Private Equity Buyouts and Strategic Acquisitions: An Analysis of Capital Investment and the Timing of Takeovers in the United States

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Abstract

This paper investigates how motivational differences between agents who execute private equity buyouts and those who execute strategic (corporate) acquisitions may influence the timing of capital investment via takeovers. This paper synthesizes prominent merger theories to inform macroeconomic variables that may drive acquisitions. I find a significant negative expected effect of volatility on capital investment via takeover for each buyer type, a negative expected effect from valuation multiples on capital investment from PE buyouts, and a positive expected effect from debt capacity (EBITDA-CAPEX) on capital investment from PE buyouts.

I.   Introduction

In the market for buying and selling companies, buyers vary in their motivations for acquisition. Commonly categorized as either strategic or financial buyers, these players are all incentivized to maximize returns for their stakeholders, but the timing and circumstance for which acquisitions take place depend on the type of buyer. Strategic buyers are interested in how the target company fits in with long term business goals. For example, a company may acquire a similar competitor to increase market share and grow revenue. On the other hand, a strategic buyer may acquire a company in another level of its supply chain to improve production efficiency and cut costs. A financial buyer acquires a company (the "target") with the expectation that the target will generate a desirable return. The financial buyer this study will focus on is the private equity (PE) firm, and this paper aims to supply evidence that PE buyers are motivated differently from strategic buyers due to differences in their respective situations and incentives. This paper investigates how the timing of capital investment from takeovers is influenced by differences in what drive PE buyouts versus strategic acquisitions over time.

I will begin by describing PE as it exists today in Section I (this section), followed by a review of the relevant literature as it relates to mergers and acquisitions (M&A) and PE in Section II. Prominent merger theories outlined in the literature review will inform corporate and macroeconomic (independent) variables that will make up the theoretical framework in Section III. Section IV will describe the data used to analyze transactions between PE and strategic buyers as well as the data that will make up the dependent (capital investment) and independent variables relevant to the empirical specification in Section V. Section V will describe and execute regressions of capital investment on aggregate corporate and macroeconomic variables and describe their findings and limitations in the context of the economic literature. Section VI will provide a conclusive summary with suggestions for future research.

Forms of Private Equity

Private equity is an asset class consisting of equity capital that is not publicly listed. Private equity firms, typically organized as limited partnerships, use capital raised from institutional investors and accredited investors to acquire undervalued companies and sell them for an expected return. The acquisition strategy as well as the business cycle stage of the targets, however, vary by type of private equity firm.

One type of financial institution similar to private equity is venture capital. The investors in this space are commonly referred to as venture capitalists (VCs). VCs primarily invest in startups or early-stage companies that demonstrate strong potential for growth. These companies are typically technology companies offering an innovative product or service. Although VCs play a role in improving the operations and management of the companies they invest in, most venture capital firms invest in less than 50% equity stake and opt to spread risk across many companies.

Another form of PE is growth equity. Growth equity focuses on slightly later-stage companies than VCs. These companies have a history of revenue growth with their products or services but are looking to raise capital to expand their operations. These investment vehicles are less operationally focused than other forms of private equity, with growth equity firms typically acquiring less than 50% ownership of the target company.

A third form of PE is buyout capital. Buyout firms invest in mature companies that are well-established and generate significant cash flow already. Some of these firms are "distressed" buyout firms which acquire troubled and underperforming companies with the goal to address some inefficiency. Buyout firms acquire greater than 50% (usually 100%) ownership, or "controlling interest", giving them the highest degree of control over their portfolio companies. Because acquiring controlling interest of mature companies requires a lot of capital, buyout firms often use high amounts of leverage. Using a significant amount of debt (relative to equity) to purchase a company, also known as a Leveraged Buyout (LBO), is risky because of a higher probability of default in the event cash flows from the acquired company fail to cover the cost of the debt. The assets of the acquired company are often used as collateral for the loans, bringing a high degree of scrutiny to the private equity industry. Because of the inherent risk associated with LBOs, PE firms are very selective in the companies they acquire, and the due diligence conducted prior to buyouts may take years. Target companies will typically have robust and stable cash flows, strong market positions, and multiple avenues of growth. Similar to other acquirers, PE firms work closely with investment banks to explore potential targets, raise debt, and facilitate the transaction in broad terms.

This study focuses on buyout PE and the acquisition of controlling interest; subsequent mentions of private equity will refer to buyout PE, or PE firms acquiring controlling interest, unless otherwise stated. These firms are the active PE players in the M&A market—the market

for control of and investment in companies for sale. For the purpose of this study, market participants include buyout PE firms, strategic buyers (also referred to as "corporates" or "strategics") on the demand side; both privately held and public companies make up the supply side. There are other forms of acquisitions such as management buyouts in which a firm's management acquires controlling interest of their company, but transactions such as these have unique players, and this study focuses on differences between PE buyers and strategic buyers in the M&A market. It is important to distinguish too that the "M&A market" described here refers to acquisitions in which controlling interest is obtained; these are far more common than mergers in which both parties give up power and control to combine as a new corporate entity.

Private Equity structure and timeline

Private equity funds, organized as limited partnerships, are made up of limited partners (LPs) and general partners (GPs). The GPs work at the private equity firm and make the investment decisions as well as execute the transactions. The limited partners are the primary investors in the private equity fund. The LPs contribute most of the capital in a fund, though GPs will often "coinvest" into their fund. GPs will charge a management fee and a performance fee to the LPs. The management fee is typically 1-3% of the committed capital from the LPs, and the performance fee is typically 20% of the profits generated by the fund. The performance fee is commonly referred to as "carried interest" and serves to align the interests of both the GPs and the LPs.

LPs invest into a PE "fund", which is an investment vehicle and portfolio of typically 10 or more acquired companies. Funds typically have a time horizon of 7-10 years, with the first five years dedicated to deploying capital and investing in the target companies and subsequent years dedicated to exiting the investments. PE funds will rarely last longer than 10 years; extending a fund's life beyond this requires the consent of the LPs. This feature is relevant to this study because this rigid timeline is a constraint unique to PE players in the M&A market.

The prominence of private equity

The prominence of PE continues to grow. According to *PitchBook*, PE-led acquisitions made up 39.4% of the M&A volume in North America for the first half 2019. This share of North American M&A has risen steadily from 23.9% in 2009. The report also illustrated the convergence between the number of public and PE-backed companies, with the number of PE-backed companies growing to more than two-thirds of the merger market by 2017. A few of the

biggest players in PE over the last 20 years with respect to assets under management (AUM) have been The Blackstone Group, Kohlberg Kravis Roberts (KKR) and The Carlyle Group. As of 3Q 2019, Blackstone managed $174B in private equity assets and Carlyle managed $84B. These firms invest in a broad spectrum of companies across different industries and geographies, though they tend to invest in large-cap companies with the high amount of capital at their disposal. The recent growth in PE investment follows a massive surge in M&A activity in the United States during the late 1990s, with the value of the M&A market reaching an unprecedented $1.8 trillion in 2000.

The growing prominence of PE in the M&A landscape further develops the interest of the growing implications of PE buyouts. I begin by reviewing the existing literature that deals with M&A, PE, and the intersection of the two. In a unified approach, a will draw from prominent merger theories to inform macroeconomic variables that may explain any variation in what drives strategic acquisitions and PE buyouts uniquely over time. I propose that differences in situation and incentives between strategic and private equity agents explain differences in the respective timing of capital investment via takeovers for each buyer type. I will test this hypothesis by comparing how strategic agents and PE agents are motivated by theory-informed macroeconomic variables.

II.   Literature Review

The existing literature pertaining to M&A is extensive. Before exploring the impact of PE on merger markets, it is necessary to review what we know about M&A and their role in the economy, including the players, their incentives, and related merger theories. This will provide a theoretical framework in which the PE firm is introduced as a unique player.

The economic role of mergers and acquisitions

M&A are significant transactions that impact the economy. They affect prices, wages, and the availability of goods and services. A number of authors present economic benefits of mergers while mentioning the considerations of consolidation. The importance of M&A in the global economy motivates this study, and prior research will set the stage for further incorporation of private equity into merger theory.

This study considers research by Eckbo (2014) on corporate takeovers and economic efficiency and Kaplan (2009) on private equity and leveraged buyouts. Eckbo reviews recent

M&A research and analyzes the drivers behind M&A as well as who is buying who. They find that the acquiring firms are often the most profitable, while the targets are not necessarily the smallest. Eckbo identifies the strategic buyer and analyzes the role of M&A in driving industry-level efficiency, providing a starting point for discussing the impact of PE on merger markets, PE's unique incentives, and the implications of PE investment in the context of merger waves and industrial organization. This paper aims to further explain industry consolidation trends described by Eckbo as they relate to recent trends in LBOs and private equity investment.

One of the considerations of accelerating M&A activity is efficiency. According to David (2012), M&A can drive efficiency in a macroeconomy with competitive markets. His paper on the aggregate implications of mergers and acquisitions in the United States observes the long-run effects of M&A on aggregate productivity and output. The model compares a simulated economy with no-M&A to an economy with M&A. In the economy with M&A, aggregate output and productivity are both 31% greater. David (2012) provides a recent assessment on the economic gains created by M&A, motivating the focus of this paper to better understand the effect of PE investment on M&A intensity.

Healy, Palepu and Ruback (1992) analyze post-merger operating performance for the 50 largest mergers by transaction value between 1979 and 1984. More specifically, they compare post-merger performance to the industry median. They find that post-merger operating cash flows are lower, on average, than their premerger levels. However, the merged firms experience higher levels of asset productivity, and results show higher operating cash flows from the merged firms than their industry peers. The reason is that although operating cash flows fell for the merged firm, operating cash flows fell by a greater degree among peer firms. This provides evidence, in the context of industry shocks, that mergers play a role industry contraction as aggregate operating cash flows decline but efficiency improves.

In earlier research on the macroeconomic implications of merger markets, Andrade and Stafford (2004) investigate the economic roles of mergers, providing a strong theoretical foundation and empirical framework for this paper. They assume that firms have a financial incentive to expand and grow their asset base. From a macro perspective, industry capacity impacts consolidation as well, and competitive forces drive efficiency in the industry through asset reallocation. For example, when there is excess supply in an industry, there is said to be excess capacity which drives industry consolidation through mergers. As one strategic buyer

acquires another company (i.e. a competitor), assets are reallocated as a means of reaching a more efficient supply level from an industry perspective.

Evidence of merger waves

Using regressions of merger intensity on industry-level variables, Andrade and Stafford (2004) found that both mergers and nonmerger investment respond to industry shocks and other incentives to invest. However, M&A activity is highest during times of excess capacity. They also identify "merger waves", a common approach across studies, that impact industries as well as the broader economy. While M&A activity was generally influenced by industry capacity, M&A intensity compared to nonmerger investment varies across time at similar industry capacities. They found, for example, in the 1970s and 1980s, industries were contracting through consolidation as they neared full capacity. At peak capacity, M&A activity slowed while nonmerger investment picked up. In the 1990s, by contrast, M&A intensity remained strong as industries neared full capacity, though nonmerger investment increased as well. In each time period, they find a positive relation between shocks and own-industry mergers. The cyclical expansion and contraction experienced by industries implies that M&A plays a critical role in maintaining efficiency.

