Investment Policy

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1 M&A

This is the most important decision in investment policy. Thus, we come to this topic at first when we talk about investment policy.

Overview The first thing we need to know is how many types of M&A and the effect of M&A to bidders and targets. Second, we need to explore why firms decide to undertake acquisition despite a common negative CAR effect at announcement. Third, we walk one by one sub-topic in M&A such as entrenchment CEO, board connection and social ties, CEO ability and experience.

What is M&A? There are two main modes of merger?

- Merger or friendly deal: tone or attitude is friendly, targets' managers are favorable, target boards voted and approved
- Tender offer/Hostile takeover: tone or attitude is hostile and aggressive, no shareholder meeting and approval

There are two main types of payment method: stock payment or cash payment. Bidders tend to pay by stocks if their stock are overvalued, while they choose to pay by cash if their stocks are undervalued.

Loughran and Vijh (1997) summarize the mode and the payment of mergers and find that over 5 years following the acquisition:

- Firms with complete stock mergers earn significantly negative excess returns of -25%
- Firms with complete cash tender offers earn significantly positive excess returns of 61.7%

Announcement effect Literature finds three popular patterns:

1. Targets earn positive abnormal returns
2. Acquirers earn little or no abnormal returns from tender offers
3. Acquirers earn negative abnormal returns from mergers

Why firms choose to M&A despite negative reaction?

1. Agency problem (Jensen, 1986): empirical evidence from Masulis et al. (2007) and Harford et al. (2012) support this view. A high entrenched CEO tend to be negative associated to bidders' CAR.
2. Market timing: acquirers are more overvalued than targets, as in Dong et al. (2006)
3. Synergy effects: or Q-hypothesis of Dong et al. (2006)
   (a) Horizontal: to get market share, market power (monopoly power)
   (b) Vertical integration:
   (c) Innovation purchase: as in Bena and Li (2014), firms with higher technological overlap (technology proximity) are more likely to merger
   (d) Other reasons such as diversification, obtain the market segment of the target firms

1.1 Q-hypothesis

Dong et al. (2006) support both the misvaluation (market timing) and the Q-hypothesis (synergy) for the acquisition motive. They propose these two hypotheses as follows:

1. Misvaluation hypothesis: Bidders can profit by acquiring undervalued targets (price<fundamental value or $P/V < 1$) or targets that less overvalued than bidders.

2. Q hypothesis: A high Tobin's Q (market value/replacement cost > 1 or $P/B > 1$) is an indicator that a firm is well run or has good business opportunity. Thus, takeovers happen because these deals could eliminate wasteful target behaviors and take advantage of better bidder investment opportunities (i.e., synergy effect). In contrast, takeovers can be used by managers of inefficient bidders to expand their domain of controls (i.e., agency problems).

The evidence supports both the misvaluation and Q-hypothesis: on average in all mergers, acquirers tend to have higher P/B than targets (support synergy) and they also have higher P/V than targets (support misvaluation, bidders are more overvalued than targets). Their finding also supports that bidders will use stock (cash) payment and if targets are overvalued (undervalued). In addition, if bidders are undervalued, they will use cash payment more frequently.

1.2 Agency problem and Governance

Takeover defense Masulis et al. (2007) consider the role of governance at bidders' firms. The idea is an entrenched CEO in bidders tend to undertake acquisitions because of agency problems (Jensen, 1986). For example, he want to build his empire or obtain private benefits based on the shareholders' wealth (tunnelling effect).

Market for corporate control (takeover bad firms) is a good control mechanism, so antitakeover provisions (ATP) are not good for a firm's shareholders, which leads to higher agency problem. Thus, their **ATP value destruction hypothesis**: Managers protected by more ATPs are more likely to indulge in value-destroying acquisitions since they are less likely to be disciplined for taking such actions by the market for corporate control.

A high anti-takeover provisions makes it difficult to remove an entrenched CEO out of his position. As a results, the high entrenchment of bidders' CEO or a higher anti-takeover provisions (ATP) in bidders lead to poor acquisition reactions to bidders. Their findings, thus, are consistent with the G-index of Gompers et al. (2003), E-index of Bebchuk et al. (2009).

They use three indices of governance: G-index of Gompers et al. (2003), E-index of Bebchuk et al. (2009), and staggered board (boards with multi-levels so that cannot replace all members in one time). They create Dictatorship index (high G and E index) and Democracy index (low G and E index). They find a negative relation between the G index, E index, staggered board and bidders' CAR.

They also control for other governance mechanisms such as product market competition (external mechanism) and board characteristics (internal mechanism).

