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# Corporate Acquisitions, Diversification, and the Firm's Life Cycle

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**ABSTRACT**

Agency theories predict that older firms make value-destroying acquisitions to benefit managers. Neoclassical theories predict instead that such firms make wealth-increasing acquisitions to exploit underutilized assets. Using IPO cohorts, we establish that, while younger firms make more related and diversifying acquisitions than mature firms, the acquisition rate follows a U-shape over firms' life cycle. Consistent with neoclassical theories, we show that acquiring firms have better performance and growth opportunities and create wealth through acquisitions of nonpublic firms throughout their life. Consistent with agency theories, older firms experience negative stock price reactions for acquisitions of public firms.

EXISTING THEORIES ON THE ROLE OF ACQUISITIONS and diversification over the life cycle of firms offer two very different views. Agency theories predict that firms make wealth-destroying acquisitions and diversify when they are mature because their cash flow outstrips their internal growth opportunities and management becomes more entrenched, so that it pursues growth at the expense of shareholders (e.g., Mueller (1972) and Jensen (1986, 1993)). Neoclassical theories predict, instead, that firms pursue acquisitions in an effort to make the best use of their valuable scarce assets (see Maksimovic and Phillips (2013) for a review). As a result, better-performing firms and firms with better growth opportunities create value through acquisitions, including diversifying acquisitions. To the extent that firms that go public are better-performing firms, we would expect them to acquire those assets that they can make better use of after going public and having easier access to external finance. As newly public firms exploit their growth opportunities, their acquisition rate should fall. Eventually, however, firms with valuable scarce assets may acquire new assets to keep making optimal use of these scarce assets, so that these theories

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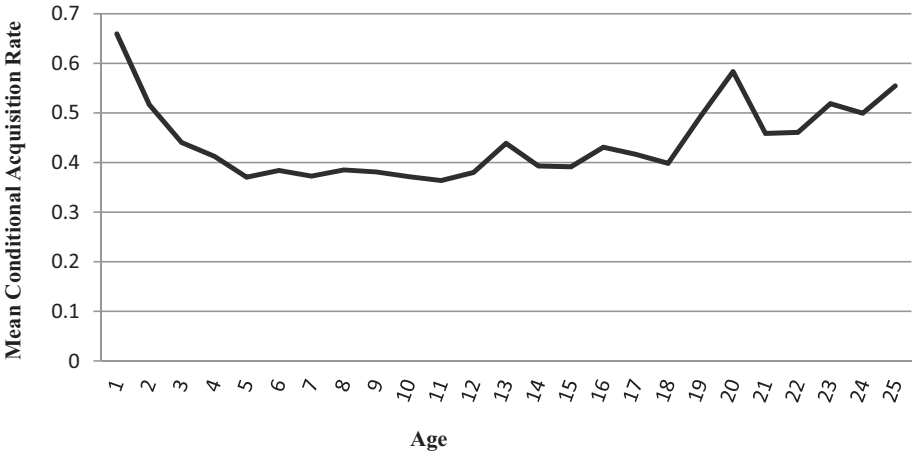


**Figure 1. Mean value of the post-IPO cohort conditional acquisition rate over the firm's life cycle.** IPOs are identified using the SDC Global Issues Database. The IPO sample includes all IPOs over the 1975 to 2008 period excluding reverse LBOs, spinoffs, rights and unit offerings, ADRs, closed-end funds, REITs, and IPO firms with stock price data available from CRSP before their IPO announcement date. Acquisition deals of the IPO firms include all acquisitions in SDC's M&A database over 1981 to 2012. Age refers to number of years since the IPO year. The conditional acquisition rate is the number of acquisition announcements of an IPO cohort in year $t$ divided by the number of firms in that cohort that are alive at the beginning of year $t$.

predict both an increase in the acquisition rate and in diversifying acquisitions as firms age.

In this paper, we investigate whether firms' acquisition rate changes over the life cycle and the extent to which such changes support the predictions of the agency and the neoclassical theories. We find strong support for the predictions of neoclassical theories that acquisitions are made by better-performing firms and firms with better growth opportunities, and that acquisitions create value. The only evidence consistent with agency theories is that the stock price reaction to acquisitions of public firms by older firms is negative.