Andrade and Stafford effectively describe the general determinants of M&A intensity. Their research emphasizes the efficiency M&A provides the economy, particularly during shocks. It lays a foundation for further research on how private equity investment may disrupt this efficient mechanism of industry expansion and contraction. This paper aims to analyze the role of private equity in industry M&A dynamics and how the influence of private equity investment may vary across industries with varying levels of capital.

The shocks investigated by Andrade and Stafford (2004) are often exclusive to a given industry or set of industries. Andrade, Mitchell, and Stafford (2001) provide evidence for the clustering of merger activity by sector. They found that among industry shocks in productivity and demand, deregulation, plays a dominant role in affecting M&A activity after the late 1980s. Andrade, Mitchell, and Stafford (2001) finds, consistent with Andrade and Stafford (2004), why and when M&A activity intensifies—during industry shocks.

Merger theory

A handful of theories in M&A literature have attempted to explain what drives takeovers. Most of these along with relevant empirical evidence support one or more of three prominent

merger theories: Synergy Gain Theory, Agency Theory, and the Hubris Hypothesis. Synergy Gain Theory aims to explain efficient mechanisms driving M&A activity while Agency Theory and the Hubris Hypothesis provide insight for the inefficient mechanisms driving acquisitions. These theories will help define the relevant variables influencing strategic acquisition and private equity buyout activity.

Synergy Gain Theory outlines the widely-accepted notion that firms acquire other willing firms to unluck new value with their assets combined—an efficiency-driving mechanism at the industry level. It draws from the theory of corporate diversification developed by Singh and Montgomery (1987), who argue that acquisitions of firms operating in related markets tend to create higher value than unrelated acquisitions. This value can be derived a number of ways. If a firm were to acquire a competitor, for example, the synergies would exist in the greater economies of scale and increased market share. Alternatively, a firm may acquire a supplier to achieve cost synergies. Aside from situations in which competition is significantly reduced, synergistic mergers can drive efficiency in a given sector, particularly in instances of excess capacity as outlined by Andrade and Stafford (2004).

In the event of regime shifts such regulatory or productivity shocks, more synergies can be realized, and we observe merger waves (Mitchell and Mulherin, 1996). This defines the Neoclassical Merger Theory that attributes merger waves to value-maximizing managers responding to regime shifts. Subsequent research has frequently cited these findings, with many building off of its framework to find supporting evidence for merger clustering by sector (see Andrade, Mitchell, and Stafford, 2001).

The neoclassical merger theory and the broader theory of merger waves draw close parallels with the widely cited work by Gort (1969) and his economic disturbance theory of mergers. It posits that rapid changes in technology lead to uncertainty in the future performance of firms. This creates greater variance in equity valuations among investors, and this heightened variance leads to a rise in merger frequency as highest bidder valuations more frequently exceed seller valuations. This interpretation of shocks and merger intensity will be useful to this study. Although it precedes more recent theories addressing industry shocks and merger waves, it accepts a broader range of shocks and can provide more quantitative insight.

Most of the literature on merger waves focuses on industry-level shocks. While this approach is analytically rigorous and has yielded invaluable findings, this study aims to broaden

the shock variable across industries by instead focusing on aggregate demand shocks (across all industries) and volatility of equity valuation. Volatility of equity valuation can be accurately measured by tracking a volatility index. Building off of the Economic Disturbance Theory, this selection extends regime shifts to the broader US economy while still capturing the impact of demand shocks and uncertainty.

Finally, the Q-Theory of mergers aims to explain economic disturbance theory and related merger wave theories through variations in Tobin's Q of target and acquiring firms. Servaes (1991) found that takeover returns were higher when the acquirer had a high Q and the target had a low Q. Jovanovic and Rousseau (2002) found that firms respond more to its Q for M&A investment than direct investment, and M&A waves featured wide interfirm dispersions of Q. The dispersion of Q is a useful metric for analyzing drivers of acquisitions, as their findings have supported.

Another driver of M&A activity comes from agency theory. Jenson (1986) proposed that corporate managers are agents for shareholders and in many strategic circumstances face conflicts of interest. The most notable situation arises when a public firm generates significant free cash flow, and the manager must decide its strategic use. The theory implies that managers are incentivized to grow power and control of the firm, which can be at the expense of shareholders. In this example, a self-interested agent would rather reinvest the free cash flow proceeds to grow the size of the business, even if such projects contain high capital costs, yielding lower returns and diminishing shareholder value. Jensen (1986) in a separate paper outlines this scenario in a free cash flow theory of mergers. The theory states that managers, incentivized by private benefits, will choose to use the excess cash to grow the firm through an acquisition before paying shareholder dividends, even when the acquisition is value-destroying. Jensen (1986) finds that managers of firms with unused borrowing power and large free cash flows are more likely to undertake low-benefit or value-destroying mergers. He also proposes that raising debt can be a partial solution to this agency problem, as managers are liable for paying fixed income payments to debt investors. This does not solve the agency cost problem for equity investors, however. In addition, private benefits incentivize managers to maintain control over the operations of the firm, with evidence supporting what seem to be defensive acquisitions—takeovers that are intended to reduce the probability of the firm being acquired

itself, even when such defensive acquisitions are value-destroying for shareholders (Gorton, 2009).

Private equity firms mostly eliminate the issue of agency costs. PE firms are not incentivized to engage in value-destroying acquisitions because their mangers' interests are more closely aligned with maximizing returns for stakeholders. Under the ownership of private equity, the agent is the general partner of the private equity fund, as he or she controls the operations of the acquired firm in a given fund. The interest of the general partner is more closely aligned with the interest of investors because of the fee structure, reputation risk, and other financial incentives tied to the success of the buyout. This distinction is important because it provides another factor that may influence strategic M&A more than PE buyouts. Significant free cash flow and defensive acquisitions provoked by merger waves should be less impactful on PE buyout frequency than strategic acquisitions because of the discrepancy in agency costs between these different players.

Private equity buyouts and strategic acquisitions

Since its inception, PE has received high degrees of criticism and praise from academics and public figures, and it remains a controversial component of the global economy today. Recent studies point to declining employment and earning per worker after a firm is acquired by private equity (Davis, 2019). For many decades, researchers have acknowledged the rise of private equity and have analyzed its impact on the economy.

Jensen (1989) has acknowledged the private equity solution to the agency costs mentioned previously. He even implies public companies with high agency costs (high cash flow and slow long-term growth) present attractive buyout opportunities for private equity as they can create value by reducing these agency costs. High growth companies are constantly changing and facing highly variable capacity thresholds, and they will frequently require restructuring. The prevalence of high cash flow firms as buyout candidates may provide insight to PE acquisition timing. The free cash flow metric will be useful in addressing two separate phenomena in this study: the drive for defensive mergers and the drive for PE buyouts.

Although such companies have presented attractive private investment opportunities independent of time, investment strategies in the private equity industry vary and have changed over recent decades. Klier, Welge, and Harrigan (2009) investigate how private equity has taken a shift towards more active investment as opposed to traditional financial investment. This is

observed by private equity firms installing their own management as well as alignment with co-investment. Active investment seeks value creation through active involvement with corporate decision-making, whereas a more traditional financial investor focuses more strongly on financial engineering. They found that active investors significantly outperform traditional financial investors through effective strategic decision-making and evasion of "corporate infrastructure" costs. It is unclear whether or not active or passive investment influences the extent to which private equity investment impacts merger waves, but this paper will differentiate by type of investor, whether strategic or financial, assuming interventionist investors may participate in greater frequency with own-industry and/or tuck-in acquisitions. This paper is limited in that it does not quantify the degree of active investment that may have changed over the time period being studied, but it important to note that more active investment may indicate an increasing motivation to improve the companies PE firms acquire, and this may alter the qualities of an ideal buyout candidate.

An observation in PE that is very relevant to this study is the significantly lower premia private equity firms pay for their acquisitions relative to strategic bidders. Leonce (2008) found that target shareholders receive a 63% higher premium when the acquirer is public rather than a private equity firm, proposing that strategic firms are willing to pay more because of synergies; private equity firms benefit far less frequently from synergies, with exceptions being when synergies may exist with an existing portfolio company. This may indicate that PE buyout activity may decline during merger waves as strategic buyers enter the merger market with synergy-based bargaining power on premia.

A more recent study by Fidrmuc et al (2012) finds that differences in synergies may not depend as much on whether the buyer is a PE agent or strategic. The authors find a number of key differences between the qualities of PE buyout targets and strategic target, but premium is not the centerpiece of these differences. Fidrmuc et al (2012) provide a comprehensive overview of how these transactions differ, including a difference in valuation preference; PE firms tend to acquire companies with lower relative valuations, such as market value to book value ratios or enterprise value to EBITDA multiples. The authors argue that this indicates a focus on resale value as a driver of PE returns, unlike drivers associated with long-term growth prospects favored by strategics. Fidrmuc also finds that PE buyers prefer targets with high levels of cash on

the balance sheet, as this may present an opportunity to generate value through reduction of agency costs, consistent with Jensen (1989).

This study will closely build off of the work of Fidrmuc (2012) and will aim to find target company-specific qualities as well as macroeconomic dynamics that affect strategic M&A and PE buyouts to varying degrees. I will consider the approach of Fidrmuc (2012) and attempt to incorporate what empirical research has discovered about PE buyout drivers into a unified framework of merger theories. The existing literature clearly outlines the M&A landscape over recent decades, describing drivers of merger waves, merger theory, and efficiency implications. However, the PE agent is not clearly differentiated as a unique merger market player among prevailing merger theories. Studies reveal the greater use of leverage from PE buyers, but little consideration have been given to how this preference for high leverage determine which companies (and in which macroeconomic conditions) are acquired. This paper aims to integrate the most prominent merger theories and their determinants of M&A frequency and assess their applicability to capital investment from private equity buyouts. While M&A drivers and implications are widely researched and effectively explain strategic corporate behavior, little consideration has been given to the narrowing applicability of these theories to the broader merger and equity capital markets as equity investors increasingly shift from public to private capital.

III.   Theoretical Framework

From the perspective of the firm, both strategic buyers and PE firms are incentivized to maximize profits for stakeholders. In the case of PE, the stakeholders are general partners (GPs) and limited partners (LPs) as described previously in greater detail. The basis of this paper is not to think of the stakeholders—whether they be investors of public or private equity—as having different incentives that drive differences in acquisition activity. Although they may be demonstrating a variation in investment strategy, we will assume stakeholders are interested in maximizing the return on their investments. The literature suggests investors will interpret returns in the context of risk and liquidity, but a comprehensive analysis of modern portfolio theory in the context of acquisition behavior is beyond the scope of this paper (see Markowitz (1952) and Tobin (1958) for foundational investment theory and Feldstein (1969) for limitations to these theories).

Instead of comparing the *stakeholders* associated with each kind of acquisition, this paper focuses on the *agents* involved and how they differ with regard to situation and (to a lesser extent) incentives that may explain variations in acquisition activity among strategics or sponsors. This section is intended to use relevant economic theory to support the claim that the agents differ in situation and incentives. These theories should help inform potential explanatory variables for timing differences in strategic acquisition and PE buyout intensity.