- Product market competition is measured using Herfindahl-Hirschman index (sum of squared market shares of all COMPUSTAT firms in each Fama-French industry). A lower HH index is a more competitive industry. A more competitive market has positive disciplinary effect on managerial behavior. Incumbents in competitive industries are less likely to divert corporate resources into inefficient use because any small mistake will be exploitted by competitors.
- A second measure of competition is measured by industry's median of selling expenses to sales. This measure is less criticized because it takes into account the foreign competitors while the HH index cannot capture the competition from foreign firms. A higher selling expenses cost means that firms are in more intensely competitive industry.
- They define two dummies: Competitive Industry and Unique industry (product uniqueness) if HHI and selling expense ratio are in lowest and highest quartiles of all FF 48 industries. As a result, market competition will have positive effect on bidders' CAR.
- CEO incentive measured by CEO ownership (stock and options) and wealth sensitivity to stock price. But CEO incentive has no relation to bidder returns.
- IO: the percentage stock ownership by a firm's largest institutional blockholder, defined as an institutional investor with at least 5% equity ownership (BLOCK), and the aggregate percentage stock ownership in a firm by 18 public pension funds (PP). Both have insignificant effect on returns.
- Boards characteristics: duality, board size, and board independence (more than 50% directors are independent). They find that duality are negatively affect bidder returns.
- Management quality: using industry-adjusted operating income growth over 3-year prior to the announcement. They find a positive relation between management quality and bidder returns.
- The result also holds if they use the subsample of firms that listed before 1990s to check the revert causality (to prepare for bad acquisitions, firms adopt the ATPs first). In this subsample, the revert causality is less likely because most of important ATPs are adopted in 1980s while the acquisitions happen in 1990s.
- The main finding holds in any of above settings.

Managerial Entrenchement Harford et al. (2012) expand the idea of Masulis et al. (2007) by look at the entrenched CEOs' decisions closer. How the entrenched CEOs could destruct the firm valuation during acquisitions:

1. Target selection: Avoid private targets or public firms with blockholders. To preserve their entrenchment, CEOs may **avoid private targets** because their concentrated ownership. *If merge private firms, they use cash rather than stock payment*. It is the same if targets are public but have blockholders.

2. Pure overpayment

3. Low synergy

How to measure entrenchment? Easily, G-index and check robust by E-index as in Masulis et al. (2007). Their method and result for each hypothesis are as follows:

1. H1, Target selection (see Table 4): they run logit regression with dependent variable is Private Target, Public Target, Private Cash, and Private Stock; main independent variable is Dictator dummy. All models use Heckman selection models to avoid endogeneity. Dictator is a dummy variable taking a value of one if $GIMindex \geq 10$, and zero otherwise. Coefficients are negative and significant for Private Target and Private Stock. They also find the same negative relation between Dictator dummy and Target with blockholders (>5% or >median of blockholding levels).

2. H2, pure overpayment (see Table 5): The dependent variable is 5-day CAR (market model), main independent variables are Dictator (for entrenchment), Private, All Stock payment, All Cash payment, **Proxy Premium (proxy for overpayment)** and their interactions. They find that Dictator is negative (repeat Masulis et al., 2007), All Stock is negative (repeat Loughran and Vijh, 1997), Private*AllStock and Private*Dictator*AllStock*RelativeSize are positive (support H1), Proxy Premium and Proxy Premium*Dictator are negative (support H2).

3. H3, low synergy (see Tables 6 and 7): They look at post-merger performance by using combined firm's industry-adjusted ROA (IAOP). Dictator bidders have worse performance.

Institutional investors What happens if targets have institutional investors? Institutional investors tend to favor the deals and improve benefits for the sell-side (the targets) so that they can earn profits. The most important problem is how to measure the institutional ownership? The literature often focus on 5% fraction of firm equity as the cut-point to define the blockholder. But this idea is not true. For example, a small firm with only $10m? A 5% of this firm is only $0.5m, which is too small value. So which investment will matter the institutional investors? When the value of the investment at one firm has a high percentage (high relative importance at one investor) in the investor's portfolio.Fich et al. (2015) use the 10% most importance of investments in the institutional investors' portfolio to define the *monitoring institutions*. This new measure of institutional investor outperform the conventional measures. The findings are as expected, higher monitoring institutional investors improve the deal performance for the targets: greater bid completion rates, higher premiums, and lower acquirer returns.

