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 $\delta_E$ and $\delta_V$ respectively. The firm seeks 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, $\alpha_E$ and $\alpha_V$ 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: $V = (I + V_F)$, if the firm “succeeds” by time 1 or $(I + V_L)$, 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 $\theta$. The firm takes into consideration the beliefs of the investors and sets a $P_{ipo}$, $\alpha_E$ and $\alpha_V$. 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 ($\rho_H$) is higher than the bargaining power of the low type firm with the acquirer ($\rho_L$). Thus, the acquirer pays $\rho_HV_F$ to the H-type firm and $\rho_LV_A$ 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 $\beta_H$ and L-type firm goes public with probability $\beta_L$.

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
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 $\gamma$ and the entrepreneur sells fraction $\alpha_0$ out of his remaining holdings $\delta_0(1-\gamma)$, he retains a fraction $\delta_0(1 - \gamma)(1 - \alpha_0)$ in the firm which has a value $V_q = p_A V_S + (1 - p_A) V_F$, where $q \in \{H, L\}$. He also retains his private benefits of control $\delta_0$ if he chooses an IPO. However, in case of an acquisition, the probability of success is increased to $p_A$ and thus the value of the firm is now $V_q = p_A V_S + (1 - p_A) V_F$. 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:

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

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

$$\max \left\{ a[\delta_0(1-\gamma)(\alpha_0 P_{IE} + (1-\alpha_0)(I + V_q)) + B] + (1-a)[\delta_0 \rho A V_A] \right\}$$ (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:

$$\max \left\{ a[\delta_0 \rho A V_A - V_0] + (1-a)[\delta_0 \rho A V_A - V_0] \right\}$$ (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 $\beta_H$ and for an acquisition with probability $(1 - \beta_H)$. The type L firm goes public with probability $\beta_L$ and for an acquisition with probability $(1 - \beta_L)$, such that,

$$\beta_H = \beta_L + \{ (1-\theta) * (P_{IE} - (I + V_L)) / \theta * [(I + V_H) - P_{IE}] \}.$$ (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:

$$\delta_0 \rho A V_A = (1-\gamma)(\alpha_0 P_{IE} + (1-\alpha_0)(I + V_q)) + B + (1-a)[\delta_0 \rho A V_A]$$ (5)

$$\delta_0 \rho A V_A = (1-\gamma)(\alpha_0 P_{IE} + (1-\alpha_0)(I + V_q)) + B + (1-a)[\delta_0 \rho A V_A]$$ (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:

$$P_{IE} = \left[ (1-\gamma)(\alpha_0 P_{IE} + (1-\alpha_0)(I + V_q)) + B \right] / (\delta_0)(1-\gamma)(\alpha_0 P_{IE} + (1-\alpha_0)(I + V_q)) + B + (1-a)[\delta_0 \rho A V_A]$$ (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:

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

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

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

$$P_{IE} = I + \frac{\beta_H \gamma}{\beta_H \gamma + \beta_L \gamma(1-\theta)} * V_H + \frac{\beta_L \gamma(1-\theta)}{\beta_H \gamma + \beta_L \gamma(1-\theta)} * V_L$$ (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 $\beta_H = I$, we get the solution derived by Bayar and Chemmanur (2011):

$$\beta_L = \left\{ \frac{\theta * (I + V_H) - P_{IE}}{(1-\theta) * [P_{IE} - (I + V_L)]} \right\}$$ (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 $\beta_H$ and for an acquisition with probability $(1 - \beta_H)$. The type L firm goes public with probability $\beta_L$ and for an acquisition with probability $(1 - \beta_L)$ such that,
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:

\[
\delta V(\alpha V + (1 - \alpha V) \frac{I}{P_{IV}^*})(P_{IV}^* - V_L - I) \\
= \delta V(I + \rho L V_A - (I + V_L))
\]

(13)

\[
\delta V(\alpha V + (1 - \alpha V) \frac{I}{P_{IV}^*})(P_{IV}^* - V_H - I) \\
= \delta V(I + \rho H V_A - (I + V_H))
\]

(14)

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

\[
P_{IV}^* = \left(\frac{(1 - \alpha V)I(V_H - V_L)}{(1 - \alpha V)(V_H - V_L) - V_A(\rho_H - \rho_L)}\right)
\]

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

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

(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 ($\alpha_V$) are larger than the liquidity requirements of the entrepreneur ($\alpha_E$), then:

\[
\left(\frac{\beta_H}{\beta_L}\right)_{PE-controlled} > \left(\frac{\beta_H}{\beta_L}\right)_{entrepreneur-controlled}
\]

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: ($\beta_H / \beta_L$) entrepreneur-controlled is increasing in PE$^*$ and ($\beta_H / \beta_L$) 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


Rohan Chinchwadkar was born in a small town named Thane in India in the year 1988. He has completed Bachelors in Technology with a specialization in Electronics from VJTI, Mumbai, India. He is currently a fourth year PhD student in Finance at Indian Institute of Management Calcutta, India. He has a diverse industry experience having complete internships with McKinsey and Company, Biosense Technologies (medical device start-up) and Vodafone. His current research interests include corporate finance, private equity, behavioral finance, business groups and networks. Mr. Chinchwadkar has been selected for presentations at various prestigious conferences like Allied Social Sciences Association Annual meeting 2013, Midwest Finance Association Annual Meeting 2013, and Academy of Entrepreneurial Finance Annual meeting 2012 and has won best paper award at Indian Institute of Management Ahmedabad Doctoral Colloquium 2012.