M&A theories

Investment theory in broad terms postulates an optimization problem for maximizing returns while minimizing risk (Tobin, 1958). In the types of investments that are mergers and acquisitions, an agent—such as a corporate executive or PE general partner—exists in the execution of such transactions, whose purpose is to align operational decision-making with the interests of stakeholders. Laws and regulations exist to enforce aligned interests, as agents have what is commonly referred to as fiduciary responsibility. With the complexity of corporate strategy, exhibiting misaligned interests, unless egregious, can be difficult to prove; one can expect the existence of agency costs when interests are not aligned.

Jensen (1986) outlines agency theory in the context of M&A to suggest some acquisitions may have inefficient drivers. Managers may be influenced by private benefits such as how utility can be derived from controlling a large enterprise. This may incentivize managers to spend cash to acquire other companies even though this may not be optimal for maximizing shareholder returns. This is described by Jenson (1986) as the free cash flow theory of mergers. A related theory is the hubris hypothesis, with posits that managers have a tendency to overestimate their ability to improve the operations and uncover value in the companies they acquire, leading to overpaying for acquisitions against the interest of shareholders (see Roll (1986) and Hayward (1997)). The theories suggest there is less agency cost with PE acquisitions, as general partners are mostly compensated proportional to the returns of their LP investors. These related theories point out how the incentives of PE agents and strategic agents may differ as they relate to acquisitions.

Other prominent merger theories reveal the unique respective situations of strategic buyers and PE buyers. The widely researched corporate diversification theory is one that can explain both strategic acquisitions and PE buyouts. Each actor will seek to acquire companies that possess a different risk profile from the acquirer and its portfolio. This is a method for

reducing systematic (market) risk (see Christensen and Montgomery (1981)) and can motivate M&A for all types of investors or agents. Where the situation for the agent differs is when strategic synergies are to be gained from acquiring similar companies that improve operational efficiencies. This is the synergy gain theory. This theory is the basis for most merger theories that assume aligned incentives with agents and shareholders. It explains the way in which buyers derive value from acquisitions. This could be in the form of more productive use of capital in Tobin's Q theory of mergers or driving acquisitions during industry shocks and periods of excess capacity. It explains why a buyer may perceive a higher valuation in a target than the seller. The related economic disturbance theory explains how uncertainty may lead to great variance in asset valuations among investors to facilitate market-making.

Theory-informed variables

I attempt to capture the M&A drivers from each theory in a set of variables that are publicly available, widely referenced by finance professionals, and accurately reflect the economic theory. It is important to note, however, that these variables do not perfectly capture what is outlined in the related theory, although they may be appropriate for an analysis that incorporates PE into a macroeconomic model that spans all industries.

Starting with synergy gain theory, acquirers have incentive to expand and grow when an acquisition will improve operational efficiency, typically from economies of scale or streamlining production. At the industry level, a productivity shock may lead same-industry firms to merge; the reallocation of existing assets allows firms to increase in size and afford larger investments in capital. This is the mechanism for industry expansion. However, mergers are also mechanisms for decreasing the capital stock in cases where M&A removed duplicated functions in industry contraction. In these situations, M&A drives industry-wide efficiency. I attempt to capture this with a variable that represents demand shocks, similar to the method employed by Andrade and Stafford (2004). This is how the shock variable is measured:

$$abs[SalesGrowth(t) - mean(sales\ growth\ in\ all\ t)]$$

My use of the shock variable is different in that it looks at sales growth across all industries. The goal of this paper is to analyze M&A trends from an industry agnostic perspective. Although this may reveal large-scale macroeconomic trends relating to M&A, it may overlook or fail to fully capture the impact of industry-specific productivity shocks that the literature has attributed to be an integral driver of merger waves.

The economic disturbance theory will be captured by the VIX volatility index. While this variable reflects uncertainty for the future as the theory describes as a driver, it may not impact merger intensity as strongly as the theory might imply. The theory is logical in that a variance in valuation should facilitate transactions, but it should assume that not only are valuations widely varied, but each individual investor in confident of the valuation. This seems less likely in practice, as investors are generally risk-averse, and although volatility is associated with variance in equities pricing, the associated uncertainty adds risk that diminish attractiveness of higher expected returns. How M&A is affected by uncertainty across PE and strategic buyers is a valuable insight, nonetheless.

The Q-theory of mergers can be broadly applied to assess how companies engage in M&A to grow the returns of the assets they are acquiring. To maximize returns, PE firms in theory will invest in companies with low Tobin's q (the ratio of asset market value to replacement value) and sell companies with higher q. Tobin's q in this case is a proxy for how much a target company could be overvalued or undervalued based on the replacement cost of the underlying assets. While strategic companies may be long-term in their view for potential growth, PE funds invest on shorter-term time horizons, and immediate access to funds and debt capital are vital to their existence. The theory argues that high Q firms tend to invest in lower Q firms. I intend to expand the implications of the Q theory to incorporate firm performance in addition to market value and asset value. I will look at return on capital, relative valuation, and debt capacity. Each of these variables will address how firms aim to allocate capital to its most efficient uses, whether it be a high valuation firm using its own stock to acquire another firm (relative valuation), a company issuing high amounts of debt to achieve higher returns on equity (debt capacity), or acquiring assets to utilize more efficiently (return on capital). Debt capacity will be captured by observing unlevered free cash flow and average CAPEX per share. This should give insight to how much of cash flow attributable to debt and equity holders remains after capital expenditures to support interest expenses. This is particularly relevant for PE in the case of LBOs, as debt is often maximized to increase equity returns.

All merger market participants are influenced by transaction costs. These costs can have a variety of sources including investment banking advisory fees, debt refinancing fees in the in the case of high call premiums on long term debt, and legal fees among others. Because this study focuses on changes in relevant macroeconomic variables across time, financing fees as they

relate to issuing debt and accessing capital markets will be the primary focus. Interest rates in particular will be measured as the macroeconomic variable. Returns on investment for both strategic and PE buyers are dependent in part on cost of debt, defined by interest rates. Investment (M&A or otherwise) should be inversely related to interest rates this increases financing costs. Because PE firms use more leverage in acquisitions, it is expected that PE investment will be more sensitive to changes in interest rates than strategic investment. Therefore, M&A transaction value should be negatively correlated with interest rates, but PE aggregate transaction values should be negatively correlated with interest rates with a greater magnitude all else equal.

With regard to agency theory and free cash flow theory, aggregate unlevered free cash flow will be measured across the S&P 500. This should provide insight to what tendencies strategics may have for using excess cash to fund acquisitions as suggested by the theory. The effect on M&A intensity will have a broad implication however because it is unclear how to distinguish between the private benefits incentive to fund acquisitions with excess cash and the heightened attractiveness of target companies generating excess cash. A relative valuation variable should partly address higher M&A transaction values for strategics as the theory implies agents sometimes overpay for acquisitions. The other component to relative valuation is it addresses synergistic differences between PE buyouts and strategic acquisitions. The hubris component is the portion of the premium that is not explained by synergies or standard transaction costs. An attempt will not be made to identify this boundary, but I will refer to empirical literature that has provided insight on this front.

The following figure illustrates the relationships between the prominent merger theories and their selected explanatory variables as discussed.

Summary of relevant merger theories and explanatory variables

Figure 1.
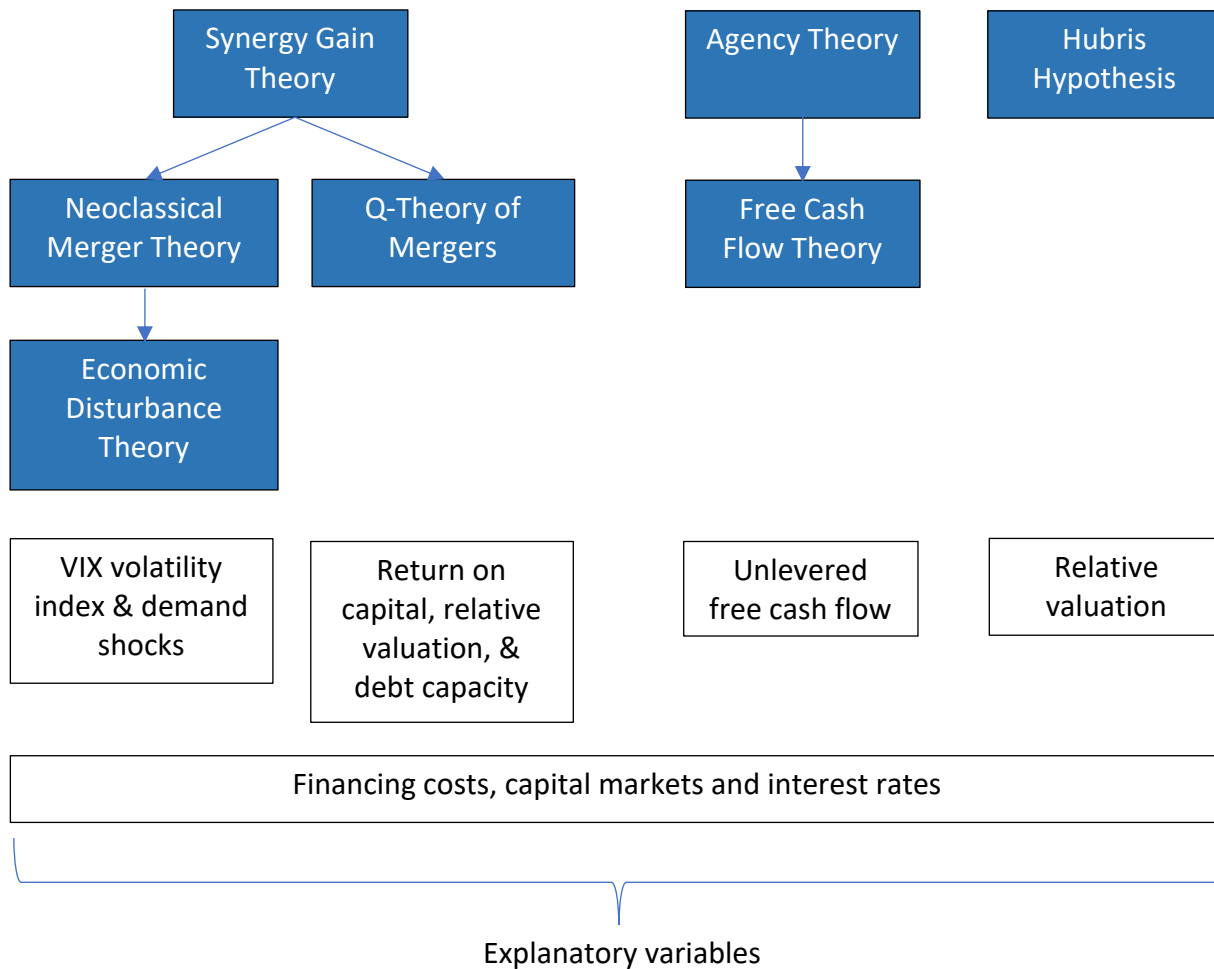
Aggregate strategic M&A transaction values are expected to have no significant correlation with private equity investment. However, PE investment will correlate with lower M&A intensity in low interest rate environments and higher M&A intensity in high interest rate environments, independent of industry productivity shocks. PE investment, by driving M&A in periods that may not feature industry shocks, may smooth M&A waves.