As far as we know, no prior study examines the acquisition behavior of firms over their life cycle. Using a sample of 7,506 firms that have an IPO in the United States over the 1975 to 2008 period, we find that the acquisition rate of young firms, which we define as firms that are less than four years from their IPO, is higher than the acquisition rate of other firms. However, as Figure 1 shows, the acquisition rate follows a U-shape over firms' life cycle: the acquisition rate falls sharply early on, stays relatively constant for a number of years, and then increases. When we separately examine acquisitions within a firm's industry and diversifying acquisitions, we find that firms diversify throughout their life cycle and mature firms do not make more diversifying acquisitions than young firms.

Note that Figure 1 does not account for cohort or economic conditions effects. The relation between a firm's acquisition rate and life cycle stage may

therefore be driven by these effects. For instance, it could be the case that, on average, economic conditions are better when the firms from our IPO cohorts are mature, so that these firms make more acquisitions not because of their life cycle stage but rather because of economic conditions. We estimate regressions that account for these effects and find a stronger U-shaped pattern for the acquisition rate. The fact that the U-shape becomes more pronounced is explained by the extremely high sensitivity of the acquisition rate of young firms to economic conditions. Focusing on diversifying acquisitions, we find evidence of a U-shaped pattern for these acquisitions as well, but the pattern is weaker compared to the pattern for all acquisitions.

The patterns in Figure 1 could be consistent with older firms making acquisitions and diversifying because they have insufficient growth opportunities in their industry. To investigate this possibility, we examine whether the determinants of the acquisition rates of young and mature firms differ using firm-level regressions. We use Tobin's $q$, measured as the ratio of the market value of firm assets to book value, as our proxy for growth opportunities. If firms are more likely to make acquisitions because they exhaust their growth opportunities as they mature, we would expect mature firms that make acquisitions to have a lower $q$ than the firms that do not make acquisitions. This is not the case. We show that the average $q$ of acquiring firms is higher than the average $q$ of nonacquiring firms over the life cycle and that the acquisition rate increases with $q$ regardless of whether a firm is young or mature.

Our evidence of a positive relation between a firm's acquisition rate and its Tobin's $q$ supports the neoclassical view of acquisitions, which holds that firms use acquisitions to reallocate corporate assets to more productive uses. High $q$ firms are expected to have more valuable assets and hence to pursue more acquisitions. In this vein, Jovanovic and Rousseau (2002) develop a $q$-theory of mergers. In their theory, investment can take place through capital expenditures as well as through acquisitions. High $q$ firms make acquisitions because they have greater productivity that they can transfer to the acquired firm. In our sample, younger firms have substantially higher $q$s than more mature firms, and thus are expected to undertake more acquisitions than mature firms. Under this theory, we would also expect better-performing firms to make more acquisitions (Warusawitharana (2008)).

Under the agency theories, CEOs benefit from growing their firm. If mature firms have poor internal growth opportunities but high cash flow, they acquire such growth opportunities through diversifying acquisitions. To see whether this is the case, we examine how the determinants of diversifying acquisitions change over the firm's life cycle. Strikingly, mature firms are more likely to make diversifying acquisitions when they have a high Tobin's $q$. This finding is hard to reconcile with agency theories but is consistent with neoclassical theories of diversification such as that developed by Maksimovic and Phillips (2002). In their model, a firm's valuable scarce asset is managerial talent. When managerial talent can be applied across several industries, it is optimal for the firm to be diversified and to equate the marginal product of managerial talent

across activities. Firms with high managerial talent, everything else equal, have high $q$ and acquire more.

Following Jensen (1986), the literature has highlighted the agency costs of high cash holdings and finds that firms with high cash holdings are more likely to acquire (e.g., Harford, Mansi, and Maxwell (2008)). Though we find that firms with more cash acquire more, there is no evidence that low $q$ older firms with more cash acquire more or that older firms with higher cash holdings are more likely to make diversifying acquisitions as predicted by agency theories.

