R_o)}$ and solve for γ to obtain the expression that appears in Proposition 1, after correcting for the fact that in equilibrium, γ needs to be non-negative, therefore whenever that expression is negative the equilibrium γ needs to be zero, driving u to 1, so we have an equilibrium without mergers. ■

Proof of Proposition 2.

The proposition looks at an equilibrium with mergers. Postulate, therefore, $\iota=1$. Shareholders take both u and γ as given when making their decisions. By Lemma 1, shareholders are indifferent between implementing either of the two actions (search/ not search). After some algebra, we can rewrite IC^T as

$$
\frac{1}{1+\alpha\gamma}p_HR_o+\frac{\alpha\gamma}{1+\alpha\gamma}R^T\geq\frac{1}{1+\alpha(1-\gamma)}\left(p_LR_o+b\right)+\frac{\alpha(1-\gamma)}{1+\alpha(1-\gamma)}B. \tag{20}
$$

In words, (20) states that the value function of a manager focusing on improving the daily operation of the firm and so being exposed to a takeover but compensated with a golden parachute is larger than deviating by paying less attention to the operation of the company and more to making strategic acquisitions. The incentive constraint for managers who are actively searching coincides except that the inequality is reversed. Since shareholders are indifferent in equilibrium, then the IC must be binding.

If mergers are worth being accepted, the limited liability condition is satisfied, so we can eliminate it from the program. The simplified problem is

$$\max_{\{R_o,R^T\}} p_H(f-R_o)+\alpha\gamma(1-\beta)\left[F-B-R^T\right]$$

$$\textit{subject to}$$

$$\frac{\Delta p+\alpha\left(p_H(1-\gamma)-p_L\gamma\right)}{(1+\alpha\gamma)(1+\alpha(1-\gamma))}R_o \geq \frac{1}{1+\alpha(1-\gamma)}b+\frac{\alpha(1-\gamma)}{1+\alpha(1-\gamma)}B-\frac{\alpha\gamma}{1+\alpha\gamma}R^T,$$

$$R_o \geq 0,$$

$$R^T \geq 0.$$

Case 1. $\Delta p+\alpha\left(p_H(1-\gamma)-p_L\gamma\right)\leq 0$. This case is ruled out by Assumption 3. However, to highlight that Proposition 2 does not rely on such assumption, we analyze this case. Under Case 1, setting a non-negative valued R_o clearly worsens the incentive constraint and given that to maximize the objective function we need to minimize the compensation to the manager, optimality requires $R_o^*=0$. Then we set R^T such that the incentive constraint binds. Note that, in this case, $R_o^*=0$ for a potential acquirer is still optimal, despite the fact that a positive value of it would alleviate IC^A. The reason is that R^T already compensates for private benefits, so no additional remuneration to $L-$projects is needed. In sum, in Case 1 it is optimal to set

$$R_o^*=0,\ R^{T*}=\frac{1+\alpha\gamma}{\alpha\gamma}\left[\frac{b}{1+\alpha(1-\gamma)}+\frac{\alpha(1-\gamma)B}{1+\alpha(1-\gamma)}\right].$$

If $b=0$ the expression is simplified to

$$R^{T*}=\frac{(1-\gamma)}{\gamma}\frac{1+\alpha\gamma}{1+\alpha(1-\gamma)}B.$$

Case 2. $\Delta p+\alpha\left(p_H(1-\gamma)-p_L\gamma\right)>0$. This is the more interesting one. Under Case 2, both ways of compensating the manager are substitutes, since they both alleviate the IC^T

constraint. To solve this indeterminacy we express R_o as a function of R^T using IC^T :

$$R_o \geq \frac{(1+\alpha\gamma)(1+\alpha(1-\gamma))}{\Delta p+\alpha\left(p_H(1-\gamma)-p_L\gamma\right)}\left[\frac{1}{1+\alpha(1-\gamma)}b+\frac{\alpha(1-\gamma)}{1+\alpha(1-\gamma)}B\right]-\frac{\alpha\gamma(1+\alpha(1-\gamma))}{\Delta p+\alpha\left(p_H(1-\gamma)-p_L\gamma\right)}R^T.$$