Independent variables and predicted effects on PE investment

Table 1.

Variable	Predicted effects	Supporting Theory
VIX Volatility Index	Positive correlation with strategic transaction value; negative correlation with PE transaction value	Economic Disturbance Theory
Return on capital, relative valuation, debt capacity	Positive correlation with strategic transaction value; negative correlation with PE transaction value	Q-Theory of Mergers
Unlevered free cash flow	Positive correlation with strategic transaction value; positive correlation with PE transaction value	Agency theory and Free Cash Flow Theory
Demand shocks	Positive correlation with strategic transaction value; negative correlation with PE transaction value	Agency Theory and Hubris Hypothesis
Interest rate	Negative correlation with strategic transaction value; Positive correlation with PE transaction value	PE firms will typically lock in a low interest rate and acquire companies in a high interest rate environment because these companies are more likely to be undervalued as equity investors turn to fixed income assets.
Relative valuation	Positive correlation with strategic transaction value; positive correlation with PE transaction value	Hubris Hypothesis and Synergy Gain Theory

Synthesizing acquisition theories for empirical framework

I will assume acquisitions in general are motivated by two objectives: (1) increase stakeholder wealth and (2) grow or maintain private benefits. First let us consider the perspective of the shareholder without the agent. The shareholder would choose some degree of M&A investment, *I*, that maximizes a return function *f* that takes *n* benefit and cost inputs $X_1, X_2, X_3 \ldots X_n$.

$$I = f(X_1, X_2, X_3 \ldots X_n)$$

These inputs might include benefits such as potential synergies, return on acquired capital, or expected growth in equity value as well as costs such as transaction cost, acquisition

financing costs, and risk. These inputs in particular will be used to inform explanatory variables later.

Next, I will introduce an agent in the model and propose that misaligned incentives created by agency costs (such as those from private benefits) may increase or decrease I by some factor, z. This can be exemplified by cases of defensive mergers or suboptimal use of free cash flow to expand the enterprise as suggested by the free cash flow theory. I propose too that the inputs have coefficients $c_1, c_2, c_3 \dots c_n$ that depend on the situation of the agent. For example, a strategic agent may benefit more from potential synergies from corporate diversification than a PE agent, while a PE agent may benefit more from a discounted valuation multiple due to its shorter investment time horizon and short-term exit strategy.

$$I = zf(c_1 X_1, c_2 X_2, c_3 X_3 \dots c_n X_n)$$

The takeaway is that between strategic and PE agents, z reflects how differences in *incentives* can influence M&A investment, and each c reflects the relative priorities (or marginal return) of each factor that depend on the unique *situation* of the agent. These hypothetical scenarios indicate why a strategic might be more concerned with long term business alignment and synergies from a target while a PE agent might be more concerned with discounted valuation or short-term growth potential, and these factors may influence acquisition timing and intensity for the respective agent as the macroeconomic input variables change over time.

IV. Data

The data used in this analysis is provided by Standard and Poor's Capital IQ. Two types of data of collected and managed to serve two unique analytical purposes. The first type of data is M&A transaction-level data that will be used to describe differences between strategic acquisitions targets, PE buyout targets, and the transactions themselves. This will provide a basic descriptive summary of significant differences between strategic acquisitions and PE buyouts. These findings will motivate analysis of the second type of data collected—aggregate corporate and macroeconomic data in the United States economy that reflect the theory-informed variables described previously (these will be referred to as macroeconomic or "macro" variables in later sections for brevity). These macro variables will used to analyze differences in motivations for strategic acquisitions and PE buyouts respectively across time through regressions in the empirical section.

Dataset selection

Capital IQ is a comprehensive database with global public data relating to companies, industries, transactions, markets, indexes, securities, currencies, and projections among others. Capital IQ is very popular among finance professionals because of its accuracy in reporting, comprehensiveness, and ease of use.

Capital IQ has a screening function that allows you to screen a broad database of historical transactions. The platform offers a wide variety of filtering criteria for companies and transactions from as broad as industry and geography to as specific as where the CEO went to college. It was ideal for me because I am focusing on a very specific set of transactions, buyers, and targets. I initially ran a similar screen on Moody's Zephyr M&A database. Zephyr has a similar screening tool, but the filtering criteria and descriptive data options were far less comprehensive than what was available on Capital IQ. In addition, some of the filtering criteria were ambiguous or too broadly defined. For example, it was difficult to distinguish between types of private equity firms in the transaction screens. You could filter transactions for "institutional buyouts", but it was unclear how broadly this was defined and how it could be trimmed even further. Because of ambiguity in the filtering methodology of Zephyr, I decided not to attempt to merge the datasets and found sufficiency with the accuracy and comprehensiveness of Capital IQ.

One limitation of Capital IQ is that it broadly defines "strategic" as a type of buyer. Conglomerates and investment-focused companies such as Berkshire Hathaway were classified as strategics for example, and firms such as these generally do not appear to exhibit strategic behavior in M&A. However, they can experience high synergies as new acquisitions fit into their portfolios. These observations make up a small proportion of the dataset but are worth noting as having both strategic and institutional qualities. To mitigate this, I applied rigorous filtering to buyer characteristics.

Transaction screen

Two transaction screens were performed on Capital IQ; one screen identified strategic acquisitions and the other identified private equity buyouts. Both screens filtered for announced acquisitions of controlling interest (>50% equity), acquisitions announced (including bids and letters of intent) between 1/1/2005 and 12/31/2019, and acquisitions in which the buyer and the target list a primary address in the United States.

The strategic screen filtered out buyers who were classified as any of the following: Private Investment Firm, Financial Service Investment Arm, Corporate Investment Arm, Public Investment Firm, Assets/Products, Public Fund, Labor Union, Government Institution, Religious Institution, Trade Association, Foundation/Charitable Institution, Supranational, Sovereign, All Investment Firms, Private Fund (Special Purpose Issuer Trust), Has Bank Regulatory Financials. Has Thrift Regulatory Financials, Has Credit Union Financials, or Has Credit Health Panel Scores. The selected buyers include both public and private companies that should exhibit strategic behavior.

The PE buyout screen included transactions considered to be private equity acquisition of majority stake, leveraged buyout, or private placement. The investment transaction type was classified as "buyout" to further distinguish against other forms of private equity such as growth equity, venture capital, and private investment in public equity (PIPE) transactions. Acquisition of controlling interest is central to this analysis, as these players continue to exhibit economic autonomy and benefit from synergies which will be compared across the acquirers.

An overview of the screening criteria and observation numbers for strategic M&A and PE buyouts has been provided in the Appendix. Note that the number of observations provided by the screen is greater than the number of observations I use in my analysis as many of the transactions in the dataset do not disclose a transaction value. As an investment analysis, numerical dollar values are critical, so transactions with which the value is disclosed will be the focus of this study, and transactions without a disclosed value will not be addressed. This study looks at M&A from a capital investment perspective, and without transaction values, such observations do not provide weight to other deal characteristics and are therefore not useful for this purpose. The analysis is limited by the amount of M&A information that is public. This study is also not intended to provide the complete picture of M&A and corporate investment in the United States, but rather to compare two specific, yet economically consequential, types of transactions. There are many other equity investments to consider, such as management buyouts, acquisitions of minority stake, or institutional investments such as those by hedge funds, banks, and many other types of buyers. In the extent to which this paper is an economic analysis of investment, it is also an analysis of corporate strategy. This is why there is an emphasis on acquisitions of controlling interest and the behavior of these specific actors.

Financial data

Transaction and company-specific data was selected to reveal fundamental differences in the PE and strategic targets and well as differences in the transaction themselves. Examples of descriptive data points to inform independent variable selection include: target EV/EBITDA, target EBITDA-CAPEX, and target free cash flow. I chose metrics that convey information that minimizes bias created by factors such as capital structure. EBITDA is the preferred performance metric because it is not influenced by how levered a company may be (affecting interest costs) or how much capital a company owns (affecting depreciation).

Unfortunately, the dataset lacks some relevant information about the PE buyers and buyout transactions—much of which is undisclosed. For example, it would be useful to understand the portfolios and investors associated with these PE firms. This would give better insight as to how funds are structured and details regarding how capital flows from investors to targets. Another important piece of these transactions is the debt structure of buyouts, such as how much debt is used for financing as well as the seniority break down of debt tranches as they compare to strategic acquisitions. For some transactions, this information can be accessed with a Bloomberg terminal (which I have limited access to), but even yet, details regarding debt financing for these transactions are generally nonpublic. Capital IQ has a display function that lists financing sources such as the percentage of debt used in acquisitions. However, the majority of PE buyouts in the dataset do not disclose any financing source details, and the few that do list financing as 100% cash; we assume that funds are generally not structured in this way.

Capital structure details of pre-acquisition targets are generally available in the dataset of public firms. However, this information is generally biased depending on the growth stage of the firm, capital intensity, and other industry or corporate strategy details. This information is also not as insightful in PE buyouts and informs acquisition attractiveness less than one may assume. A common idea is that highly levered companies could be bad buyout targets because they may be unable to support much additional debt used to finance LBOs. This approach is misguided such that LBOs impose an entirely new capital structure on firms post-acquisition that is financed with little consideration to the previous structure. Exceptions may exist in cases such as when a target has a lot of long-term debt with high call premiums, which can present high refinancing costs. Other cases may include instances when a target has an inefficiently managed balance sheet that could be improved. With the many buyout considerations involved with PE

due diligence, I assume capital structure falls low on the list of priorities. With such high complexities of these transactions, this is a detail I choose to omit.

Characteristics of targets

The previous comments lead to a consideration of other financial details of targets and how they can depend so heavily on the context with which these companies are situated. These complexities should be noted and considered when looking at aggregate data that includes transactions from a variety of industries, geographies, and business life cycle stages. For example, I look at capital expenditure data from transaction targets and firms in the broader economy and this about how this may lead acquisitions and dictate the type of buyer. Some companies have high capital costs depending on the industry (think of energy companies for example). I also analyze free cash flow for target firms, buyers, and US companies in general. Free cash flow as well as capital expenditure can depend on where a target is in its business life cycle. Younger firms, for example, may use more cash to invest in future growth via capital expenditure relative to more mature companies within the same industry. For these reasons, I provide details regarding industry and age of targets in these transactions and how the distribution of these characteristics varies depending on the buyer. These characteristics are intended to provide explanation for financial differences in capital expenditures and free cash flow, but financial variables such those mentioned as well as demand shock and other macroeconomic variables are what I am most interested in.

