

Theory of Exit Choice: IPOs versus Acquisitions with Differential Bargaining

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Abstract—This paper introduces differential bargaining into the Bayar and Chemmanur (2011) model of exit choice between IPOs and acquisitions and shows that a mixed strategy equilibrium can exist for both high (H) type and low (L) type firms. Using the concept of signaling games and perfect Bayesian equilibrium, we prove for the first time in a theoretical framework that PE investors are inclined to take more type H firms public than entrepreneurs.

Index Terms—Private equity exits, initial public offering, acquisitions, signaling games

I. INTRODUCTION

Initial Public Offering (IPO) literature addresses only two outcomes for a firm: staying private or conducting an IPO (e.g. [1]-[3]), whereas mergers and acquisitions literature analyzes acquisitions in isolation (e.g. [4]). Few studies analyze the decision to exit as a choice between IPO and acquisition such as empirical studies by [5] and [6] and only one theoretical model by [7]. Reference [7] assumes that a crucial factor driving the exit choice is product market competition: a stand-alone firm has to fend for itself after going public but an acquirer is able to provide considerable support to the firm in product market competition. Based on the probability of success in the product market, they divide the firms into two types: high (H) and low (L). They show that under certain conditions high type firms always go for an IPO i.e. use a pure strategy and low type firms use mixed strategy in equilibrium.

The objective of this paper is to introduce differential bargaining into the Bayar and Chemmanur model and show that a mixed strategy equilibrium can exist for both H type and L type firms. We also prove an intuitive result for the first time in a theoretical framework that private equity (PE) investors are inclined to take more H type firms public than entrepreneurs.

II. THE MODEL

The basic structure of the model follows [7]. At time 0, shares of a private firm are initially held by two types of agents: an entrepreneur and a PE investor. Initially, the fractions of equity held by them are denoted by δ_E and δ_V respectively. The firm needs new investment I for a positive NPV project at time 0. The investment (I) can be raised either

through an IPO or by selling the firm to an acquirer. In order to satisfy their liquidity demand, the entrepreneur and the PE investor will also sell a fraction of their shares out of their remaining initial equity holdings, α_E and α_V respectively, to outside investors through a secondary offering in the IPO market. At time 1, all cash flows are realized and the firm is liquidated. The final cash flows (V) depend on the choice of exit mechanism decided at time 0, the degree of product market competition between time 0 and time 1 and firm type. If the project is implemented at time 0 by raising I , the cash flows (V) can take one of two possible values at time 1: $V = (I + V_S)$, if the firm “succeeds” by time 1 or $(I + V_F)$, if the firm “fails” by time 1.

The decision is modeled as a signaling game played between the firm (entrepreneur or PE investor), the IPO market and the acquirer. IPO market investors believe that the proportion of H-type firms is θ . The firm takes into consideration the beliefs of the investors and sets a P_{ipo} , α_E and α_V . The investors have to decide whether to bid for the IPO or not.

We introduce differential bargaining into the model such that bargaining power of the high type firm with the acquirer (ρ_H) is higher than the bargaining power of the low type firm with the acquirer (ρ_L). Thus, the acquirer pays $\rho_H V_A$ to the H-type firm and $\rho_L V_A$ to the L-type firm, where V_A is the post-acquisition value of the firm due to synergy effect. The introduction of this structure allows the possibility of mixed strategy equilibrium for the H-type firm as well. Thus, the H-type firm goes public with probability β_H and L-type firm goes public with probability β_L .

III. EQUILIBRIUM OF THE MODEL

We use the concept of Perfect Bayesian Equilibrium (PBE) to analyze the choice decision. The equilibrium includes: (i) a choice made by the entrepreneur or PE investor between an IPO and an acquisition, (ii) a decision by the IPO market investors about whether to bid or not at the price P_{ipo} and (iii) a decision by the acquirer about the acquisition price P_{acq} . We consider equilibria in two different cases: (i) an entrepreneur controlled firm and (ii) a PE investor-controlled firm.

“Reference [7] shows that only four types of equilibria can exist in their model: (i) type H firms strictly prefer to go public whereas type L firms play a mixed strategy (ii) both types of firms strictly prefer to go public; (iii) type H firms strictly prefer to go public whereas type L firms strictly prefer acquisitions; (iv) both types of firms strictly prefer acquisitions.” In their model, equilibrium (v): ‘both types of firms play mixed strategy’, is not possible. However, if we

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introduce differential bargaining, category (v) equilibrium is possible. We will also show that equilibrium of category (i), which is the main focus of [7], is a corner point solution of category (v) such that probability of IPO for H-type firm is strictly 1.