Agency theories of acquisitions and diversification have dramatically different implications from the neoclassical theories about the impact of acquisitions and diversification on shareholder wealth. There is a vast literature on the stock price impact of acquisitions, but this literature does not separately consider the impact of acquisitions of older versus young firms (see Betton, Eckbo, and Thorburn (2008) for a review). If acquisitions by older firms are not efficient, we would expect the market to react negatively to these acquisitions. In contrast, under neoclassical theories, firms make acquisitions because they create shareholder wealth, so we would expect the market to react positively to acquisitions at any age. While the market reacts positively to acquisitions of private firms and subsidiaries, the evidence for acquisitions of public firms is mixed. There is a significant negative reaction for acquisitions of public firms by older firms, but this reaction is not significantly worse than the insignificant reaction for similar acquisitions by younger firms. The market reacts negatively to acquisitions of public firms paid for with equity, regardless of whether they are undertaken by a young or a mature firm. For acquisitions of public firms paid for with cash, the market reacts positively for acquisitions by young firms but there is a significant negative stock price reaction to acquisitions by older firms. Surprisingly, for young firms, unrelated acquisitions of public firms have a positive stock price reaction, but the reaction is negative for related acquisitions. The stock price reaction to announcements of public acquisitions by mature firms is largely consistent with the predictions of the agency theories, but the stock price reaction to announcements of private firms and subsidiaries is not. Agency theories do not have a compelling argument for why acquisitions of public firms destroy wealth due to agency costs, while other acquisitions do not. In contrast, theories of information asymmetry can explain why acquisitions of public firms paid for with equity lead to stock price decreases. The latter theories seem better able to explain the evidence than agency theories because they make different predictions for acquisitions of public firms and acquisitions of private firms (see Moeller, Schlingenman, and Stulz (2007)).

We show that the life cycle effects we demonstrate are due to the age of the firm relative to the IPO rather than to the age of the firm relative to incorporation. This evidence is consistent with the literature reviewed later in this section that suggests going public leads to a different acquisition rate, perhaps because IPOs improve access to external finance and firms can use their stock as an acquisition currency. We show that the acquisition rate of public firms is highly sensitive to aggregate credit conditions as measured by the credit spread, which is defined as the difference between the yield on

BAA bonds and the yield on AAA bonds. Strikingly, for young firms, the credit spread is a more important determinant of the acquisition rate than Tobin's $q$. The opposite is true for mature firms.

Equity can be misvalued. A recent literature focuses on the role of misvaluation in acquisition decisions and suggests that a high Tobin's $q$ could be evidence that the firm is overvalued rather than an indication of good growth opportunities. Firms could time their IPOs, going public when the market is likely to overvalue them (see Ritter and Welch (2002) for a review of theories and evidence), and make acquisitions using their overvalued equity. Shleifer and Vishny (2003) provide a model of acquisitions made by overvalued firms and other researchers find evidence for a role of overvaluation in acquisition decisions and outcomes (e.g., Rhodes-Kropf, Robinson, and Viswanathan (2005), Dong, Hirshleifer, Richardson and Teoh (2006)). Overvalued firms are expected to pay for acquisitions with equity. Strikingly, we find that cash is the preferred mode of payment for both young and mature firms. When we use the firm-specific measure of misvaluation developed by Rhodes-Kropf, Robinson, and Viswanathan (2005), we find that their misvaluation measure does not help understand the acquisition rate of young or mature firms, but is significantly related to the acquisition rate of middle-aged firms.

A plausible explanation for life cycle effects is that known determinants of the acquisition rate evolve as firms age, so that predicted acquisition rates based on these determinants evolve as firms age as well. We show, however, that this explanation is not sufficient. When we allow for the role of the known determinants of the acquisition rate, we find that the acquisition rate of firms still exhibits life cycle effects. Further research is needed to identify firm characteristics other than those considered in this paper that explain why firms have different acquisition rates at different stages of their life cycle. It is clear from our investigation that a firm's life cycle stage affects its acquisition rate in addition to the characteristics known to affect a firm's acquisition rate.

We build on recent papers that emphasize the high acquisition rate of young firms. In an important contribution using a sample of IPOs from 1985 to 2004, Celikyurt, Sevilir, and Shivdasani (2010) show that firms are active acquirers immediately after their IPO, relative to firms that are more than five years from their IPO. In other related work, Brau and Fawcett (2006, p. 399) find in a survey of CFOs that "the primary motivation for going public is to facilitate acquisitions." Hsieh, Lyandres, and Zhdanov (2011) find that high IPO intensity precedes merger waves, which suggests that the high acquisition rate of IPO firms may be related to the degree of activity in the M&A merger market, and Hovakimian and Hutton (2010) find that IPO firms benefit from having highly valued public stock as a means of acquisition currency. Further, Brau, Couch, and Sutton (2012) find that IPO firms that make acquisitions underperform in the long run relative to firms that do not, Wiggenhorn, Gleason, and Madura (2007) show that firms that make acquisitions during the first year following an IPO do not have worse long-term performance than other IPO firms and that the stock market reacts positively to such acquisitions, Gao, Ritter, and Zhu (2013) argue that, in recent years, it has been important for firms to grow fast

and, as a consequence, IPO firms are more likely to acquire and be acquired, and Alimov and Mikkelson (2012) examine the investment behavior of firms that go public during favorable market conditions (conditions in which the IPO rate and firm valuations are high), and find that firms that go public under these conditions tend to spend more on acquisitions. In contrast to the above work, we follow firms over their life cycle controlling for cohort- and calendar-year effects, investigate theories that pertain to mature firms, and compare the determinants of acquisition rates for the same firms when they are young and mature.