Understanding the industry context of acquisition targets can help guide questions of what qualities of target companies are favored by PE in context of strategic M&A activity (industry analysis is for descriptive purposes and is not included in the later empirical section, maintaining the industry agnostic approach of this study). This was another advantage of the Capital IQ dataset was the industry classification of the companies involved. Industry data was complete with SIC codes and informative classifications. This was less true of the Zephyr dataset, in which over a third of companies were classified as "other services". Some classifications such as "Primary Sector (agriculture, mining, etc.)" were very broad, some classifications such as "Wood, cork, paper" were very specific, and others such as "Education, Health" were less informative and somewhat ambiguous. The data retrieved from Capital IQ provided a more informative industry analysis. M&A volume by industry for each buyer is outlined in Table 2.

Table 2.

M&A Volume by Target Industry

Target sector	# of strategic acquisitions	% of disclosed	# of PE buyouts	% of disclosed
Energy	953	4.67%	65	2.91%
Real Estate	1,148	5.63%	67	3.00%
Materials	928	4.55%	169	7.58%
Industrials	3,008	14.74%	494	22.14%
Consumer Discretionary	3,858	18.91%	513	22.99%
Consumer Staples	773	3.79%	99	4.44%
Health Care	2,766	13.56%	223	10.00%
Financials	1,555	7.62%	72	3.23%
Information Technology	3,250	15.93%	343	15.37%
Communication Services	1,810	8.87%	157	7.04%
Utilities	354	1.74%	29	1.30%
No Primary Industry Assigned	1,009	-	23	-
Total	**21,412**		**2,254**	

The data show differences in the clustering by industry between strategic acquisitions and PE buyouts. The data indicate that industrials and consumer discretionary companies make up a higher proportion of PE buyouts than strategic M&A; they are also from two of the three industries with the highest M&A volume. PE firms also tend to acquire energy firms and financial companies at a lower proportion than strategic buyers. There are many reasons why this clustering may occur. It may be that PE agents have industry focus and are therefore able to add value in some industries more than others. Another explanation could be that some industries are made up of companies that are not well-suited for high amounts of leverage associated with LBOs. I will focus on the latter explanation regarding debt capacity in favor of its quantifiability and broader applicability. To capture debt capacity, I will look at earnings before interest, taxes, depreciation, and amortization after capital expenditures, or simply EBITDA-CAPEX, before acquisition. This provides a number that indicates how much cash a company has that can be used for debt payments on interest and principal. This will be taken as a percentage of revenue for standardization purposes. Other debt metrics such as a debt to equity ratio or multiple of debt on EBITDA for financing would be insightful for debt capacity, but as mentioned previously, such information is rarely disclosed, so this EBITDA-CAPEX metric will provide an indication of leverage constraints for buyout and acquisition targets. Table 3 highlights the median EBITDA-CAPEX as a percentage of revenue by industry.

Table 3.

Target EBITDA-CAPEX as a % of Revenue by Industry

Target sector	Strategic target median	PE target median
Energy	-13.37%	3.20%
Real Estate	13.15%	No data
Materials	-31.03%	5.55%
Industrials	2.07%	9.32%
Consumer Discretionary	1.16%	8.71%
Consumer Staples	-16.99%	10.23%
Health Care	-15.88%	6.24%
Financials	11.00%	No data
Information Technology	-10.81%	10.40%
Communication Services	-6.70%	15.30%
Utilities	12.86%	5.29%
No Primary Industry Assigned	No data	No data

Not only does this reveal varying debt capacities of acquired companies by industry, but it also illustrates how debt capacity drives PE buyouts differently than strategic acquisitions. Among PE buyouts, the median margin was positive for all industries for which this data was disclosed. The apparent variance between industries is less informative than expected. Real estate and financial companies demonstrate a positive margin, but the data indicates that these industries are less popular among PE buyouts. There may be drivers associated with the stability of cash flow in these industries. To capture this, the standard deviation of free cash flow will also be included as an explanatory variable outlined in the following section.

In addition to industry, it is important to note variations in the age of target firms. The following table illustrates the age distribution for strategic and PE targets.

Table 4.

M&A Volume by Target Age

Target age	# of strategic acquisitions	% of disclosed	# of PE buyouts	% of disclosed
0-5 years	2,813	17.32%	248	12.32%
5-15 years	5,431	33.44%	415	20.62%
15-30 years	3,950	24.32%	524	26.03%
Greater than 30 years	4,045	24.91%	826	41.03%
Undisclosed	5,173	-	241	-
Total	**21,412**		**2,254**	

The data suggest that, compared to strategic buyers, PE firms acquire older companies. This is consistent with findings by Jensen (1989) that indicate that buyout PE firms favor mature, stable companies, as these typically have more defensible market positions with stable growth and robust free cash flow.

Descriptive statistics

While the independent (macro) variables were carefully selected to capture drivers from the relevant merger theories described previously, descriptive variables were selected to illustrate characteristics of the targets, buyers, and transactions themselves to reveal any significant differences between transactions corresponding to each buyer type. With this selection, I aim to describe differences in PE buyouts and strategic acquisitions, particularly as they relate to key transaction metrics, target firm financials (both at acquisition announcement and across the 15-year observation period), acquirer financials at acquisition announcement, target valuation metrics, and the business life maturity of targets when acquired. The table below defines the comprehensive list of these descriptive variables, as well as the dependent and independent (macro) variables of this study.

Table 5.

Variable	Definition
Key Transaction Variable	
Transaction Value ($mm)	Total cost of acquisition, including premium and fees
Target Financials at Acquisition Announcement	
Target LTM EBITDA (at announcement) ($mm)	Last report of target last twelve months EBITDA before announcement
Target Market Cap (1 day prior to announcement) ($mm)	Target market capitalization at last close before announcement
Target Total Assets (at announcement) ($mm)	Last report of target book value of total asset
Acquirer Financials at Acquisition Announcement	
Acquirer LTM EBITDA (at announcement) ($mm)	Last report of buyer last twelve months EBITDA before announcement
Acquirer Market Cap (1 day prior to announcement) ($mm)	Buyer market capitalization at last close before announcement
Acquirer Total Assets (at announcement) ($mm)	Last report of buyer book value of total asset
Target Valuation Variables	
Implied Equity Value ($mm)	Equity value of transaction including premium
Implied Equity Value/Book Value (x)	Ratio of equity value of transaction including premium to target book value of equity
Implied Enterprise Value ($mm)	Total enterprise value of transaction including premium
Implied Enterprise Value/EBITDA (x)	Total enterprise value of transaction including premium as a multiple of LTM EBITDA

Target Stock Premium (1 month prior) (%)	Percentage difference of equity purchase price to equity value one month prior to announcement
Target Historical Financials	
Target Total Revenue (15-year average) ($mm)	Average of single target total revenue over 15-year observation period
Target EBITDA Margin (15-year average) (%)	Average of single target EBITDA margin % over 15-year observation period
Target EBITDA-CAPEX (15-year average) ($mm)	Average of single target EBITDA less capital expenditures over 15-year observation period
Target EBITDA-CAPEX as a % of revenue (15-year average) (%)	Average of single target EBITDA less capital expenditures as a % of revenue over 15-year observation period
Target Unlevered Free Cash Flow (15-year average) ($mm)	Average of single target unlevered free cash flow over 15-year observation period
Target Unlevered Free Cash Flow Std. Dev. (15-year average)	Average of single target standard deviation of unlevered free cash flow over 15-year observation period; assesses cash flow stability for a single target
Maturity of Targets	
Target Age at Announcement	Announcement date minus founding date of target in years
Macroeconomic (Independent) Variables	
Volatility	Closing value of the Chicago Board Options Exchange's (CBOE) Volatility Index (VIX) at a specific time
Interest Rate (%)	Yield on the United States 10-year treasury at a specific time; commonly used as benchmark for risk-free rate of investing
Average EV/EBITDA (monthly) (x)	Average enterprise value as a multiple of EBITDA for firms in the S&P 500 reported monthly
Demand Shock (quarterly) (%)	Demand shock proxy; measured by the magnitude of the difference in sales growth in time t and the average sales growth across all t; sales reported quarterly
Average Return on Capital (%)	Average return on capital across firms in the S&P 500 at a specific time
Average Unlevered Free Cash Flow ($)	Average unlevered free cash flow per share in the S&P 500 reported quarterly in absolute USD
Average EBITDA-CAPEX ($)	Average EBITDA less capital expenditure per share in the S&P 500 reported quarterly in absolute USD
Dependent Variables	
Capital Investment from Strategic Acquisitions (quarterly) ($mm)	Sum of transaction values of strategic acquisitions for transactions in a given quarter
Capital Investment from PE Buyouts (quarterly) ($mm)	Sum of transaction values of PE buyouts for transactions in a given quarter
Percent Capital Investment from PE Buyouts (quarterly) (%)	The percent of observed capital investment attributed to PE buyouts (as opposed to strategic acquisitions) in a given quarter

In Table 5, I introduce the dependent variables I will analyze. These data are not explicitly reported in the data set but are instead calculated based on transaction values between strategic acquisitions and PE buyouts summed by quarter. These calculations were performed in Excel using the SUMIFS function to sum the transaction values for observations that were announced in a given quarter. For example, an observation of Q1 2019 would be the sum of the transaction values that were announced between 1/1/2019 and 3/31/2019. The announced date was chosen (as opposed to the closing date for example) because it is the closest date publicly available to when the agent decided to engage in the acquisition. Summing these values to observe them over time intervals in important to the goal of this paper because this study is not interested in the determinants of valuation for individual transactions, but rather the number of dollars invested for M&A across all transactions for each buyer type in a given macroenvironment. In other words, this study investigates capital investment via M&A from PE and strategic buyers, dependent on selected macroeconomic variables. The individual transaction values are not the focus but are useful here in describing the differences in transactions (and associated target companies) between PE and strategic agents. Figure 2 illustrates quarterly capital investment from takeovers by buyer type.

Figure 2.