Next we use this and substitute back into the objective function to leave it only in terms of R^T, ending up with

$$\max_{R^T}\ p_H\frac{\alpha\gamma(1+\alpha(1-\gamma))}{\Delta p+\alpha\left(p_H(1-\gamma)-p_L\gamma\right)}R^T-\alpha\gamma(1-\beta)R^T.$$

The first-order condition is

$$p_H\frac{1+\alpha(1-\gamma)}{\Delta p+\alpha\left(p_H(1-\gamma)-p_L\gamma\right)}-(1-\beta),$$

which is positive. To prove it by contradiction, let us assume that the first-order condition is non-positive. Then after rearranging terms, we obtain

$$\beta p_H(1+\alpha(1-\gamma))\leq-(1-\beta)p_L(1+\alpha\gamma),$$

a contradiction. Since the first-order condition is positive, we need to optimally set R^T as large as we can (R_o as small as we can) in order to satisfy the incentive constraint, so

$$R_o^*=0,\ \ R^{T*}=\frac{1+\alpha\gamma}{\alpha\gamma}\left[\frac{b}{1+\alpha(1-\gamma)}+\frac{\alpha(1-\gamma)B}{1+\alpha(1-\gamma)}\right].$$

■

Proof of Corollary 1.

By direct substitution it is immediate to see that

$$\lim_{\gamma\to 0}R^{T*}(u,\gamma)=\frac{B}{0}=+\infty,\ R^{T*}(u,1)=0.$$

Regarding the partial derivative with respect to γ, note first that γ also affects the equilibrium value of u, so denoting R^{T*}_i the partial derivative with respect to the variable i we have that

$$\frac{\partial R^{T*}(u,\gamma)}{\partial\gamma} = R^{T*}_\gamma + R^{T*}_u\frac{\partial u}{\partial\gamma}.$$

Taking derivatives we find that

$$R^{T*}_\gamma = \frac{2\alpha\gamma(1-\gamma)-1-\alpha}{\gamma^2\left(1+\alpha(1-\gamma)\right)^2}B<0$$

since $\max_\gamma 2\alpha\gamma(1-\gamma)=\alpha/2<\alpha$. On the other hand,

$$\frac{\partial R^{T*}}{\partial\alpha} = \frac{(2\gamma-1)(1-\gamma)}{\gamma\left(1+\alpha(1-\gamma)\right)^2}B,\;\; \frac{\partial\alpha}{\partial\gamma} = -\frac{2\alpha\lambda(1-2\gamma)u}{4\lambda(1-\gamma)\gamma u+\delta}.$$

Therefore, $\frac{\partial R^{T*}}{\partial\alpha}\frac{\partial\alpha}{\partial\gamma}\geq 0$. Nonetheless, this size effect is of second order, and it is not able to offset the negativity of $\frac{\partial R^{T*}}{\partial\gamma}$. To prove this, add derivatives to get

$$\frac{\partial R^{T*}}{\partial\gamma} = \frac{B}{\gamma^2\left(1+\alpha(1-\gamma)\right)^2}\left\{2\alpha\gamma(1-\gamma)\left[1-\frac{(2\gamma-1)(1-2\gamma)\lambda u}{4\lambda\gamma(1-\gamma)u+\delta}\right]-1-\alpha\right\}.$$

It can be shown that the expression inside the braces is maximized at $\gamma=1/2$, but at that value the size effect is just zero. Therefore we conclude that $\frac{\partial R^{T*}}{\partial\gamma}<0$.

Finally,

$$\frac{\partial^2 R^{T*}}{\partial\gamma^2} = \frac{2+4\alpha+2\alpha^2-6\alpha(1+\alpha)\gamma+2\alpha(1+\alpha)\gamma^2}{\gamma^2(1+\alpha(1-\gamma))^3}.$$

So the sign of the second derivative is the same as the numerator of the expression above. The numerator is a second-order polynomial in γ, strictly decreasing in γ in the unit interval. Therefore it suffices to look at the case where $\gamma=1$. At $\gamma=1$ the numerator is $2-2\alpha^2$, which is non-negative whenever $\alpha\leq 1$. Note that even when $\alpha>1$, there exists a γ_1 such that $\forall\gamma\leq\gamma_1$, $\frac{\partial^2 R^{T*}}{\partial\gamma^2}\geq 0$ and $\forall\gamma>\gamma_1$, $\frac{\partial^2 R^{T*}}{\partial\gamma^2}<0$. This concludes the proof. ■

Proof of Proposition 3.