The paper proceeds as follows. In Section I, we discuss in greater detail the predictions of the agency and neoclassical theories and outline our tests of these predictions. In Section II, we describe our sample construction. In Section III, we study the acquisition rate of firms as a function of their age relative to the IPO date. We show how the acquisition behavior of young firms differs from that of mature firms in Section IV. In Section V, we estimate life cycle, IPO cohort, and economic condition effects on the acquisition rate. In Section VI, we investigate whether life cycle effects hold when we control for firm characteristics and whether the relation between the acquisition rate and firm characteristics depends on a firm's life cycle stage. We examine whether the value created by acquisitions depends on whether a firm is young or mature in Section VII. We conclude in Section VIII.

## I. Hypotheses and Tests

In this section, we present our main hypotheses and the approaches we use to test them. As we discuss in the introduction, we focus on two broad sets of theories on the role of acquisitions and diversification, namely, agency theories and neoclassical theories. We review these theories in this section and draw out testable implications.

### *A. Agency Theories*

Under the agency theories, firms have valuable growth opportunities early in their life. Eventually, however, management grows the firm beyond the level that can be achieved by exploiting the firm's existing growth opportunities, as long as resources are available to do so (Jensen (1986)). The rationale is that the firm's stock of valuable growth opportunities declines over time as firms use their initial growth opportunities, and, at some point, firms begin to acquire and diversify to increase their growth opportunities, or because doing so has other benefits for management. The agency literature generally views diversification as inefficient because of the complexity associated with managing firms in different industries. However, diversification benefits management because it decreases uncertainty (Amihud and Lev (1981)) and acquisitions enable firms to keep growing, which allows management to control more resources (Mueller (1972)). Acquisitions and diversification can also entrench management (Shleifer and Vishny (1989)), as larger firms tend to offer management

more perks and higher compensation. If management does not diversify, it has to return cash to shareholders, in which case the firm grows less or possibly even shrinks. As a result, diversification is associated with agency problems and firms with more agency problems are more likely to diversify (Denis, Denis, and Sarin (1997)).

The agency theories predict that firms acquire and diversify later in their life cycle as they run out of growth opportunities, presuming that management is reluctant to pay out the firm's cash flow to shareholders. These theories therefore predict that firms acquire and diversify when they have poor growth opportunities, and when they have high cash flow (Jensen (1986)). To the extent that such acquisitions tend to be made by mature firms, these acquisitions destroy shareholder wealth, particularly for diversifying acquisitions.

### *B. Neoclassical Theories*

The heart of the neoclassical view is that firms have valuable scarce assets that they take advantage of through acquisitions and diversification. It follows that the firms that undertake acquisitions are more valuable and better performing. This means that high $q$ firms acquire and a higher $q$ leads firms to acquire more. To the extent that younger firms have a higher $q$ ratio (Pástor and Veronesi (2003)), we expect younger firms to be active acquirers. It also follows that acquisitions increase shareholder wealth.

Why acquisitions and diversification increase shareholder wealth differs across models. Maksimovic and Phillips (2002) develop a model in which firms own a scarce asset that has decreasing returns to scale in an industry. As a result, firms optimally invest in other industries to maximize the value of the asset when it has a higher return in other industries. Within an industry, a firm may find it more efficient to acquire production capacity through acquisitions than to build new plants or increase the size of existing plants. Alternatively, a firm may have valuable scarce assets that can be used profitably in multiple industries or assets that can be best exploited when their output is combined with the output of other industries. These arguments imply that acquisitions and diversification are value-increasing because they allow a firm to exploit its valuable scarce assets, including growth opportunities.