Capital Investment from Takeovers by Buyer Type
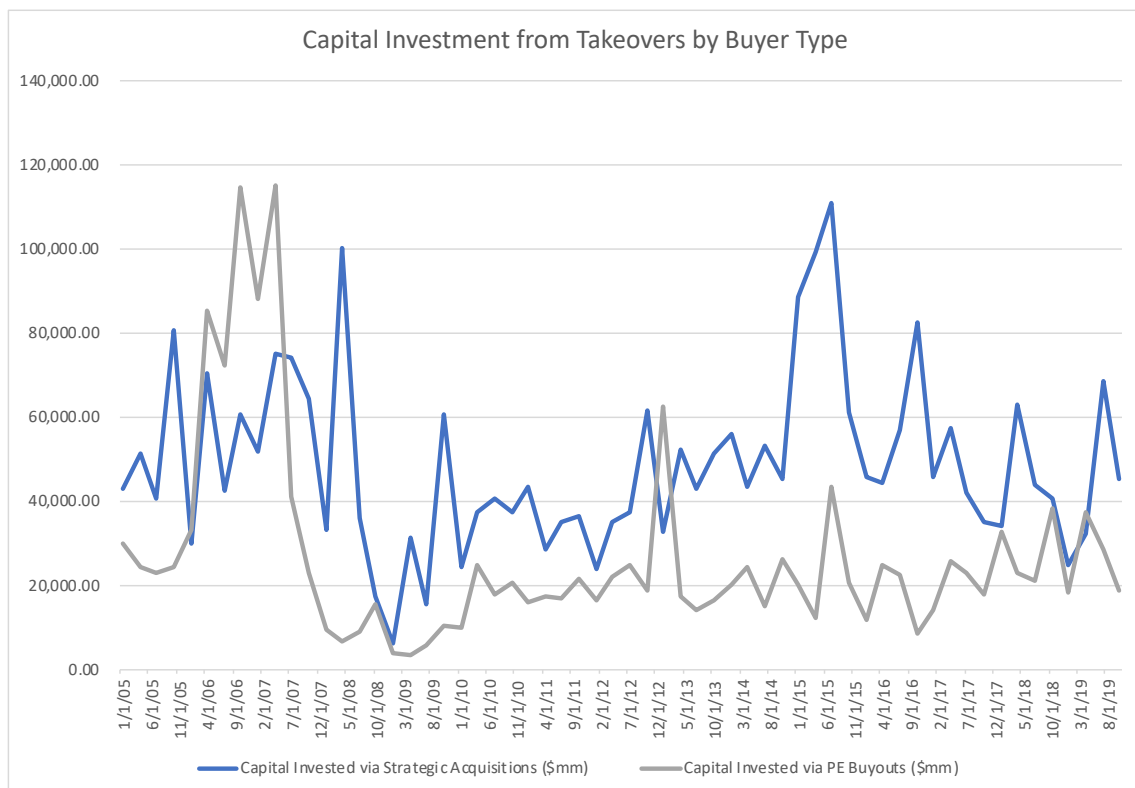
The data reveal the proportion of strategic M&A to PE buyouts is not constant. While in most quarters M&A is dominated by strategic buyers, PE buyout investment outpaces strategic M&A investment in other quarters. This implies there may be unique drivers for each buyer type that are causing differences in acquisition timing.

Summary statistics and basic analysis

Table 6.

Descriptive Statistics

Variable	Observations	Mean	Median	Std. Dev.	Minimum	Maximum
Transaction Value	23,666	192.00	14.20	1,104.61	-209.60	44,492.24
Target LTM EBITDA (at announcement)	3,093	759.76	5.41	38,546.01	-7,577.20	2,143,727.00
Target Market Cap (1 day prior to announcement)	1,728	835.42	129.08	2,268.20	0.00	27,563.64
Target Total Assets (at announcement)	3,764	960.62	40.42	10,415.48	-30.49	518,416.00
Acquirer LTM EBITDA (at announcement)	6,102	250.51	20.09	1,401.83	-2,515.89	39,310.00
Acquirer Market Cap (1 day prior to announcement)	6,573	2,469.01	222.61	13,035.82	0.00	552,389.20
Acquirer Total Assets (at announcement)	6,889	8,882.49	219.76	82,581.15	-0.10	2,950,319.00
Implied Equity Value	22,218	162.00	11.90	910.19	0.00	34,052.20
Implied Equity Value/Book Value (x)	2,404	9.00	2.84	25.60	0.00	300.00
Implied Enterprise Value	21,538	183.56	13.75	1,103.68	-207.34	44,467.24
Implied Enterprise Value/EBITDA (x)	2,191	18.23	11.06	27.16	0.30	295.50
Target Stock Premium (1 month prior)	1,645	43.27	27.26	249.40	-100.00	8,768.00
Target Total Revenue (15-year average)	5,349	187.90	19.00	1,367.86	-8.06	63,617.20
Target EBITDA Margin (15-year average) (%)	380	1.97	8.08	138.96	-296.40	2,521.10
Target EBITDA-CAPEX (15-year average)	443	100.97	0.12	446.35	-1,545.10	4,272.30
Target EBITDA-CAPEX as a % of revenue (15-year average) (%)	423	-2,281.34	2.51	20,712.28	-340,000.00	122.67
Target Unlevered Free Cash Flow (15-year average)	404	89.54	0.17	365.69	-679.70	4,280.70
Target Unlevered Free Cash Flow Std. Dev. (15-year average)	356	129.78	7.81	416.35	0.00	3,759.10
Target Age at Announcement	18,252	24.76	15.00	28.42	0.00	300.00
Volatility (VIX index)	3,776	18.40	15.66	8.82	9.14	80.86
Interest Rate (U.S. 10-yr Treasury Yield) (%)	783	2.98	2.74	1.01	1.38	5.22
Avg EV/EBITDA (monthly; S&P 500) (x)	180	10.19	10.23	1.64	6.54	13.83
Demand Shock (abs[SalesGrowth(t)-mean(SalesGrowth(all t))]) (%)	60	0.03	0.02	0.03	0.00	0.15
Avg Return on Capital (quarterly; S&P 500) (%)	60	12.84	12.70	1.04	10.70	16.70
Avg Unlevered FCF (quarterly; per share in S&P 500) ($)	60	21.19	21.30	10.04	-3.90	57.40
Avg EBITDA-CAPEX (quarterly; per share in S&P 500) ($)	60	15.57	15.87	3.41	9.01	22.67
Capital Investment from Strategic Acquisions (quarterly) ($mm)	60	48,722.06	43,502.77	20,929.12	6,071.46	110,741.80
Capital Investment from PE Buyouts (quarterly) ($mm)	60	27,009.78	20,787.85	23,540.21	3,400.10	114,897.00
Percent of Capital Investment from PE (quarterly) (%)	60	33.68	32.25	13.92	6.09	65.56

This analysis reveals high-level information about the distribution of these variables. It is clear that some variables contain extreme outliers. In some cases, certain ranges of data points are less informative than others. For example, EBITDA-CAPEX margin and EBITDA margin are less useful when total revenue or the metric of focus (i.e. EBITDA or EBITDA-CAPEX) is negative, as this often produces a negative value with great magnitude that cannot be effectively used in comparison to margins or multiples of other companies.

Table 7.

Summary Statistics by Buyer Type

Variable	Group	Observations	Mean	Standard Error	Std. Dev.	[95% Confidence Interval]		Significant Diff.
Transaction Value	Strategic Acquisitions	1,296	677.04	52.84	1,902.14	573.38	780.69	
	PE Buyouts	432	1,310.57	147.84	3,072.76	1,019.99	1,601.14	
	Combined	1,728	835.42	54.56	2,268.20	728.40	942.44	
	Difference		-633.53	157.00		-941.92	-325.14	YES
Target LTM EBITDA (at announcement)	Strategic Acquisitions	2,547	885.79	841.67	42,477.00	-764.62	2,536.21	
	PE Buyouts	546	171.85	19.58	457.43	133.39	210.30	
	Combined	3,093	759.76	693.09	38,546.01	-599.20	2,118.73	
	Difference		713.95	841.89		-936.92	2,364.81	NO
Target Market Cap (1 day prior to announcement)	Strategic Acquisitions	1,296	677.04	52.84	1,902.14	573.38	780.69	
	PE Buyouts	432	1,310.57	147.84	3,072.76	1,019.99	1,601.14	
	Combined	1,728	835.42	54.56	2,268.20	728.40	942.44	
	Difference		-633.53	157.00		-941.92	-325.14	YES
Target Total Assets (at announcement)	Strategic Acquisitions	3,213	792.19	173.12	9,813.19	452.74	1,131.63	
	PE Buyouts	551	1,942.78	569.49	13,367.85	824.13	3,061.42	
	Combined	3,764	960.62	169.77	10,415.48	627.77	1,293.46	
	Difference		-1,150.59	595.22		-2,319.36	18.18	NO
Acquirer LTM EBITDA (at announcement)	Strategic Acquisitions	6,079	250.25	18.01	1,404.46	214.94	285.57	
	PE Buyouts	23	317.28	19.64	94.20	276.54	358.01	
	Combined	6,102	250.51	17.95	1,401.83	215.33	285.69	
	Difference		-67.02	26.65		-120.12	-13.92	YES
Acquirer Market Cap (1 day prior to announcement)	Strategic Acquisitions	6,547	2,465.79	161.42	13,061.29	2,149.35	2,782.23	
	PE Buyouts	26	3,280.85	274.79	1,401.18	2,714.90	3,846.80	
	Combined	6,573	2,469.01	160.79	13,035.82	2,153.82	2,784.21	
	Difference		-815.06	318.70		-1,456.87	-173.25	YES
Acquirer Total Assets (at announcement)	Strategic Acquisitions	6,864	8,898.47	998.57	82,730.90	6,940.96	10,855.98	
	PE Buyouts	25	4,494.43	425.17	2,125.85	3,616.93	5,371.94	
	Combined	6,889	8,882.49	994.95	82,581.15	6,932.07	10,832.90	
	Difference		4,404.04	1,085.32		2,274.06	6,534.02	YES
Implied Equity Value	Strategic Acquisitions	20,259	115.82	4.80	682.95	106.42	125.23	
	PE Buyouts	1,959	639.59	46.98	2,079.46	547.45	731.73	
	Combined	22,218	162.00	6.11	910.19	150.04	173.97	
	Difference		-523.77	47.23		-616.38	-431.15	YES
Implied Equity Value/Book Value (x)	Strategic Acquisitions	1,961	9.76	0.61	27.18	8.55	10.96	
	PE Buyouts	443	5.66	0.79	16.54	4.12	7.21	
	Combined	2,404	9.00	0.52	25.60	7.98	10.03	
	Difference		4.09	1.00		2.14	6.05	YES
Implied Enterprise Value	Strategic Acquisitions	19,552	128.67	5.81	812.35	117.28	140.05	
	PE Buyouts	1,986	723.96	56.74	2,528.77	612.68	835.25	
	Combined	21,538	183.56	7.52	1,103.68	168.82	198.30	
	Difference		-595.30	57.04		-707.16	-483.43	YES
Implied Enterprise Value/EBITDA (x)	Strategic Acquisitions	1,716	19.41	0.71	29.44	18.01	20.80	
	PE Buyouts	475	13.96	0.72	15.79	12.54	15.39	
	Combined	2,191	18.23	0.58	27.16	17.09	19.36	
	Difference		5.44	1.01		3.45	7.44	YES
Target Stock Premium (1 month prior)	Strategic Acquisitions	1,217	45.52	8.18	285.46	29.47	61.58	
	PE Buyouts	428	36.86	4.15	85.81	28.70	45.01	
	Combined	1,645	43.27	6.15	249.40	31.21	55.33	
	Difference		8.67	9.17		-9.33	26.66	NO