Corporate Social Responsibility Deng et al. (2013) consider the role of CSR of bidders could create value for acquirers' shareholders. Compare to low CSR acquirers, high CSR acquirers have higher merger ***announcement CAR***, higher value-weighted portfolio returns of acquirers&targets, higher ***post-merger long-term*** operating performance, and positive long-term stock returns. High CSR acquirers made the merger in ***shorter time and less likely to fail*** the merger.

Actually, they propose two opposing hypotheses: maximizing shareholder wealth (positive effect) and shareholder expense (negative effect).

Some methods and results

1. For CAR of acquirers:
   (a) Model: $Acquirer'sCAR = (+)Acquirer'sCSR$
   (b) Add instruments: (i) religion rank (number of religious adherents/population of headquarters' state); (ii) blue state (Democratic state)
2. Long-term performance:
   (a) Operating cash flows: Use control firms: propensity score matching approach. Then run regression $\Delta post - mergeCF_{merge-control} = a + \Delta pre - mergeCF_{merge-control}$ in two subsamples of high CSR and low CSR. The intercept a is negative in the low CSR group, but not significant for high CSR group.
   (b) Long-term returns: use calendar time approach and control the portfolio return for 4 factor model. The abnormal return α is positive and signigicant for full sample and high CSR acquirers but not significant for low CSR acquirers.
3. Deal completion (probit) and time to complete (survival analysis):
   (a) Probit: $CompletedDeal = (+)AdjustedCSR$
   (b) Survival nonparametric Cox model: The dependent variable is the number of days spent to complete the deal (i.e., the length of days from the announcement date to the effective date). $\#Days = (+)AdjustedCSR$. In both regressions, the hazard ratio for the adjusted CSR measure is significantly greater than one, suggesting that mergers by high CSR acquirers take less time to complete than those by low CSR acquirers.
   (c) Instruments: religion rank and blue state

1.3 CEO and directors

There are some topics relating to CEO when we are dealing with M&A. They include overconfidence, board connection, social ties, merger experience and ability, and other topics.

Overconfidence

Dark sides: Overinvestment Who makes the merger and acquisition? The overconfident CEO (Malmendier and Tate, 2008). How they define the OC?

- Option-based measure: OC believe in the firm's future performance, so they fail to exercise the in-the-money option until expiration instead of reducing their exposure to firm-specific risk (i.e., diversify his personal portfolio).
  - Longholder: fixed effect during his tenure, he holds option until expiration despite 40% in-the-money
  - Pre/Post-Longholder: Split Longholder into two separating indicators. Post- for OC after the first time hold option until expiration; Pre for the rest of the CEO years in which $Longholder = 1$.
  - Holder 67: consider the exercise decision in the fifth year prior to expiration (since most options in sample have 10 years of duration), although 67% increase in stock price since grant date. This CEO will retain the OC label for all the remaining years in sample.
- Media-based: hand-collect data on CEO coverage in press with words "confident", "optimistic" vs. "reliable", "conservative", "practical", "steady", "frugal".

Their main results are:

1. OC tend to undertake M&A more when they test the logit regression with $Y = 1$ if CEO made a successful merger bid in a firm year, main independent is OC. In all fixed effect and random effect models in Table 3, coefficients of OC measures are positive and larger for cash-rich firms (abundant internal resource). Because they consider their firms are undervalued and external funding is costly, they only overinvest (merger more) just in cases these mergers can be financed internally.
2. Above finding is interesting because this effect is different from the traditional agency theory. Because empire-building CEOs are aware that their overinvestment are harmful so they should minimize their personal investment in the company by exercising their option at the earliest opportunity. In contrast, in this sample, CEOs fail to do so. Thus, the overinvestment in this case is from overconfidence.
3. Next, they examine the financing source. The results in Table 4 show that OC tend to use cash to finance the deals and when the firms are less likely to be overvalued (firms' Q are lower than industry median). Because OC believe that their firms are undervalued, it appears that they use cash to merger.

4. The effect is stronger for diversified mergers (bidders and targets are not in the same FF48 industries) rather than within-industry mergers.

5. When OC engage more in mergers than other CEOs, their deals have lower average quality. Thus, $CAR(-1;1)$ are -90 bp for OC firms but are -12 bp for other firms.

Bright sides: Innovation

1. Hirshleifer et al. (2012) provide the very first evidence on the bright side of OC, who are more likely to undertake risky projects such as R&D. Thus, they invest more in R&D activities and gain more innovations.

2. Malmendier et al. (2011) expand the idea in their paper in 2008 that OC seem to believe that their firms are undervalued; thus, being reluctant to issue external finance because they think that external finance is too costly. As a result, they prefer internal finance to external finance (Y = Public Issues, OC's coefficient <0). If they have to raise external fund to cover financing deficit, they will choose debt than equity (Y=Debt, X = Financing Deficit * OC). In addition, if they have to use debt, they use it conservatively relative to available tax benefits.