Step 1. Proof that if $F\geq\widehat{F}$ a SEM exists.

First, from equation (9) it is straight-forward to see that u is a well-defined, continuous function of γ, $u : [0,1] \rightarrow [0,1]$. For each value of γ there exists a unique solution to (9). On the other hand, the steady-state value of u does not depend on the vector of contracts.

Second, equation (13) represents a continuous mapping from γ (the unit interval) into the contract space. The optimal contract is also a continuous function of $\alpha \equiv \lambda u/r$ for all values of γ, therefore continuity in u is also guaranteed. All the other elements in the optimal vector of contracts are fixed and do not depend on γ nor u. The third equation needed to determine the equilibrium is given by (11) after substituting for the optimal contract $\mathbf{R}^*$. The functional γ given in (11) is continuous in R^T. Not only that, but it is also monotonically decreasing in that variable. In sum, we can express the solution as

$$\begin{aligned} \gamma^* &= \max\left\{\frac{\beta\sigma(\mathbf{R}^*) - r/\lambda u(\gamma^*)}{2(1-\beta)+\sigma(\mathbf{R}^*)}, 0\right\} \equiv T\gamma, \\ \textit{where } \sigma(\mathbf{R}^*) &\equiv \frac{F - B - 2p_H f - R^{T*}(\gamma^*, u(\gamma^*))}{\Delta p f} \end{aligned} \qquad \text{(A.2)}$$

This implies that a SE is in fact a fixed point of the map $T : [0,1] \rightarrow [0,1]$, by definition. Clearly, the unit interval is non-empty, closed and a convex set. To apply Brouwer's Fixed-Point Theorem we also need to verify that T is a continuous mapping from $[0,1]$ to itself. As we have argued, R^{T*} and u^* are continuous functions of γ, and so is (A.2) with respect to R^T and u. Since the composition of such functions is our map T we conclude that T is a continuous mapping. Finally, we need to show that T maps the unit interval into itself. To see this, first note that $\lim_{\sigma\rightarrow\infty} \gamma = \beta$, that is, (A.2) is bounded above by $\beta < 1$. Regarding the lower bound, the proof for a SE would conclude since $\max\left\{\frac{\beta\sigma(\mathbf{R}^*) - r/\lambda u(\gamma^*)}{2(1-\beta)+\sigma(\mathbf{R}^*)}, 0\right\} \geq 0$. However we are characterizing a SEM and we need to show that the fixed point occurs at $\gamma > 0$. To show this we rule out a fixed point in $\gamma = 0$. This is obvious since at $\gamma = 0$, R^T tends to infinity and the merger is not accepted.

The proof can also be seen illustratively with Figure 3. First, use (14) and express R^T as a function of γ,

$$R^T = F - B - 2p_H f - \frac{2\gamma^*(1-\beta) + 1/\alpha}{\beta - \gamma^*}\Delta p f. \qquad \text{(A.3)}$$

In particular note that such function is monotonically decreasing and strictly concave in γ (recall the discussion after Proposition 1). Moreover, it is strictly increasing in F. This, together with Corollary 2, which maps γ into R^T according to the incentive constraint, is illustrated in Figure 3. Since the rational expectations equation (A.3) is increasing in F, there exists cutoff value $\widehat{F}$ such that $\forall F$, $F > \widehat{F}$, the two curves intersect. It is direct from the illustration in Figure 3 that in general there will be two points where the curves cross; they both are consistent with our definition of equilibrium. The uniqueness of equilibrium would arise if both curves, given a particular set of parameter values, were tangent.

Step 2. To prove *i*) assume for a contradiction that in a SEM the acceptance condition does not hold. Then $\sigma(\mathbf{R}^*) < 0$ and $\gamma = 0$ according to (A.2), which contradicts the definition of SEM.