Variable	Group	Observations	Mean	Standard Error	Std. Dev.	[95% Confidence Interval]		Significant Diff.
Target Total Revenue (15-year average)	Strategic Acquisitions	4,413	108.57	12.67	841.81	83.73	133.42	
	PE Buyouts	936	561.89	87.64	2,681.12	389.90	733.87	
	Combined	5,349	187.90	18.70	1,367.86	151.23	224.56	
	Difference		-453.32	88.55		-627.08	-279.55	YES
Target EBITDA Margin (15-year average) (%)	Strategic Acquisitions	255	-4.04	10.56	168.68	-24.84	16.76	
	PE Buyouts	125	14.21	2.02	22.57	10.21	18.21	
	Combined	380	1.97	7.13	138.96	-12.05	15.98	
	Difference		-18.25	10.75		-39.42	2.92	NO
Target EBITDA-CAPEX (15-year average)	Strategic Acquisitions	318	36.00	16.68	297.47	3.18	68.82	
	PE Buyouts	125	266.24	59.70	667.52	148.07	384.41	
	Combined	443	100.97	21.21	446.35	59.29	142.65	
	Difference		-230.24	61.99		-352.77	-107.71	YES
Target EBITDA-CAPEX as a % of revenue (15-year average) (%)	Strategic Acquisitions	298	-3,241.73	1,426.53	24,625.64	-6,049.10	-434.35	
	PE Buyouts	125	8.21	1.47	16.46	5.30	11.13	
	Combined	423	-2,281.34	1,007.07	20,712.28	-4,260.83	-301.85	
	Difference		-3,249.94	1,426.53		-6,057.32	-442.56	YES
Target Unlevered Free Cash Flow (15-year average)	Strategic Acquisitions	283	27.96	11.91	200.40	4.51	51.41	
	PE Buyouts	121	233.58	51.82	569.98	130.98	336.17	
	Combined	404	89.54	18.19	365.69	53.78	125.31	
	Difference		-205.62	53.17		-310.78	-100.45	YES
Target Unlevered Free Cash Flow Std. Dev. (15-year average)	Strategic Acquisitions	237	73.90	19.44	299.23	35.60	112.19	
	PE Buyouts	119	241.09	52.15	568.91	137.81	344.36	
	Combined	356	129.78	22.07	416.35	86.38	173.18	
	Difference		-167.19	55.66		-277.15	-57.23	YES
Target Age at Announcement	Strategic Acquisitions	16,239	23.73	0.22	27.63	23.30	24.15	
	PE Buyouts	2,013	33.13	0.74	33.00	31.69	34.58	
	Combined	18,252	24.76	0.21	28.42	24.35	25.18	
	Difference		-9.41	0.77		-10.91	-7.91	YES

The descriptive statistics show key differences between PE buyouts and strategic acquisitions. A two-sample t-test assuming unequal variances was performed on mean differences of descriptive variables between strategic acquisitions and PE buyouts. As expected, we see a larger average transaction value, market capitalization, and enterprise value among PE buyouts compared to strategic acquisitions, indicating the favor PE agents have for mature firms. Regarding relative valuation, PE buyouts included companies with lower multiples of implied equity value to book value and enterprise value to EBITDA. Performance metrics, on the other hand, including target LTM EBITDA (prior to acquisition) and average EBITDA margin (but not including free cash flow) did not have significant differences between buyers. These findings are consistent with Fidrmuc et al. (2012) who found that PE buyouts tend to have lower relative valuations than those of strategic acquisitions, as PE agents are more concerned with resale value than are strategic firms, but both are concerned with performance. Surprisingly, there was no significant difference in the premium. There have been conflicting findings in the literature with regard to differences in premia. Bargeron (2008) finds that strategic buyers pay more than PE agents with regard to the premia, while Fidrmuc et al. (2012) found no significant difference. It is possible that the synergy dynamics are evolving in more recent times, as the more active role PE agents play in operations enable PE buyers to capture performance synergies and compete

with high bidders, whether these synergies arise from general partners' industry expertise or portfolio synergies from other companies owned by the fund.

There were also significant differences for variables that address debt capacity. Target EBITDA-CAPEX, EBITDA-CAPEX margin, and unlevered free cash flow all had greater means for PE buyouts with significant differences. This highlights the potential importance for debt capacity as factor that drives PE buyouts and strategic acquisitions at varying magnitudes.
Table 8.

Basic Analysis (Quarterly Observations)

	Capital Investment from Strategic M&A	Capital Investment from PE Buyouts	% of Capital Investment from PE	Volatility	Interest Rate	Avg EV/EBITDA	Demand Shock	Return on Capital	Unlevered FCF	Avg EBITDA-CAPEX
Capital Investment from Strategic M&A	1									
Capital Investment from PE Buyouts	0.2203	1								
% of Capital Investment from PE	-0.3402	0.7702	1							
Volatility	-0.3721	-0.3082	-0.0788	1						
Interest Rate	0.0593	0.4717	0.3177	0.0100	1					
Avg EV/EBITDA	0.3331	0.1523	0.0203	-0.6185	0.0070	1				
Demand Shock	-0.1234	-0.0928	0.0574	0.4352	-0.0618	-0.1598	1			
Return on Capital	-0.0187	0.0852	0.0364	-0.0650	0.4324	-0.0789	-0.3018	1		
Avg Unlevered FCF	0.0923	0.0621	-0.0143	-0.1595	-0.4002	0.3607	-0.0710	-0.2404	1	
Avg EBITDA-CAPEX	0.1135	-0.1841	-0.1312	-0.1342	-0.6807	0.3833	0.0773	-0.2424	0.5596	1

This basic analysis in Table 8 reflects correlations between quarterly measurements of selected independent (macro) and dependent variables. The dependent variables will be capital investment from strategic M&A and capital investment from PE buyouts. This capital investment figure has been represented by the aggregate transaction values of strategic acquisitions and PE buyouts respectively over time, in this case summed quarterly to match quarterly reports of the independent variables.

The correlation matrix reveals potential interactions among the selected variables. Notably, there is a positive correlation with the interest rate and unlevered free cash flow, as well as positive correlations with the interest rate and return on capital, interest rate and EBITDA-CAPEX, volatility and EV/EBITDA multiples, volatility and demand shock, and unlevered free cash flow and EBITDA-CAPEX. These correlations will be used to inform interaction variables in the regressions described and executed in the next section.

V.   Empirical Specification and Results

As discussed, there are many missing observations in the data, with some observations containing more details than others. For example, one transaction may disclose the transaction value, relative valuation metrics, and target firm historical financials, while another transaction will disclose the transaction value, some relative valuation data, and no data regarding historical

financials. The data are therefore unbalanced, but transaction-specific variables such as target market capitalization and individual EV/EBITDA multiples are used for descriptive purposes and will not be used in the regression. The dependent and independent (macro) variables are reported at least quarterly; some independent variables such as the yield on the 10-year US treasury are reported more frequently. The variables selected for the empirical analysis are monthly figures to address issues associated with balancing. Over the 15-year observation period, this yields 60 observations from 60 quarters. This is less granular than monthly or daily observations, but important financial variables such as EBITDA-CAPEX and unlevered free cash flow are only reported quarterly. However, this does not address the balancing issues from the missing transaction values that are not disclosed. Only 1.4% of strategic acquisitions and 4.6% of PE buyouts in the data disclose the value associated with the acquisition. This is an unfortunate limitation but cannot be fully remedied with the information that is publicly available. Volume of the number of transactions is not informative for an analysis of aggregate capital investment.

Transaction-specific variables (as opposed to macro variables) do not provide the insight I am looking for regarding capital investment. If individual transaction valuation was the dependent variable instead, the selected macroeconomic variables would likely be poor predictors of the transaction value as each transaction value would of course depend on the size and performance of the individual target firm. It also would neglect the number (and valuation) of transactions that occur in a given period of time that may depend on the macro variables. Therefore, individual transaction variables are dropped, and the model will include capital investment per quarter for each buyer type as a function of the macroeconomic variables.

After aggregating capital investment by quarter, we are left with panel data with two individual buyer types (strategics and PE) across 60 time periods (quarters). Because I am interested in how each variable influences strategic acquisition investment and PE buyouts investment uniquely, I will perform an unbalanced panel multivariate regression with time trend effects to capture elements such as momentum, regulatory changes, broad economic shocks (think 2008), and general substitution for equity investment as opposed to investment in other assets. Three OLS regressions are performed for the three continuous dependent variables of interest: capital investment from strategic acquisitions (I_S,), capital investment from PE buyouts (I_{PE}), and percent of capital investment from PE buyouts (P). Log transformations are performed for I_S and I_{PE} to address the skewness of their distributions as well as the large size of their scale

values. These variables are regressed on the seven continuous macro variables described in Section IV, four continuous interaction variables, and the integer time trend variable, t. The macro variables specified are assumed to effectively capture the acquisition drivers outlined by merger theory. The variables have been briefly defined below the model; more detailed definitions can be found in Table 5 with rationale for their selection throughout Section III.

$$I_{S,t} = \beta_0 + \beta_1 VIX_t + \beta_2 RFR_t + \beta_3 MULT_t + \beta_4 SHOCK_t + \beta_5 CAPR_t + \beta_6 FCF_t \\ + \beta_7 DEBTCAP_t + \beta_8 VIX_t * SHOCK_t + \beta_9 VIX_t * MULT_t \\ + \beta_{10} RFR_t * FCF_t * DEBTCAP_t + \beta_{11} RFR_t * CAPR_t + \beta_{12} t + \varepsilon_S$$

$$I_{PE,t} = \beta_0 + \beta_1 VIX_t + \beta_2 RFR_t + \beta_3 MULT_t + \beta_4 SHOCK_t + \beta_5 CAPR_t + \beta_6 FCF_t \\ + \beta_7 DEBTCAP_t + \beta_8 VIX_t * SHOCK_t + \beta_9 VIX_t * MULT_t \\ + \beta_{10} RFR_t * FCF_t * DEBTCAP_t + \beta_{11} RFR_t * CAPR_t + \beta_{12} t + \varepsilon_{PE}$$

$$P_t = \beta_0 + \beta_1 VIX_t + \beta_2 RFR_t + \beta_3 MULT_t + \beta_4 SHOCK_t + \beta_5 CAPR_t + \beta_6 FCF_t + \beta_7 DEBTCAP_t \\ + \beta_8 VIX_t * SHOCK_t + \beta_9 VIX_t * MULT_t + \beta_{10} RFR_t * FCF_t * DEBTCAP_t \\ + \beta_{11} RFR_t * CAPR_t + \beta_{12} t + \varepsilon$$

VIX: Volatility index value
RFR: Risk free rate captured by the yield of the 10-year US treasury
MULT: Average enterprise value to EBITDA multiple in the S&P 500
SHOCK: Demand shock captured by the magnitude of the difference in sales growth in time t and the average sales growth across all t
CAPR: Average percent return on capital per share in the S&P 500
FCF: Average unlevered free cash flow per share in the S&P 500
DEBTCAP: Debt capacity captured by the average EBITDA-CAPEX per share in the S&P 500

Interaction variables were selected to address correlation with the macro variables. The three-way interaction variable interacting RFR, FCF, and DEBTCAP was selected with the rationale that free cash flow is correlated with EBITDA-CAPEX to an extent that is correlated with the interest rate. EBITDA-CAPEX is a metric of earnings before interest payments, whereas free cash flow is a metric of earnings after interest payments. Therefore, the relationship (or difference) between EBITDA-CAPEX and free cash flow should depend on the interest rate environment affecting the size of interest expenses. The time trend variable, t, is linear and ranges from 1 to 60 for each observed quarter.

Findings

Table 9.