   (a) A confusing part of this paper is they further expand the paper to Great Depression CEOs and military-background CEOs

      i. Great Depression CEOs are more conservative and appear to access risky capital markets more conservatively

      ii. In contrast, military-background CEOs tend to take more risky, using more leverage

   (b) To proxy for conservativeness of using debt, they use a variable namely $kink$ (hypothetical level of interest / actual interest paid). This variable captures the additional debt could be issued before expected marginal tax-shield benefits begin to fall. Thus, a higher $kink$ means that firms use debt more conservatively. In model, they use $kink$ as Y, coefficients of OC and Great Depression are positive.

Board Connection: positive to bidders Cai and Sevilir (2012) study two orders of board connection:

1. First order: two firms share the same director before deal announcement

2. Second order: two firms have directors serving in a third firm

The main result is the first order connection helps to reduce takeover price (i.e., better bargaining power in deal negotiation, limit outside competitors with lack of material information about target) and second order connection increase post-merger ROA. Overall, with and without connection, bidder returns increase 2.45% for first order and 1.84% for second order.

Social ties: negative to bidders Ishii and Xuan (2014) look at the social ties (education and work experience) between bidders and targets executives. In contrast to Cai and Sevilir (2012), the effect of social tie is negative. Some interesting findings are:

1. Bidders experience negative reactions
2. CEOs and directors of targets are more likely to in their place after the merger
3. CEOs of bidders receive bonus of these negative mergers
4. Acquisitions tend to happen more for firms with high social ties

Schmidt (2015) looks at social ties between CEOs and board members at bidders. These social ties have either cost or benefit: (i) when *board advice* is more important, social ties bring higher bidder annoucement returns; and (ii) when *monitoring* is more needed, social ties lower returns. They have two measures of social ties:

- % Friendly board: Actual proportion of connections - Expect proportion (from simulations)
- Social Ties: a dummy of 1 for % Friendly board > 0; and 0 otherwise

For monitoring and advice proxies, they use:

- Monitoring: (1) follow Dittmar and Mahrt-Smith (2007), excess cash (in cases of free cash flow); (2) CEO equity ownership; (3) E-index for entrenchment; (4) Institutional Ownership; (5) Past performance and Diversifying; (6) Merger wave, follow Harford (2005).
- Advice: when directors possess information that CEOs do not have, such as: (1) Informed Board (directors work in the target's industry); (2) External Connections (outside directors); (3) Board Centrality (centrality of director in network, relating to quality of directors' network); (4) Low R&D intensity (advice will be more valuable); (5) Market Timers (directors earn better returns than industry median for that year); (6) Expert Board (financial expertise, work as CFO or top executive in banks).
- Use PCA to combine all monitoring and advice into main factor: use first factor.

Model: $BidderCAR = a + b * SocialTie * Monitoring + c * SocialTie * Advice$

The interaction with Monitoring is negative, while the interaction with Advice is positive.

Prior merger performance, merge experience and CEO career

Only experienced directors matter their career's future prospects Harford and Schonlau (2013) ask an interesting question that whether the labor market examine the acquisition experience and ability of the CEOs and directors. Acquisition experience is a good indicator but a high experienced CEO does not mean that he did a good performance in M&A in his career. Some CEOs could make good acquisitions and some CEOs could make poor acquisitions. Thus, if the labor market considers the acquisition ability, the CEO should have fewer board positions if he made poor acquisitions in the past. In contrast, if the labor market does not consider the acquisition ability, a higher acquisition experence helps CEOs/directors have more board positions. They, thus, propose two competing hypotheses: Gain Experience hypothesis and Reveal Ability hypothesis.

While the Gain Experience predicts that both positive and negative acqusition performance is positively related to future board positions, the Reveal Ability predicts that a low takeover premium will lead to fewer subsequent board seats. These different prediction allows them to test.

How to measure experience: Acquisition (Yes and No); number of Acquisition ($ln(1+\#\,Acquisitions)$); and Dollar measure ($ln(1 + Sum\,of\,SDC\,transaction\,value)$. How to measure ability: $SumCAR$ for bidders and $ExcessPremium$ for targets. To measure $ExcessPremium$ we need two steps:

- First, run regression and get the residuals as the Excess Premium: $ExpectedPremium = AdjROA + ExcessPremium_{t-1} + RelativeSize + Unsolicited + \lambda_i + \nu_t$
- Second, compare Excess Premium with zero or the mean premium from recent 10 deals in industry to define a Positive Excess Premium and Negative Excess Premium.