Step 3. The Bellman equations given in *iii*) are obtained after some algebra and once we substitute for the equilibrium values of γ^*, u^* and R_o^*. The derivation of V_o is contained in the proof of Proposition 1.

Step 4. Finally, in an equilibrium without mergers shareholders maximize value with good projects, therefore they will provide contracts so that it is in the manager's interest to do so. We therefore obtain the value R_o^* after substituting in the incentive constraint for $\gamma = 0$ and its corresponding steady-state value of the market size, $u = 1$ (which implies $\alpha = \lambda/r$). Lastly, when $F < \widetilde{F}$, $\iota = 0$ and the result is direct. This completes the proof. ■

Proof of Proposition 4.

Essentially we need solve the model when synergies are uncertain and only known when the firms meet, but before they make the decision on merging. For that purpose, define $\mathbb{E}_{\mathcal{A}}[F] \equiv \mathbb{E}[F \mid F \in \mathcal{A}]$. Recall (5) and define $\widetilde{F}$ as the cut-off value such that the acceptance region is satisfied with equality. After some algebra one can show that

$$r(V^T - V_o) = \frac{1-\beta}{1 + 2\alpha\gamma(1-\beta)(1-G(\widetilde{F}))} \left[F - 2p_H(f - R_o) - B - R^T + 2\alpha\gamma(1-\beta)(1-G(\widetilde{F}))\left(F - \mathbb{E}_{\mathcal{A}}[F]\right)\right].$$

Since we assume that the equilibrium exists in both cases, then the expression above is non-negative under the benchmark case and the general model. On the other hand, $\widetilde{F}_{BC} < \widetilde{F}_{GP}$, since golden parachutes act as a barrier to merge. If we take conditional expectations above,

$$r\mathbb{E}_{\mathcal{A}}(V^T - V_o) = \frac{1-\beta}{1+2\alpha\gamma(1-\beta)(1-G(\widetilde{F}))}\left[\mathbb{E}_{\mathcal{A}}\left[F\right] - 2p_H f - B - R^T + 2p_H R_o\right].$$

First, $1 - G(\widetilde{F}_{BC}) > 1 - G(\widetilde{F}_{GP})$. Second, $\mathbb{E}_{\mathcal{A},GP}\left[F\right] - 2p_H f - B - R^T > \mathbb{E}_{\mathcal{A},BC}\left[F\right] - 2p_H f - B + 2p_H R_o$, since

$$\mathbb{E}_{\mathcal{A},GP}\left[F\right] - 2p_H f - B - R^T = \int_{\widetilde{F}_{GP}}^{\infty} \frac{F - 2p_H f - B - R^T}{1 - G(\widetilde{F}_{GP})} dG(F).$$

■

Proof of Corollary 2

We use subscripts BC and GP to denote the benchmark case (no golden parachutes allowed) and the general case (golden parachutes allowed) respectively. We start with a useful claim.

Claim 1. $\sigma_{BC} > \sigma_{GP}$.

Proof. Using (11) and substituting for the correspondent optimal vector of contracts in each scenario we take differences

$$\begin{aligned}
\sigma_{BC} - \sigma_{GP} &= \frac{F - 2p_H f - B + 2p_H R_o}{\Delta p(f - R_o)} - \frac{F - 2p_H f - B - R^T}{\Delta p f} \\
&= \frac{p_H R_o\left(F - 2p_H f - B - R^T\right) + \Delta p f R^T + 2\Delta p f p_H R_o}{\Delta p f\left(\Delta p(f - R_o)\right)} \\
&> 0.
\end{aligned}$$

The last inequality follows from the fact that since we are evaluating these surpluses in equilibrium, the acceptance condition in the general case is $F - 2p_H f - B - R^T$, which is non-negative if the mergers are to be optimally accepted. On the other hand, in the benchmark equilibrium $\Delta p(f - R_o) \geq 0$, otherwise no $\gamma \in (0, 1)$ can be sustained in equilibrium since the LL would be violated. This completes the proof of Claim 1. ■

We measure the amount of search in the economy by the mass of acquirers, that is, γ. Use again, the definition of γ from proposition 1. To study the ranking of both measures we separate the analysis in two cases.