Regressions of capital investment from strategic acquisitions, capital investment from PE buyouts, and percent of takeovers by PE on macroeconomic variables

	I_S	I_{PE}	P
Volatility	-0.162191 ***	-0.213466 **	-1.113915
Interest Rate	-1.191543	0.149397	26.424190
EV/EBITDA	-0.151124	-0.500817 **	-7.633332 *
Demand Shock	-7.361374	-11.068620	-60.896730
Return on Capital	-0.258058	-0.415705	-4.348149
Free Cash Flow	0.004247	0.025871	0.388312
EBITDA-CAPEX	-0.018472	0.184437 ***	4.221621 ***
Volatility*Demand Shock	0.275092	0.630480 **	7.014010
Volatility*EV/EBITDA	0.014786 **	0.017959 *	0.072861
Interest Rate*Free Cash Flow*EBITDA-CAPEX	0.000001	-0.000131	-0.002556
Interest Rate*Retrun on Capital	0.085538	0.003274	-1.513523
Time Trend	-0.003204	-0.062706 **	-1.203663 **
Constant	16.799500 ***	15.768510 ***	41.196190
N	60	60	60
F(12,47)	3.36	3.98	2.28
Prob > F	0.0014	0.0003	0.0223
R^2	0.461700 ***	0.504200 ***	0.367700 **
Adj R^2	0.324300 ***	0.377600 ***	0.206300 **
Root MSE	0.3936	0.5568	12.4010

*Statistical significance at the 10% level
**Statistical significance at the 5% level
***Statistical significance at the 1% level

Model regressions of capital investment from strategic acquisitions, capital investment from PE buyouts, and the percent of takeovers by PE are significant at the 1%, 1%, and 5% level respectively, with R-squared values of 0.462, 0.504, and 0.368. For robustness, additional regressions were performed with the independent variables detrended by dropping the time trend variable, t, in an effort to address inflation of the goodness-of-fit values caused by unexplained information associated with t. The associated p-values for the F-tests (and associated R-squared values) for the respective adjusted models are 0.0007 (R-squared = 0.4614), 0.0015 (R-squared =

0.4396), and 0.0587 (R-squared = 0.3065), reflecting significance at the 1%, 1%, and 10% levels when excluding time trend effects. The models with time trend effects therefore provide significant explanatory power.

Discussion

Findings suggest a significant negative effect of volatility on capital investment via takeover for both strategic and PE buyers. These findings are inconsistent with the economic disturbance theory of mergers proposed by Gort (1969) that suggests M&A are facilitated by wide variances in equity valuations. A possible explanation for this is that the VIX volatility index to a degree captures uncertainty (risk), and, by the economic disturbance theory, this factor is not considered inhibiting towards investment, contrary to research supporting modern portfolio theory that assumes investors are risk-averse (Markowitz 1952). The findings are more consistent with evidence for corporate diversification theory (Christensen and Montgomery 1981) that describes how firms aim to reduce risk through acquisitions. The initial prediction was that equity volatility would add liquidity to merger markets. When taking risk into consideration (and the accompanying higher expected returns), the market becomes less liquid during periods of high volatility as investors are risk-averse. These findings are insufficient, however, in describing how volatility may influence the timing of capital investment between strategic and PE buyers.

Financing costs captured by yield on the US 10-year treasury (risk-free rate of investing) were not shown to have a significant expected effect on capital investment from takeovers. This could be explained by findings from Andrade and Stafford (2004) who found that M&A investment was driven primarily by industry-level shocks, while nonmerger investment was driven more by broad capital market variables such as interest rates. My selection is limiting, however, in that it does not consider the true cost of debt that depends heavily on credit ratings and spreads and other benchmarks such as the London Interbank Offered Rate (LIBOR). Future research should take a more comprehensive approach in capturing the effects of financing costs as they relate to strategic acquisitions and PE buyouts.

While relative valuation (captured by the average EV/EBITDA multiple in the S&P 500) was not shown to have a significant expected effect on strategic capital investment via takeover, it was shown to have a significant negative expected effect on capital investment from PE buyouts and the proportion of takeovers that were by PE. This supports the hypothesis that PE

agents are motivated by discounted valuation in acquisition activity and is consistent with the significant difference in the mean EV/EBITDA multiples from the transaction-level data presented earlier that revealed higher multiples for strategic targets. The significant difference from the transaction data supports synergy theory and the Hubris hypothesis that posit strategic acquirers will pay more for target companies; the extent to which the higher valuation is due to synergies or agency costs is beyond the scope of this paper, however. These findings are also consistent with Fidrmuc (2012) who finds that PE buyers prefer targets with lower valuations (captured by market value to book value ratios), as PE firms are more concerned with resale value than strategic buyers. The findings provide further evidence that PE agents differ from strategic agents in their situation as short-term investors; in the aggregate, valuation multiples may be a unique driver for PE buyouts that influences capital investment timing relative to that of strategic M&A.

Demand shock was not shown to have a significant expected effect on capital investment from strategic and PE buyers. This is somewhat inconsistent with neoclassical merger theory and empirical findings by Andrade and Stafford (2001) that suggest M&A is driven by regime shifts and productivity shocks. However, these studies focus on regime shifts at the industry level (and make this distinction clear) as it relates to M&A, while the study presented here takes an industry agnostic approach. Therefore, these findings do not contradict the conclusions drawn by Andrade and Stafford (2001) but made an attempt to extend these findings to the US economy in a holistic manner. While these findings provide no significant effect from demand shocks, limitations to these data involve the weakness in how aggregate shocks and regime shifts are captured. The shock formula I employ considers only shocks to demand and neglects cost-related shocks, therefore providing an incomplete view of shocks to productivity. However, there may be validity to the findings that suggest there is no significant effect, as it may be the case that these shocks are indeed only insightful to M&A at the industry level. This is a reasonable explanation considering that in 55% of the strategic acquisitions I observe, the target and buyer are within the same industry. Nonetheless, further research should employ new methods for analyzing aggregate demand shock effects on M&A, as the role of demand shocks at the industry level is well-documented and supported by the literature.

Return on capital also demonstrated no significant expected effect on capital investment via takeovers. The findings are unable to support the Q-theory of mergers and synergy gain

theory as it relates to capacity. Regarding Q-theory, it might have been better to consider the distribution of return on capital by firm, as a higher average may not necessarily drive strategic acquisitions from highly productive acquirers or PE buyouts from highly productive targets—the variable may not signal opportunities for value creation. The distribution would better capture the implications of Q-theory, as this may indicate the degree of possibilities for highly productive firms to acquire less productive firms. Regarding synergy gain theory, this may be explained again by industry-level effects, as found by Andrade and Stafford (2001) who attribute merger waves to productivity shocks by industry.

The findings do not reveal a significant expected effect from average aggregate free cash flow and fails to support agency theory and the free cash flow theory of mergers proposed by Jensen (1986). These findings are also unable to support Fidrmuc (2012) who suggests that cash levels attract PE buyers more than strategic buyers. This does not necessarily contradict Fidrmuc (2012) because their approach is more focused on cash as it appears on the balance sheet, as opposed to free cash flow. A limitation of analyzing average free cash flow in the aggregate is that it does not consider cash flow differences between buyers and targets and does not address opportunities for firms to use excess cash for nonmerger investment. For PE, free cash flow in the current period may not be very insightful, as it does not reflect cash flow stability or uses of cash in the case of necessary capital expenditure. These dynamics are better captured by the variable for debt capacity.

Debt capacity (captured by average EBITDA-CAPEX in the S&P 500) revealed no significant expected effect on capital investment via strategic acquisitions but demonstrated a significant expected effect at the 1% level on capital investment via PE buyouts and the proportion of takeovers by PE. From a nuanced perspective, this supports the Q-theory of mergers with regard to PE buyouts, as PE agents realize a lower cost of capital from high leverage and are thereby (in part) able to generate higher returns than the cost of capital associated with their targets. This is similar to the Q-theory which generally assumes that firms with higher capital productivity will acquire firms with lower productivity (also a component of synergy gain theory). The use of leverage in LBOs allow PE agents to achieve higher returns on their equity investments than the cost of capital for target firms, which is another way of interpreting PE capital as being more productive than the capital productivity of targets to the extent that targets are able to support high debt loads. This supports the hypothesis that PE

agents differ from strategic agents in their situation as short-term buyers with leverage contributing more to stakeholder returns in the case of PE buyouts than in the case of strategic acquisitions. This contributes to the literature by providing evidence for debt capacity—the ability of firms in the aggregate to support leverage—being a potential driver for PE buyouts relative to strategic acquisitions, which thereby influences the timing of capital investment from takeovers.

There is a significant negative expected effect from the time trend variable on capital investment from PE buyouts as well as the proportion of takeovers by PE. A possible explanation for this is the stricter leverage constraints and regulations that followed the financial crisis of 2008. This explanation for time trend effects is not supported by the model, however. The evolution of investment vehicles has also been driven by developments in technology, emergence of new ideas, and the application of new investment strategies over time.

VI.   Conclusion

This investigation takes an industry agnostic and unified approach of merger theories to answer the question: do differences in situation and incentives between strategic and private equity agents explain differences in the respective timing of capital investment via takeovers. I attempt to answer this question by synthesizing prominent merger theories to inform macroeconomic variables that may explain how strategic acquisitions and PE buyouts are uniquely motivated by different aggregate economic conditions over time.

I find that when looking at transaction-level data, there are significant differences between strategic targets and PE buyout targets as has been outlined in the literature, particularly building off of the more recent findings by Fidrmuc (2012). I then perform a series of regressions of capital investment via takeovers on the macroeconomic variables informed by merger theory. I find no significant effect from the risk-free rate of investment, demand shocks, average return on capital in the S&P 500, or average free cash flow in the S&P 500. I find a statistically significant negative expected effects from volatility on capital investment for each buyer type, a negative expected effect from EV/EBITDA valuation on capital investment via PE buyouts, and a positive expected effect from debt capacity (EBITDA-CAPEX) on capital investment via PE buyouts.

The expected effects from relative valuation and debt capacity of the average firm on capital investment via PE buyouts may provide evidence that strategic acquisitions and PE buyouts are in some ways uniquely motivated across time. This contributes to the extensive M&A and private equity literature by taking a unified approach to merger theory and investigating the related macroeconomic drivers in a recent time period from an industry agnostic perspective. The applicability of these findings may be limited, however, as this investigation is based on a small sample of transactions and a relatively small set of publicly available data that may contain selection bias regarding which data are publicly disclosed. PE buyouts and strategic acquisitions of majority stake also represent only a small portion of the complex market of corporate transactions.

Nonetheless, research such as this underscores the growing implications of private equity. For one, if it is true that the rise of private equity is impacting the timing of capital investment, it may also be true that firms have opportunities to raise capital more smoothly across the business cycle and outside of strategic merger waves, at least with respect to takeovers. It may also indicate that target assets are being locked up by the rigid investment time horizons set by PE investors, which may have efficiency implications particularly with regard to industry consolidation. Future research should aim to address the limitations stemming from the narrow scope of M&A transaction types presented here, as well as advance research on the efficiency implications from the growing prominence of private equity in merger markets.

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Appendix

Appendix A. Strategic M&A filters from Capital IQ

Appendix B. PE buyout filters from Capital IQ