Other models also predict that diversification can create value for shareholders. One alternative explanation is that diversification is itself a source of value because a diversified firm's internal capital market enables it to allocate capital more efficiently than if its divisions were stand-alone firms forced to access external markets (Stein (1997)). Moreover, this internal capital market enables firms to exploit information that would be difficult to convey to outsiders, making it possible to invest in projects that would be hard to finance externally. Internal capital markets can also make it easier for firms to stop activities that have become unprofitable, and can make it possible for firms to mitigate the impact of unexpected shocks to credit supply as a diversified firm can use cash flows generated by segments that are not growing to invest in segments expected to grow (Kuppuswamy and Villalonga (2012), Matvos and

Seru (2014)). Another model that predicts that diversification creates value holds that firms may not know their comparative advantage precisely. They may hold assets that they know are valuable but not be sure how to best use these assets. In such a situation, a firm may invest in different activities and discard activities when it finds that others can pursue these activities more efficiently (Matsusaka (2001)). Finally, in Gomes and Livdan (2004, p. 508), firms diversify to take advantage of economies of scope and because "diversification allows a mature, slow-growing firm to explore attractive new productive opportunities." Their model predicts that firms make diversifying acquisitions when they are mature rather than when they are young.

The neoclassical view predicts that firms with a higher Tobin's $q$ invest in both capital expenditures and acquisitions. Hence, everything else held constant, we expect higher $q$ firms to acquire more. If Tobin's $q$ falls with age, we would expect mature firms to acquire less than young firms. However, some of the models that we discuss imply that firms make diversifying acquisitions when some scarce assets become underemployed. To the extent that these assets become underemployed when firms become more mature, a U-shaped pattern of acquisition activity over a firm's lifetime can be consistent with the neoclassical view.

### *C. Tests*

The agency and neoclassical theories have implications for the acquisition rate of firms over their life cycle, for how firm characteristics affect firms' acquisition decisions, and for how acquisitions affect firm value. We test each of these implications in turn.

In Sections III and IV, we investigate the main prediction of the life cycle model, namely, that a firm's acquisition rate changes with its age. To investigate such a relation, we use the average acquisition rate of firms in a given cohort year. The focus on cohort averages mitigates the problem that the number of firms that go public in a given year is endogenous: if we focus on the number of acquisitions by a firm when it has a given age, we might have many firms that go public precisely when it is advantageous for them to make many acquisitions, in which case these firms would dominate the sample. In contrast, each year a cohort of firms goes public, and hence the existence of a cohort is not endogenous. We control for cohort characteristics and economic conditions using fixed effects in Section V. This approach is ideally suited to capture life cycle effects.

Firm characteristics change as firms age. At the core of the life cycle view is the argument that firms use up internal growth opportunities as they age (e.g., DeAngelo, DeAngelo, and Stulz (2006)), so that their $q$ falls unless they find a way to replace these opportunities. To the extent that investment falls as $q$ falls, we would expect firms to acquire less as they age. It is therefore important to examine whether the evolution of firm characteristics as firms age can explain the life cycle effects we identify. Accordingly, in Section VI, we examine whether life cycle effects can be explained by firm characteristics.

Using models in which the dependent variable is the number of acquisitions of a firm, we find that this is not the case. We also examine whether the determinants of the acquisition rate of young and mature firms differ, as predicted by the agency view, whether the determinants of the diversifying versus nondiversifying acquisition decision differ for young and mature firms, and whether the evolution of firm characteristics can explain the life cycle effects. Finally, in Section VI, we test whether the shareholder wealth impact of acquisitions differs between young and mature firms.

## II. IPO and Acquisition Samples

To construct our sample of IPOs, we begin with the population of firms and their deals in the SDC database maintained by Thompson Reuters Financial Database. We exclude unit issues, spinoffs, privatizations, reverse LBOs, rights issues, ADRs, closed-end funds and trusts, and REITs. In addition, we exclude IPO firms with stock price data available in CRSP before their IPO announcement date. These filters yield 7,759 original U.S. common stock offerings from 1975 to 2008. Our IPO sample comprises the 7,506 IPOs that have unique PERM numbers, which allow us to obtain data on stock prices from the CRSP database.