A. Analysis of the Entrepreneur's Problem

We know that the entrepreneur faces a trade-off between IPO price P_{IE} and acquisition price P_{acq} . Since the amount of equity offered in the IPO is γ and the entrepreneur sells fraction α_E out of his remaining holdings $\delta_E(1-\gamma)$, he retains a fraction $\delta_E(1-\gamma)(1-\alpha_E)$ in the firm which has a value $V_q = p_q V_S + (1-p_q) V_F$, where $q \in \{H, L\}$. He also retains his private benefits of control B if he chooses an IPO. However, in the case of an acquisition, the probability of success is increased to p_A and thus the value of the firm is now $V_A = p_A V_S + (1-p_A) V_F$. Since investors' beliefs are updated by Bayes' Rule, the IPO price if the entrepreneur takes the firm public (i.e. $a = 1$) is given by:

$$P_{IE} = I + \Pr(q = H | a = 1)V_H + \Pr(q = L | a = 1)V_L \quad (1)$$

However, in case of an acquisition, the acquirer pays $\rho_H V_A$ to the type H firm and $\rho_L V_A$ to the type L firm. Thus, the objective function of the entrepreneur is:

$$\max \{ a.[\delta_E(1-\gamma)(\alpha_E P_{IE} + (1-\alpha_E)(I + V_q)) + B] + (1-a).[\delta_E \rho_q V_A] \} \quad (2)$$

where, $q \in \{H, L\}$

Thus, an entrepreneur compares between (IPO premium + private benefits of control) on one side and (acquisition premium due to synergy) on the other side.

B. Analysis of the PE Investor's Problem

There are only two differences between the entrepreneur and the PE investor: (1) the PE investor does not enjoy private benefits of control, (2) the liquidity requirements of PE investor are different from that of the entrepreneur. Thus, the PE investor's objective function is given by:

$$\max \{ a.[\delta_v(\alpha_v + (1-\alpha_v)\frac{I}{P_{IV}})(P_{IV} - V_q - I)] + (1-a).[\delta_v(\rho_q V_A - V_q)] \} \quad (3)$$

C. Equilibrium in an Entrepreneur-Controlled Firm

Proposition 1: Choice between IPO and Acquisition in an Entrepreneur-controlled firm

Under the existence of differential bargaining with the acquirer, both types of firms play mixed strategy in equilibrium. The type H firm goes public with probability β_H and for an acquisition with probability $(1 - \beta_H)$. The type L firm goes public with probability β_L and for an acquisition with probability $(1 - \beta_L)$ such that,

$$\beta_H = \beta_L * \left\{ \frac{(1-\theta) * (P_{IE}^* - (I + V_L))}{\theta * [(I + V_H) - P_{IE}^*]} \right\} \quad (4)$$

The equilibrium IPO price P_{IE}^* is given by (7)

Proof. If a player plays mixed strategy in equilibrium, then he must be indifferent between his pure strategies. Due to the existence of differential bargaining, in the above equilibrium,

it is possible for both firms to play a mixed strategy since both the following indifference equations can hold:

$$\delta_E(\alpha_E + (1-\alpha_E)\frac{I}{P_{IE}^*})(P_{IE}^* - V_L - I) + B = \delta_E(I + \rho_L V_A - (I + V_L)) \quad (5)$$

$$\delta_E(\alpha_E + (1-\alpha_E)\frac{I}{P_{IE}^*})(P_{IE}^* - V_H - I) + B = \delta_E(I + \rho_H V_A - (I + V_H)) \quad (6)$$

Since both (5) and (6) can exist, both type H and type L firm can play mixed strategy in equilibrium i.e. IPO or acquisition. From (5) and (6), we get the equilibrium price P_{IE}^* is given by:

$$P_{IE}^* = \left(\frac{(1-\alpha_E)I(V_H - V_L)}{(1-\alpha_E)(V_H - V_L) - V_A(\rho_H - \rho_L)} \right) \quad (7)$$

Now, we know that prior probability beliefs of investors are: $\Pr(q = H) = \theta$ and $\Pr(q = L) = (1 - \theta)$. Since we analyze mixed strategy equilibrium for both types of firms, the updated beliefs are:

$$\Pr(q = H | a = 1) = \frac{\beta_H^* \theta}{\beta_H^* \theta + \beta_L^* (1 - \theta)} \quad (8)$$

$$\Pr(q = L | a = 1) = \frac{\beta_L^* (1 - \theta)}{\beta_H^* \theta + \beta_L^* (1 - \theta)} \quad (9)$$

Solving (1), (8) and (9), we get,

$$P_{IE}^* = I + \frac{\beta_H^* \theta}{\beta_H^* \theta + \beta_L^* (1 - \theta)} * V_H + \frac{\beta_L^* (1 - \theta)}{\beta_H^* \theta + \beta_L^* (1 - \theta)} * V_L \quad (10)$$

Rearranging (10), we get (4) from proposition 1.

Corollary 1: Corner point solution is the Bayar and Chemmanur model.

We see that if you use a corner point solution of proposition 1 such that $\beta_H = 1$, we get the solution derived by Bayar and Chemmanur (2011):

$$\beta_L = \left\{ \frac{\theta * [(I + V_H) - P_{IE}^*]}{(1 - \theta) * [P_{IE}^* - (I + V_L)]} \right\} \quad (11)$$

However, the equilibrium IPO price in our model is different from that of [7] since it is derived from two indifference equations rather than one.