On average, the outside board position is popular, with average two positions up to 4+ positions. Acquisition experience is also popular, with 49% diretors have experience in acquisitions.

The results show that only experience matters. A higher experienced CEO has more board positions. For $SumCAR$, it is not significant, while both $Acq(+)$ and $Acq(-)$ have positive relation to board seats. This result is inconsistent with the Reveal Ability hypothesis.

Next, they consider whether CEO is in his own board in year $t + 2$ with the same setting. The main independent is a dummy that CEO is on his own board two year after stepping down as CEO. Interestingly, now the acquisition performance is more significant and positive, while the acquisition experience is not significant anymore.

This fact is true for both acquirer CEO and target CEO ($ExcessPremium$ is inconsistent). It is also true for directors and CEOs.

Why experienced directors are get more board positions? This paper raises an interesting question that why the labor market rewards the experienced CEOs despite their poor acquisition decisions? Why firms need a board with experienced members in acquisitions? Good questions need good people answer. Field and Mkrtchyan (2017) look at the post-acquisition performance of firms with experienced board. This paper finds that the board acquisition experience is positively related to

subsequent acquisition *short-* (CARs) and long-run performance. It means that the labor market does a perfect decision.

They propose two hypotheses: *Experience hypothesis* (firms with higher levels of board acquisition experience will engage in better-performing acquisitions) and *Performance hypothesis* (firms in which directors' prior acquisitions earned higher announcement returns will engage in better-performing acquisitions). How to measure the experience and prior acquisition performance?

- Experience 1: number of acquisitions that involved directors outside the principal firm during past 10 years
- Experience 2: percentage of independent directors that have had acquisition experience outside the principal firm during the prior ten years
- Performance: sum of announcement returns for all prior acquisitions that directors involved outside the principal firm: 54% have positive CAR, 46% have negative CAR, and total are value-decreasing for shareholders.
  - Median CAR of prior acquisitions
  - Number of prior acquisitions with positve/negative CAR
  - Percentage of prior acquisitions with positive/negative CAR

They reveal some interesting findings.

- First, the acquisition experience is quite common: 80% of acquirers have at least 1 independent director with acquisition experience; 28.7% of independent directors participated in prior acquisitions as executives/CEOs of other bidders.
- Second, the result support both the Experience Hypothesis and Performance Hypothesis:
  - Higher board acquisition experience, higher CAR. They regress CAR(-1;1) on Experience; Experience is positive.
  - Past acquisition performance also matter CAR (so dismiss the idea that directors learn equally from good and bad acquisitions): a better past acquisition performance is positively related to CAR. They regress CAR(-1;1) on Experience and Performance. All coefficients are positive.
  - Endogeneity check: 2SLS with IV variables are:
    * For Experience hypothesis: (i) the number of urban firms (10 largest cities in US) in which independent directors have served as a manager or director in the prior ten years, is motivated by prior literature showing that firms located in larger metropolitan statistical areas engage in greater acquisition activity; (ii) number of serial acquirers in which independent directors have served as a manager or director in the prior ten years.

    * For Performance hypothesis: (i) Median firm size of prior bidders (firm size is negatively related to acquirers' CAR); and (ii) Percent of prior stock deals (acquirers experience negative CAR if they pay by equity)

- The channels through which these two hypotheses happen:
  - (i) avoid large loss acquisitions: only past performance negatively affect Probability of large loss acquisition (logit model)
  - (ii) assist firms to select targets with higher synergies (i.e., higher combined firm value-weighted announcement returns; weight is based on ME at 50-day before deal announce): Combined CAR(-1;1) = (+) Experience + (+) Performance
  - (iii) assist in target integration: greater improvements in TFP and operating performance (industry-median-adjusted ROA)
    * Total factor productivity is computed as the residual from a regression of sales on labor, fixed assets, materials, industry and year fixed effects. To some extent, both factors improve post-performance.
  - For target CAR, only experience related to target-side (not bidder-side) improves target CAR

65-age effect When your career is promising at your young age, you worried that you lose the job after an acquisition (career risk/cost is high). But when your time is not too long, your retirement age (i.e., usually 65) is coming, you don't care about the career cost anymore. One earlier year and later year is not important anymore. In eastern countries, we often think that 60s age is when we learn how to accept rather than compete for a winning or a losing.