By way of comparison, the sample in Celikyurt, Sevilir, and Shivdasani (2010) consists of 1,250 IPOs from 1985 to 2004 with proceeds greater than $100 million in 2004 dollars. The sample in Hovakimian and Hutton (2010) is more comparable as they have 5,771 IPOs from 1980 to 2003, but they follow their firms for only three years. Our sample of IPOs is mostly the same as the Field-Ritter data set (Field and Karpoff (2002), Loughran and Ritter (2004)) made available by Professor Ritter on his website. The major exception is that we include IPO firms from all industries, penny stocks, and rollups, while the Field-Ritter data set excludes banks, savings and loan companies, penny stocks, and rollups. Penny stocks account for 6% of IPOs and 3% of the acquisitions made by IPO firms. Rollups account for 3% of IPOs but 9% of the acquisitions. Penny stock IPOs concentrate in the 1980s, while almost all rollups take place over the 1996 to 1999 period. As appropriate, we discuss how our results are affected when we use more restrictive samples.

Table I summarizes our sample of 7,506 IPO firms. Consistent with existing evidence on IPOs, the number of IPOs varies substantially over time, with a large number of IPOs in the second half of the 1990s. In particular, the period from January 1995 to December 2000 contains 34% of our IPOs. Further, underpricing is highest in 1999 and 2000. There is a high attrition rate for the firms in our sample. For the cohorts with at least one firm surviving for at least 10 years, on average, only 43% of the firms survive 10 years.

Through most of the paper, our sample of acquisitions includes all attempts by the IPO firms to acquire another firm regardless of whether in whole or part, public or private, or a subsidiary of another firm, but we also discuss results for the subsample that only includes completed acquisitions, where

**Table I**

## IPO Sample and Survival Rate

IPOs are identified using the SDC Global Issues Database. The IPO sample includes all IPOs from 1975 to 2008 excluding reverse LBOs, spinoffs, rights and unit offerings, ADRs, closed-end funds, REITs, and IPO firms with stock price data available from CRSP before their IPO announcement date. Acquisition deals of the IPO firms include all acquisitions in the SDC's M&A database from 1981 to 2012. Age refers to the number of years between the deal year and the IPO year. IPO proceeds are from the SDC Global Issues Database and are calculated as the total number of shares issued multiplied by the offer price. IPO underpricing is calculated for all IPOs for which data are available as the percentage initial return (P1-P0)*100/P0, where P1 is the first-day closing stock price or bid-ask average (from CRSP) and P0 is the IPO offer price. Total Assets ($M) are from SDC and are measured before the IPO. All dollar values are reported in 2004 dollars using the CPI as deflator. Total assets are available for 4,847 (67%) IPOs. The post-IPO survival rate is calculated as the number of firms alive as of January 1st of the 5th, 10th, and 20th event year over the total number of IPO firms.

| | | | | | | Surviving Firms and Survival Rate | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | January 1st of Event Year | | | | | | | |
| IPO Year | Total # of IPOs | | Median IPO Proceeds ($M) | Median IPO Underpricing (%) | Median IPO Total Assets ($M) | Year 5 | | Year 10 | | Year 20 | | January 1st, 2012 | |
| 1975 | 5 | 0.07% | 57.93 | 4.38 | | 4 | 80.00% | 3 | 60.00% | 3 | 60.00% | 1 | 20.00% |
| 1976 | 32 | 0.43% | 18.43 | 0.56 | | 24 | 75.00% | 12 | 37.50% | 10 | 31.25% | 2 | 6.25% |
| 1977 | 22 | 0.29% | 12.55 | 5.00 | | 14 | 63.64% | 7 | 31.82% | 6 | 27.27% | 1 | 4.55% |
| 1978 | 28 | 0.37% | 15.80 | 13.29 | | 20 | 71.43% | 15 | 53.57% | 6 | 21.43% | 1 | 3.57% |
| 1979 | 54 | 0.72% | 17.70 | 5.47 | | 44 | 81.48% | 27 | 50.00% | 13 | 24.07% | 5 | 9.26% |
| 1980 | 103 | 1.37% | 12.39 | 11.72 | 82.19 | 83 | 80.58% | 52 | 50.49% | 19 | 18.45% | 11 | 10.68% |
| 1981 | 241 | 3.21% | 12.47 | 3.57 | 37.41 | 183 | 75.93% | 110 | 45.64% | 47 | 19.50% | 26 | 10.79% |
| 1982 | 85 | 1.13% | 9.85 | 5.73 | 23.00 | 60 | 70.59% | 36 | 42.35% | 18 | 21.18% | 7 | 8.24% |
| 1983 | 494 | 6.58% | 19.55 | 3.99 | 36.04 | 366 | 74.09% | 216 | 43.72% | 83 | 16.80% | 37 | 7.49% |
| 1984 | 221 | 2.94% | 10.91 | 1.43 | 44.18 | 143 | 64.71% | 88 | 39.82% | 38 | 17.19% | 25 | 11.31% |
| 1985 | 219 | 2.92% | 15.41 | 3.96 | 23.70 | 158 | 72.15% | 98 | 44.75% | 31 | 14.16% | 14 | 6.39% |
| 1986 | 459 | 6.12% | 19.13 | 2.86 | 42.40 | 343 | 74.73% | 228 | 49.67% | 83 | 18.08% | 54 | 11.76% |
| 1987 | 324 | 4.32% | 17.25 | 2.38 | 25.61 | 229 | 70.68% | 151 | 46.60% | 54 | 16.67% | 36 | 11.11% |