Case 1: $u_{BC} \geq u_{GP}$. After rearranging terms

$$\begin{aligned} u_{BC}\left(\gamma_{BC}-\gamma_{GP}\right) &= 2\beta(1-\beta)u_{BC}\left(\sigma_{BC}-\sigma_{GP}\right)+\frac{2(1-\beta)r}{\lambda}\left(\frac{u_{BC}}{u_{GP}}-1\right)+\frac{r}{\lambda}\left(\sigma_{BC}\frac{u_{BC}}{u_{GP}}-\sigma_{GP}\right) \\ &> 0, \end{aligned}$$

since by Claim 1, $\sigma_{BC} > \sigma_{GP}$, and under Case 1, $u_{BC}/u_{GP} \geq 1$.

Case 2: $u_{BC} \geq u_{GP}$. This is the ambiguous case. Observing the expression for the difference between both probabilities above it is direct to see that as the distance between market sizes shrinks, the difference is positive, obtaining the desired result, that is,

$$\lim_{|u_{BC}-u_{GP}|\to 0} u_{BC}\left(\gamma_{BC}-\gamma_{GP}\right)=\left[2\beta(1-\beta)u_{BC}+\frac{r}{\lambda}\right]\left(\sigma_{BC}-\sigma_{GP}\right)>0.$$

■

Proof of Proposition 5.

The proof of the first part of Proposition 7 consists of deriving conditions under which the stock price reaction of the acquirer is negative. First, note that by solving the program

$$rV_o=\max_{\{R\}}\left\{\begin{array}{c} p_H\left(f-R_o\right)+\lambda u\gamma\mathbb{E}\left(V_m^T-V_o\right), \\ p_L\left(f-R_o\right)+\lambda u(1-\gamma)\phi\mathbb{E}\left(V_m^{DA}-p_L(f-R_o)/r\right)+\lambda u(1-\gamma)(1-\phi)\mathbb{E}\left(V_m^A-V_o\right) \end{array}\right\},$$

using the first-order conditions from the bargaining game and Lemma 1,

$$\begin{aligned} r\left(V_m^A-V_o\right) &= \beta\left(F-B-R^T-2rV_o\right) \text{ and} \\ r\left[V_m^{DA}-p_L(f-R_o)\right] &= \beta\left[F-B-R^T-rV_o-p_L(f-R_o)\right], \end{aligned}$$

we find that the ex-ante value of the firm is

$$rV_o = \frac{p_L(f - R_o) + \alpha(1-\gamma)\beta(F - B - R^T - \phi p_L(f - R_o))}{1 + \alpha(1-\gamma)\beta(2-\phi)}.$$

For an acquirer facing the last chance to merge,

$$V_m^{DA} - V_o = \beta(F - B - R^T)\left[1 + \alpha(1-\gamma)\beta(2-\phi)\right] - \alpha\beta(1-\beta)(1-\gamma)(F - B - R^T - 2p_L(f - R_o)).$$

Therefore such acquirers will have a negative stock price reaction whenever

$$\frac{1 + \alpha(1-\gamma)\beta(2-\phi)}{\alpha(1-\gamma)(1-\beta)} < \frac{F - B - R^T - 2p_L(f - R_o)}{F - B - R^T}, \tag{A.4}$$

which holds for β small and ϕ large enough (since the LHS of (A.4) is strictly decreasing in β and strictly decreasing in ϕ). That is, there exists a $\overline{\beta}$ such that if $\beta < \overline{\beta}$ the stock price reaction is negative. Similar for ϕ, there exists a $\overline{\phi}$ such that if $\phi > \overline{\phi}$ abnormal returns are negative. The threshold for β is given by