D. Equilibrium in a PE Investor-Controlled Firm

Proposition 2: Choice between IPO and Acquisition in a PE investor-controlled firm

Under the existence of differential bargaining with the acquirer, both types of firms play mixed strategy in equilibrium. The type H firm goes public with probability β_H and for an acquisition with probability $(1 - \beta_H)$. The type L firm goes public with probability β_L and for an acquisition with probability $(1 - \beta_L)$ such that,

$$\beta_H = \beta_L * \left\{ \frac{(1 - \theta) * (P_{IV} * - (I + V_L))}{\theta * [(I + V_H) - P_{IV} *]} \right\} \quad (12)$$

The equilibrium IPO price P_{IV}^* is given by (15).

Proof. If a player plays mixed strategy in equilibrium, then he must be indifferent between his pure strategies. Due to the existence of differential bargaining, in the above equilibrium, it is possible for both firms to play a mixed strategy since both the following indifference equations can hold:

$$\delta_V(\alpha_V + (1 - \alpha_V) \frac{I}{P_{IV}^*})(P_{IV}^* - V_L - I) = \delta_V(I + \rho_L V_A - (I + V_L)) \quad (13)$$

$$\delta_V(\alpha_V + (1 - \alpha_V) \frac{I}{P_{IV}^*})(P_{IV}^* - V_H - I) = \delta_V(I + \rho_H V_A - (I + V_H)) \quad (14)$$

From (13) and (14), we get the equilibrium price P_{IV}^* is given by:

$$P_{IV}^* = \left(\frac{(1 - \alpha_V) I (V_H - V_L)}{(1 - \alpha_V)(V_H - V_L) - V_A(\rho_H - \rho_L)} \right) \quad (15)$$

Solving (1), (8) and (9), we get,

$$P_{IV}^* = I + \frac{\beta_H * \theta}{\beta_H * \theta + \beta_L * (1 - \theta)} * V_H + \frac{\beta_L * (1 - \theta)}{\beta_H * \theta + \beta_L * (1 - \theta)} * V_L \quad (16)$$

Rearranging (16), we get (12) from proposition 2.

Proposition 3: Exit choice in entrepreneur-controlled versus PE investor-controlled firms

If the liquidity requirements of the PE investor (α_V) are larger than the liquidity requirements of the entrepreneur (α_E), then:

$$\left(\frac{\beta_H}{\beta_L} \right)_{\text{PE-controlled}} > \left(\frac{\beta_H}{\beta_L} \right)_{\text{entrepreneur-controlled}} \quad (17)$$

Thus, PE investors would prefer to take more type H firms public and lesser type L firms public than entrepreneurs.

Proof. It has been documented that PE investors have a bias towards taking only their “star” companies public since an IPO creates reputation. Thus, PE investors want to take only those firms public which have a higher probability of succeeding in the market. This bias is obtained for the first time in literature as a result in our theoretical framework as mentioned in proposition 3. We can see that when $\alpha_V > \alpha_E$, $P_{IV}^* > P_{IE}^*$. We also know from equations in propositions 1

and 2 that: (β_H / β_L) entrepreneur-controlled is increasing in P_{IE}^* and (β_H / β_L) PE-controlled is increasing P_{IV}^* . Thus, when $P_{IV}^* > P_{IE}^*$, we arrive at (17) in proposition 3.

IV. CONCLUSION

This paper introduced differential bargaining in the model used in [7] and proved that mixed strategy equilibrium can exist for both H and L type firms when firms take an exit decision between IPOs and acquisitions. We also prove for the first time in a theoretical framework that PE investors are inclined to take more H type firms public than entrepreneurs due to possible reputation benefits from taking H type firms public.

REFERENCES

- [1] T. J. Chemmanur and P. Fulghieri, “A theory of the going-public decision,” *Review of Financial Studies*, vol. 12, no. 2, pp. 249–279, 1999.
- [2] A. Subrahmanyam and S. Titman, “The going-public decision and the development of financial markets,” *The Journal of Finance*, vol. 54, no. 3, pp. 1045–1082, 1999.
- [3] J. R. Ritter and I. Welch, “A review of IPO activity, pricing, and allocations,” *The Journal of Finance*, vol. 57, no. 4, pp. 1795–1828, 2002.
- [4] M. Jensen and R. Ruback, “The market for corporate control: the scientific evidence,” *Journal of Financial Economics*, vol. 11, pp. 5–50, 1983.
- [5] J. C. Brau, B. Francis, and N. Kohers, “The choice of IPO versus takeover: Empirical evidence,” *Journal of Business*, vol. 76, no. 4, pp. 583–612, 2003.
- [6] A. B. Poulsen and M. Stegemoller, “Moving from private to public ownership: Selling out to public firms versus initial public offerings,” *Financial Management*, vol. 37, no. 1, pp. 81–101, 2008.
- [7] O. Bayar and T. J. Chemmanur, “IPOs versus Acquisitions and the valuation premium puzzle: A theory of exit choice by entrepreneurs and venture capitalists,” *Journal of Financial and Quantitative Analysis*, vol. 46, pp. 1755–1793, 2011.



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