Jenter and Lewellen (2015) recognize this fact and apply to CEOs at targets when they are around 65 age (from 64 to 66 years old). Targets with close-to-65-age CEO increase the successful bids/probability, with an equal or higher takeover premiums and target announcement CAR than deals made by younger CEOs. It means that 65-age CEOs *do not sacrify the premium for the merger*. It means that retiring CEOs do not make a stupid decision. Insteads, they accept the optimal deal when it comes.

In contrast, a young CEOs have many things to lose when they accept the deals. Most of them are kicked out of the companies after the deals. Young CEOs may be reluctant to sell their firms, and weak boards allow them to reject value-increasing deals, making the overall frequency of takeovers is lower than optimal for target shareholders.

They also find that acquirers' CAR are not related to target CEO's age, dismiss the idea that retirement age CEOs have weaker bargaining.

There are two other channels may affect the 65-age effect.

- Governance: good governance of targets can reduce the 65-age effect. The interaction between 65-age and Governance is negative.

- Merger wave 1990s: an increase in merger benefits make the 65-age effect weaker because benefits of merger much more important than target CEO's private cost. The interaction between 65-Age and Merge Wave is negative. In fact, during merge wave, the peak of merge frequency is earlier: 59-63 years old.

They also try to explain the 65-age effect by other alternatives. For example,

- Disciplinary: a prior poor performance of retiring CEOs lead to takeover. But retiring CEO's operating performance is quite good.
- Succession problem: targets made the mergers to find a replacement for the retiring CEOs. They add some interaction with Industry Pay and Industry CEO Performance (industry-adjusted stock price). But not significant.
- Illiquiditiy: CEOs sell firms to exercise their stock/option positions to get cash.
- CEO wealth change: do wealth benefits (stock/option ownership + golden parachutes - lost future compensation) from the merger matter?

1.4 Innovation purchase motive

The most important paper about this motive is Bena and Li (2014). They propose that firms with high R&D cost but slow growth in patents tend to be targets. In contrast, firms with low R&D but high growth in patents are more likely to be acquirers. In addition, firms with higher technology overlap tend to merger each other. This paper is discussed clearly in R&D section below.

1.5 Source of finance and M&A

A rated firm could access to bond market and have less financial constrained, so they tend to invest in any positive NPV projects. In contrast, a without-rated constrained firm tend to invest in the best project with the largest NPV. For example, there is two projects A and B, both need the investment of 100. Project A has rate of return 10% and project B has rate of return 20%. A firm X, with rated and access to external debt market, could borrow to invest in both two projects to get average rate of return 15%. In contrast, a firm Y, without bond rating and do not have enough money to invest both, tend to choose the highest NPV project B and earn 20%. So, both firms earn but the firms with rated tend to have lower investment returns (but still positive), higher investment (i.e., higher M&A frequency), and accept a higher offer price.

Harford and Uysal (2014) study how access to public debt market (i.e., bond rating) can affect firms' investment decisions (i.e., acquisition). Having bond rating has both advantage (larger borrowing capacity, lower cost of capital) and disadvantage (less effective monitoring effect from concentrated

informed lenders such as banks). Thus, bond rating could have both effects on M&A result: (i) Financial constraint hypothesis: having bond rating is value-increasing and less costly and (ii) Free cash flow hypothesis: value-decreasing.

They find that in general, rated firms undertake more acquisitions (probit and tobit models), pay more target premium (about 5.5% higher), lower acquirer CAR, and lower long-run performance than non-rated firms (but still positive). As we outline above, they explain that:

- One final alternative explanation is that rated acquirers pick targets with similar potential synergies as those picked by nonrated acquirers, but they bid higher and so transfer more of the total synergies to the target shareholders.
- The results are most consistent with the hypothesis that firms without access to public debt markets are financially constrained, forcing them to limit their investment to the highest NPV projects. Because unconstrained firms can take all positive NPV projects, their marginal project will create less value than the marginal project of a constrained firm, reducing the average. This is reflected in the lower, but still positive, average announcement returns for rated firm acquisitions. Thus, the source of financing matters for investment.

1.6 Agency theory vs. Neoclassical theory

When mature firms undertake acquisitions? Why agency theory predicts that firms with low growth opportunities and high free cash flows tend to undertake M&A so that managers could earn private benefits. In contrast, neoclassical theory predicts that mature firms tend to undertake M&A to reallocate underutilized assets.

Arikan and Stulz (2016) study how firms undertake M&A during their lifecycle. They find that there is a U-shaped curve between firm age (since IPO year) and mean conditional acquisition rate. It means that firms undertake more acquisitions when they are young (around first 4 years after IPO), then lower probability of M&A in midde-aged years (4-9 years), then increase back when they old.