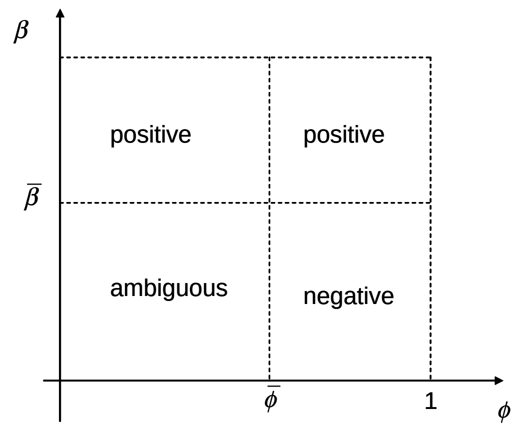
$$\overline{\beta} \equiv \frac{\upsilon\alpha(1-\gamma) - 1}{\alpha(1-\gamma)(2-\phi+\upsilon)}, \text{ where } \upsilon \equiv \frac{F - B - R^T - 2p_L(f - R_o)}{F - B - R^T}.$$

Assume now that condition (A.4) holds. Then the cross-sectional average of stock price reactions is

$$\mathbb{E}(V^A - V_o \mid t = t_a) = \phi\left(V_m^{DA} - V_o\right) + (1-\phi)(V_m^A - V_o),$$

where the first summand is negative and the second positive. Therefore our model is consistent with having negative or close to zero average abnormal returns as long as ϕ is large enough. Figure A.1 below illustrates the possibilities depending on the values of the relative bargaining power and the mass of last-chance acquisitions.

Figure A.1. Average Stock Price Reaction



Proof of Proposition 6. Solution to the model with financial intermediation.

First, we know the solution to the bargaining game with two parties. The solution to a three-party bargaining game is as follows:

$$\max_{\{\pi^{AF},\pi^{TF},\pi^{FF}\}} \frac{1}{3}\log(\frac{\pi^{AF}}{r} - V_o^{AF}) + \frac{1}{3}\log(\frac{\pi^{TF}}{r} - V_o^{TF}) + \frac{1}{3}\log(\frac{\pi^{FF}}{r} - V_o^{FF})$$

Assume intermediaries are in a competitive market, that is, if there is free entry then in equilibrium $V_o^{FF} = 0$.

$$\begin{aligned} FOC &: \pi^{AF} : \frac{\pi^{AF}}{r} - V_o^{AF} = \frac{F - \pi^{AF} - \pi^{TF}}{r} \\ \pi^{TF} &: \frac{\pi^{TF}}{r} - V_o^{TF} = \frac{F - \pi^{AF} - \pi^{TF}}{r} \end{aligned}$$

Then if $V_o^{AF} = V_o^{TF}$,

$$\frac{\pi^{TF}}{r} = \frac{1}{3}\left[\frac{F}{r} + V_o^{TF}\right].$$

We now need to solve the Bellman equations. First, targets, they can be contacted either by an acquirer or by a financial intermediary:

$$\begin{aligned} rV_o^T &= p_H f + \lambda\gamma\left(V_m^T - V_o^T\right) + \theta\mu\left(V_m^{TF} - V_o^T\right) \\ &= \frac{p_H f + \lambda\gamma F/2r + \theta\mu F/3r}{1 + \lambda\gamma/r + 2\theta\mu/3r}. \end{aligned}$$

The value function for an acquirer who chooses to hire a financial advisor is

$$\begin{aligned} rV_o^{AF} &= p_H f + \theta(1-\gamma-\mu)\left(V_m^{AF} - V_o^{AF}\right) \\ &= \frac{p_H f + \theta(1-\gamma-\mu)F/3r}{1 + 2\theta(1-\gamma-\mu)/3r}. \end{aligned}$$

If on the other hand he decides to search himself

$$rV_o^A = p_L f + \lambda(1-\gamma-\mu)\left(V_m^A - V_o^A\right) = \frac{p_L f + \lambda(1-\gamma-\mu)F/2r}{1 + \lambda(1-\gamma-\mu)/r}$$