(*Continued*)

**Table I**—*Continued*

| IPO Year | Total # of IPOs | | Median IPO Proceeds ($M) | Median IPO Underpricing (%) | Median IPO Total Assets ($M) | Surviving Firms and Survival Rate | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | January 1st of Event Year | | | | | | January 1st, 2012 | |
| | | | | | | Year 5 | | Year 10 | | Year 20 | | | |
| 1988 | 139 | 1.85% | 19.29 | 2.63 | 40.88 | 95 | 68.35% | 63 | 45.32% | 28 | 20.14% | 21 | 15.11% |
| 1989 | 116 | 1.55% | 23.64 | 5.00 | 30.92 | 92 | 79.31% | 58 | 50.00% | 23 | 19.83% | 19 | 16.38% |
| 1990 | 105 | 1.40% | 24.28 | 7.11 | 23.85 | 85 | 80.95% | 49 | 46.67% | 20 | 19.05% | 18 | 17.14% |
| 1991 | 231 | 3.08% | 34.95 | 9.58 | 29.40 | 193 | 83.55% | 113 | 48.92% | 49 | 21.21% | 47 | 20.35% |
| 1992 | 306 | 4.08% | 30.80 | 4.62 | 24.17 | 237 | 77.45% | 130 | 42.48% | 69 | 22.55% | 69 | 22.55% |
| 1993 | 475 | 6.33% | 35.30 | 6.52 | 40.53 | 362 | 76.21% | 192 | 40.42% | | | 97 | 20.42% |
| 1994 | 395 | 5.26% | 30.62 | 3.85 | 28.93 | 274 | 69.37% | 145 | 36.71% | | | 67 | 16.96% |
| 1995 | 437 | 5.82% | 38.67 | 14.43 | 26.53 | 266 | 60.87% | 151 | 34.55% | | | 80 | 18.31% |
| 1996 | 650 | 8.66% | 38.41 | 9.91 | 20.53 | 343 | 52.77% | 203 | 31.23% | | | 102 | 15.69% |
| 1997 | 449 | 5.98% | 38.10 | 9.38 | 27.89 | 242 | 53.90% | 144 | 32.07% | | | 90 | 20.04% |
| 1998 | 284 | 3.78% | 43.42 | 8.33 | 36.16 | 161 | 56.69% | 89 | 31.34% | | | 66 | 23.24% |
| 1999 | 435 | 5.80% | 68.03 | 38.54 | 35.09 | 226 | 51.95% | 139 | 31.95% | | | 108 | 24.83% |
| 2000 | 328 | 4.37% | 81.83 | 26.61 | 81.67 | 197 | 60.06% | 100 | 30.49% | | | 83 | 25.30% |
| 2001 | 65 | 0.87% | 98.00 | 13.00 | 166.77 | 46 | 70.77% | 34 | 52.31% | | | 32 | 49.23% |
| 2002 | 67 | 0.89% | 91.85 | 2.73 | 232.37 | 43 | 64.18% | 31 | 46.27% | | | 31 | 46.27% |
| 2003 | 71 | 0.95% | 100.61 | 8.33 | 179.35 | 49 | 69.01% | | | | | 36 | 50.70% |
| 2004 | 199 | 2.65% | 87.50 | 5.25 | 122.10 | 141 | 70.85% | | | | | 107 | 53.77% |
| 2005 | 154 | 2.05% | 81.25 | 7.04 | 176.08 | 112 | 72.73% | | | | | 91 | 59.09% |
| 2006 | 152 | 2.03% | 88.87 | 5.73 | 160.98 | 105 | 69.08% | | | | | 99 | 65.13% |
| 2007 | 141 | 1.88% | 89.28 | 6.20 | 108.55 | 97 | 68.79% | | | | | 97 | 68.79% |
| 2008 | 20 | 0.27% | 130.71 | −3.22 | 94.14 | | | | | | | 16 | 80.00% |
| Total | 7,506 | 100.00% | | | | 5,037 | 67.11% | 2,684 | 36.00% | 600 | 7.99% | 1,596 | 21.26% |
| Median values across IPO cohorts | | | 32.88 | 5.60 | 37.41 | | | | | | | | |