In contrast to agency theory, they find that mature bidders often have higher Tobin's Q than their targets. It means that they do not have lower growth opportunities than nonacquiring firms over the lifecycle. Insteads, they tend to reallocate corporate assets to more productive uses. High q firms tend to have more valuable assets so they undertake acquisitions more.

They also consider the stock reactions when mature and young firms announce the deals. If older firms make poor acquisitions as in agency theory, we should see *negative reactions*, while the neoclassical theory predicts that mature bidders earn *positive market reactions*. The market reactions could be summarized as follows:

	Private targets	*Public targets*			
		Related	*Unrelated/Diversify*	*Stok*	*Cash*
Young bidders	+	-	+	-	+
Mature bidders	+	-	-	-	-

2 R&D and Innovation

2.1 Source of finance for R&D and innovation: Equity

The equity finance is the most important for R&D activities. R&D intensive firms seem to have more intangible assets, lack of collateral, and need to protect proprietary information. These characteristics make R&D activities are often financed from equity rather than debt. Because:

- R&D are not suited for debt finance:
  - Adverse selection problem is more severe in high-tech firms/industries: due to the inherent riskiness of investment
  - Moral hazard: after obtaining the finance, R&D firms could change their behaviors from low-risk to high-risk projects
- Cost of debt is high because high distress cost of young high-tech firms because their market value depends heavily on future growth opportunities. However, growth opportunities depreciate quickly if they face financial distress (which rises with more additional debt).
- R&D firms do not have much collateral assets (most of their assets are intangible assets), which restrict their use of debt. But debtholders (e.g., banks) often require collateral.
- In cotrast, equity and internal source are more suitable for R&D because
  - Shareholders share in upside return, no collateral requirements, and additional equity does not increase the financial distress
  - Internal equity finance does not create adverse selection problems

Empirical evidence to support this view There are two papers support this view.

Brown et al. (2009) find the same increasing trend in internal cash flow and share issues as that in R&D activities (that peaks in dot-com period). They use a GMM model with IVs to check the effect of internal CF and equity on R&D expenses with 2 stages:

- In state 1: $RD_{t-1} = RD_{t-3} + RD_{t-4}$ and $RD^2_{t-1} = RD_{t-3} + RD_{t-4}$
- Stage 2: $RD_t = RD_{t-1} + RD^2_{t-1} + +GrossCF + StockIssue + \gamma X_{t-1}$

The result shows that $GrossCF$ and $StockIssue$ are positively related to R&D expense in young firm sample.

The second paper is Brown et al. (2013) from the international sample of 32 countries. They find that strong shareholder protection and better access to stock market (financial development) lead to higher long-run rates of R&D investment. They propose an important measure of *Industry-level dependence on external finance*.

$$Dependence\,on\,external\,finance = \frac{Fixed\,investment - Cash\,from\,operation}{SIC2\,median\,fixed\,investment + R\&D\,in\,US}$$

To measure financial development:

- Equity Market development: Country equity issues, Accounting standards, IPO/GDP
- Debt Market development: Country weighted leverage, Credit/GDP

To measure legal shareholder protection: Anti-self dealing index (ASDI) to reduce insider trading, Enforcement (enforce laws), and Legal Origin.

The model will be: $RD = Enforcement * FinancialDevelopment$ and this model with IVs are legal variables. All results show that equity market access help to improve R&D activities but not for the capital expenditure. The results are stronger for small and young firms, which are need the funding more.

2.2 Institutional ownership

Aghion, Reenen, and Zingales (2013) ask that whether institutional investors improve firm innovation. This paper contrast two hypothesis: "lazy managers" and "career concern". The lazy manager hypothesis argue that managers prefer a quiet life so institutional investors force them to innovate. The career concern argue that managers dislike the innovation risk (i.e., lose their jobs). Institutional investors can improve manager incentive to innovate by insulating managers against reputation consequences of bad income realization.

They also add the market competition into their model.

- If market competition is high, lazy managers work hard already. Thus, competition reduces effect of institutional investors on innovation.
- In contrast, when competition is high (more copycat problems) then success rate of innovation lowers, leading to higher career risk. Institutional investors play more important role in this case to insulate the managers and motivate him/her to innovate.

The results support the career concern hypothesis. *Institutional ownership* (i.e., proportion of stocks owned by institutions) improves firm innovation *input* (R&D) and *productivity* (cite-weighted patents

per R&D dollar). The effect is stronger in case of high competition. Furthermore, the decisions to fire CEO is less affected by a decline in profitability when institutional investment is high. Remember here is institutional investors should not be quasi-indexer institutions, who are less active monitoring the firms.