In equilibrium, it must be the case that acquirer and target strategies yield the same value, this pins down μ:

$$\begin{aligned} V_o^T &= V_o^{AF} \\ \frac{p_H f + \lambda\gamma F/2r + \theta\mu F/3r}{1 + \lambda\gamma/r + 2\theta\mu/3r} &= \frac{p_H f + \theta(1-\gamma-\mu)F/3r}{1 + 2\theta(1-\gamma-\mu)/3r} \\ \mu(\gamma) &= \frac{1-\gamma}{2} - \frac{3\lambda\gamma}{4\theta} \qquad (21) \\ \mu(0) &= \frac{1}{2} \text{ which yields the first-best aggregate acquisition rate.} \\ \mu(\gamma) &\geq 0 \Leftrightarrow \frac{\theta}{\lambda} \geq \frac{3}{2}\frac{\gamma}{1-\gamma} \qquad (22) \end{aligned}$$

It must also be the case that both acquiring strategies (hiring a financial advisor versus not) yield the same value, we obtain γ:

$$\begin{aligned} V_o^{AF} &= V_o^A \\ \frac{p_H f + \theta(1-\gamma-\mu)F/3r}{1+2\theta(1-\gamma-\mu)/3r} &= \frac{p_L f + \lambda(1-\gamma-\mu)F/2r}{1+\lambda(1-\gamma-\mu)/r} \\ \gamma(\mu) &= \frac{r\Delta pf}{\theta/3(F-2p_L f) - \lambda/2\left[F-2p_H f\right]} + (1-\mu) \\ \gamma &= \frac{\frac{r\Delta pf}{\theta/3(F-2p_L f)-\lambda/2[F-2p_H f]} + 1/2}{1/2 - 3\lambda/4\theta} \end{aligned} \tag{23}$$

To prove the existence of equilibrium, we start with some claims.

Claim 1 *If* $\theta/3(F-2p_L f)-\lambda/2\left[F-2p_H f\right] \geq 0 \Leftrightarrow \frac{\theta}{\lambda} \geq \frac{3}{2}\frac{F-2p_H f}{F-2p_L f}$ *then* $\gamma > 1$ or $\gamma < 0$. *Therefore the equilibrium doesn't exist.*

Proof. Immediate using (23) ■

That leaves us with the following condition that needs to be met in equilibrium:

Condition 1

$$\nu \equiv \frac{\theta}{\lambda} < \frac{3}{2}\frac{F-2p_H f}{F-2p_L f} \leq \frac{3}{2}$$

Condition above implies $\theta/\lambda \leq 3/2$ so the denominator in (23) is non positive.

Claim 2 *For* $\gamma > 0$ *we need*

$$\frac{\theta}{\lambda} > \frac{3}{2}\frac{F-2p_H f}{F-2p_L f} - 6\frac{r\Delta pf}{\lambda\,(F-2p_L f)} \equiv \nu_1 \tag{24}$$

Proof. By substitution. ■

Claim 3 *In an equilibrium where there are acquirers who search directly, the following condition must also hold (*$\gamma < 1$*):*

$$\frac{\theta}{\lambda} < \frac{1}{1+4\frac{r\Delta pf}{\lambda(F-2p_L f)}}\left[\frac{3}{2}\frac{F-2p_H f}{F-2p_L f}\right] = \frac{3}{2}\frac{F-2p_H f}{\lambda\,(F-2p_L f)+4r\Delta pf} \equiv \nu_2. \tag{25}$$

Proof. By substitution. ■

Claim 3 $\nu_2 > \nu_1$.

Proof. By contradiction. Assume instead

$$\begin{aligned}
\frac{3}{2}\frac{F-2p_Hf}{\lambda\left(F-2p_Lf\right)+4r\Delta pf} &< \frac{3}{2}\frac{F-2p_Hf}{F-2p_Lf}-6\frac{r\Delta pf}{\lambda\left(F-2p_Lf\right)} \\
\frac{1}{1+4\frac{r\Delta pf}{\lambda(F-2p_Lf)}} &< 1-4\frac{r\Delta pf}{\lambda\left(F-2p_Hf\right)} \\
1 &< \left[1-\left(4\frac{r\Delta pf}{\lambda\left(F-2p_Hf\right)}\right)^2\right]\frac{1+4\frac{r\Delta pf}{\lambda(F-2p_Lf)}}{1+4\frac{r\Delta pf}{\lambda(F-2p_Hf)}},
\end{aligned}$$

a contradiction since the first multiplicative term is less than one and the second too given that $4\frac{r\Delta pf}{\lambda(F-2p_Lf)} < 4\frac{r\Delta pf}{\lambda(F-2p_Hf)}$. ■

Proof of Proposition 6.

Using the equations for μ and γ we can solve for the thresholds such that whenever ν is larger μ and γ are non-negative. Define $\widehat{\nu}$ the maximum of those thresholds: $\widehat{\nu} \equiv \max\{\nu_1, \frac{3}{2}\frac{\gamma}{1-\gamma}\} = \max\left\{\frac{3}{2}\frac{F-2p_Hf}{F-2p_Lf} - 6\frac{r\Delta pf}{\lambda(F-2p_Lf)}, \frac{3}{2}\frac{\gamma}{1-\gamma}\right\}$. For all $\nu > \widehat{\nu}$ both μ and γ are positive. The next step consists in proving that μ is always valued less than one. This is the case since

$$\mu(\gamma) < 1 \Longleftrightarrow \frac{1-\gamma}{2} < 1 + \frac{3\lambda\gamma}{4\theta} \text{ which is always the case since } \frac{1-\gamma}{2} \leq 1/2.$$

Next, by imposing $\gamma < 1$ we can solve for the upper bound on ν such that the condition is satisfied as shown in claim 2 above. Let us further define $\widetilde{\nu} \equiv \max\{v_2, \frac{3}{2}\frac{\gamma}{1-\gamma}\} = \left\{\frac{3}{2}\frac{F-2p_Hf}{\lambda(F-2p_Lf)+4r\Delta pf}, \frac{3}{2}\frac{\gamma}{1-\gamma}\right\}$. There are 2 possible scenarios, First, $\nu_1 > \frac{3}{2}\frac{\gamma}{1-\gamma}$. Then, $\widehat{\nu} = \nu_1$ and $\widetilde{\nu} = v_2$, and any $\nu \in (\nu_1,\, \nu_2)$ satisfies $\mu > 0$, $1 > \gamma > 0$. The interval exists, that is proven in claim 3 above. Also whenever $\nu \leq \nu_1$ the only possible equilibrium is $\mu > 0$ and $\gamma = 0$ or (whenever $\nu \leq \frac{3}{2}\frac{\gamma}{1-\gamma}$) $\mu = \gamma = 0$. Finally if $\nu \geq \nu_2$ the only possible equilibrium is$\gamma = 0$ and $\mu > 0$. Secondly, $v_2 > \frac{3}{2}\frac{\gamma}{1-\gamma} > \nu_1$. Then $\widehat{\nu} = \frac{3}{2}\frac{\gamma}{1-\gamma}$ and $\widetilde{\nu} = v_2$. In this scenario, the same reasoning applies except that whenever $\nu \leq \widehat{\nu}$ the only possible equilibrium is $\gamma > 0$ and $\mu = 0$ or if $\nu \leq \nu_1$, $\mu = \gamma = 0$.■

Proof of Proposition 7.

Claim 1. $\sigma^{FB} > \sigma_{GP}$. The proof is immediate; use the equilibrium value of such gains given in (14) and (16) and take differences

$$\begin{aligned}
\sigma^{FB} - \sigma_{GP} &= \frac{F - 2p_H f + B}{\Delta p f - b} - \frac{F - 2p_H f - B - R^{T*}}{\Delta p f} = \\
&= \frac{(F - 2p_H f + B)\,\Delta p f - (\Delta p f - b)\left(F - 2p_H f - B - R^{T*}\right)}{(\Delta p f - b)\,\Delta p f} = \\
&= \frac{b\,(F - 2p_H f) + (2\Delta p f - b)\,B + (\Delta p f - b)\,R^{T*}}{(\Delta p f - b)\,\Delta p f} \\
&> 0.
\end{aligned}$$

The last inequality comes from the fact that under Assumption 1 $\Delta p f - b > 0$ and also in a SEM under the general case, $F - 2p_H f > 0$ (by Assumption 2 that is not necessarily the case in the first-best world).

The ranking on γ is totally parallel to that of σ (γ is monotonically increasing in σ) provided we abstract from market size considerations, which we have addressed in Corollary 3. This concludes the proof.■