Using addition to S&P500 index as exogenous shock, they find that when firms newly added to S&P500, their institutional ownership increases and firm innovation also improve. They run a 2SLS as follows. In first stage, run $IO = (+)SP500membership$ then take the fitted value. In second stage, run $Cite = (+)\hat{IO}$. The result again supports the main positive relation. Next, they also study event around the addition to S&P500, and see that after added to the index, institutional ownership increases and firm innovation increases too.

2.3 R&D risk and likelihood to be takeovered

Although literature confirms that R&D activities are good for shareholders and debtholders in long-term (Eberhart et al., 2004, 2008). However, there is another risk for R&D intensive firms, that they are more likely to be targets of M&A, where large firms want to acquire them. Bena and Li (2014) link the R&D activities and M&A activities.

One of reasons firms undertake M&A is synergy effect from technology reasons (or Q-hypothesis as in Dong et al. (2006)). If this prediction true, we should see that R&D and innovation activities at bidders and targets should have important effects on probability of the M&A deal between them.

1. First, firms with high R&D but slow growth in patent output (not too successful, maybe due to lacking of financing) should be potential targets. In contrast, firms with low R&D expense but have large patent portfolios should be potential acquirers.

2. Second, technological overlap between two firms should have positive effect on transaction incidence.

3. Moreover, if bidders and targets have more technological linkage before the deal, they should produce more innovations later due to synergy effect afterward.

Two important measures

1. Patent index: three steps

   (a) First, for each tech class k and patent application year t, we calculate the ***median value of number of awarded patents*** in tech class k with application year t across all firms that were awarded *at least one* patents in technology class k with application t. So, median patents in each technology class *should be positive*.

   (b) Second, *scale patents* awarded by each firm in year t by corresponding *median value* from first step.

(c) Third, sum all scaled patents *across technology classes* for each firm and each year. Then, sum the sum scaled number patents above *across applications years* from year $t-3$ to year $t-1$.

2. Technological overlap:

   (a) Technological proximity (from Jaffe, 1986): closeness of two firms' innovation activities in the technology space using patent counts in different tech class.

      i. is uncentered correlation coefficients between two firms' patent counts. It follows $proximity = \frac{F_i F_j'}{\left[(F_i F_i')(F_j F_j')\right]^{1/2}}$

      ii. where F_i is vector of relative patent in each tech class k for a firm i. And F_j is vector for firm j. For example, if firm i has patents in 6 tech classes as $[10, 0, 2, 0, 0, 0]$ in year t, the sum of patents in year t will be 12 and the $F_{i,t} = [\frac{10}{12}; 0; \frac{2}{12}; 0; 0; 0]$.

   (b) Knowledge Base Overlap: extent to which two firms awarded patents cite the same set of past patents

   (c) Cross-Cites Ratio: extent to which target firms' patent portfolio is directly cited by acquirers' patent portfolio and vice versa. It captures the immediate importance of a firm's innovation activity to that of another firm.

Important results

1. They run a conditional logit model: use Patent Index and R&D expense as main independent variables and left-hand side variables are $Acquirer = 1$ (and zero for a randomly or propensity score matched firm) and $Target = 1$ (and zero for randomly or propensity score matched firm).

   (a) Who is acquirers? Patent Index's coefficient >0 and R&D's coefficient <0

   (b) Who is targets? R&D's coefficient >0 and $\Delta PatentIndex$'s coefficient<0

   (c) Thus, firms with large patent portfolio and less R&D expense tend to be acquirers, while firms with high R&D expense but less growth in innovation output tend to be targets.

2. How are merger pairs form? Because technological overlap.

   (a) Model: $Pr(Acquirer - TargetPair = 1) = (+)G(Overlap\,measures)$

   (b) Results support that technological overlap between two firms increases the probability to merger between them

3. Postacquisition performance of the merger with technological overlap: use DiD or $DiDiD$ methods

(a) They follow Seru (2014) to employ control firms as firms with withdrawn bids that failed because reasons exogenous to innovation activities. Treat firms are firms with successful bids.

(b) Model: $PatentIndex = (+)After * Treat * AnyTechOverlap$ where $PatentIndex$ here is sum of patent output of acquirers and targets.

(c) For firms with tech overlap, the merger leads to synergy effects so the postacquisition firm tends to be more innovative productivity

(d) For firms without any tech overlap, the $After * Treat$ is not significant. It means that because the technological overlap before the merger bring the positive synergy effect for the postacquisition firm.

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