the acquirer acquires complete control of the acquired firm.[1] Our rationale for including subsidiaries in our acquisition sample is straightforward: The same set of activities could be organized as a private firm, a public firm, or a subsidiary. From this perspective, a firm that grows by acquiring a subsidiary achieves the same outcome as it would if the activities of the subsidiary were instead organized as a public firm or a private firm. The inclusion of subsidiaries in the acquisition sample follows the earlier literature (e.g., Celikyurt, Sevilir, and Shivdasani (2010) and Hovakimian and Hutton (2010)).

While the acquisition sample may be a better reflection of acquisition activity by a firm since it includes both partial and complete acquisitions, the restricted sample of control acquisitions may provide a better indication of how a firm changes as a result of acquisitions. The restricted subsample is constructed as follows. We first eliminate all deals for which we cannot determine that the acquirer owns less than 50% of the acquired firm before the acquisition announcement. Within this subset of acquisitions, we then keep only the acquisitions for which we can ascertain that the acquirer owns 100% of the acquired firm after the acquisition. As a result of this screen, the restricted subsample is substantially smaller than the full sample of acquisitions.

Acquisition data for the 7,506 IPO firms come from the SDC Mergers & Acquisitions database. Data on acquisitions are sparse before 1981. Therefore, we only include acquisitions announced over the period of 1981 to 2012 by our IPO firms. We exclude repurchases, recapitalizations, and self-tenders, but include acquisitions of domestic firms as well as foreign firms.[2] Of the 7,506 firms that went public between 1975 and 2008, 5,489 (73%) pursued at least one merger or acquisition over the 1981 to 2012 period.[3] These firms had a total of 32,647 transactions with an average of 5.95 deals per firm, while the remaining 2,017 firms have no transaction recorded by SDC. SDC has information on acquisitions by the IPO firms that took place before these firms went public. We do not use this information in our analysis because it is not comprehensive, although we do use the fact that 1% of firms announced an acquisition on the same day as their IPO.

An obvious concern with our analysis is that it could suffer from biases if SDC does not report all acquisitions. SDC casts a wide net as it reviews more than 200 publications as well as SEC filings. Further, investment banks have incentives to communicate deals to SDC. As far as we know, only one study compares SDC data to hand-collected data. This study finds that SDC becomes reliable in the early 1980s for acquisitions of public firms by public firms (Barnes, Harp, and Oler (2014)). No prior study compares SDC data for acquisitions of private firms. One possible bias is that the acquisition of a private firm is more likely to be material for a small firm than for a large

[1] In this paper, we use the term subsidiary acquisition to denote the acquisition of a subsidiary, division, or branch.

[2] With SDC, acquisitions by a foreign subsidiary are, in principle, attributed to the ultimate parent, so that acquisitions by a foreign subsidiary of a firm in our IPO data set will be attributed to that firm.

[3] The SDC database for M&A transactions starts in the 1970s.

firm, so that the large firm may not report acquisitions in a way that would be noticed by SDC. We cannot exclude this possibility. However, we find that large firms are more likely to make acquisitions in our sample, which is not what we would expect if this bias were large. To the extent that SDC data have become more comprehensive over time, including more recent years should lead to more complete data. We therefore take comfort from the fact that our results are largely unchanged when we extend the end year of our sample of acquisitions from 2006 to 2012 and of our IPO sample from 2002 to 2008. In any case, at the very least, our results hold for those acquisitions that firms consider material.

## III. The Acquisition Rate over a Firm's Life Cycle

In this section, we investigate the conditional acquisition rate of firms over their life cycle. The conditional acquisition rate is defined as the number of acquisitions by firms in a cohort during an event year divided by the number of firms in that cohort that have survived as of the beginning of the given event year. This measure thus gives the average number of acquisitions per firm in a cohort during an event year. Throughout the paper, year 0 is the calendar year in which the IPO takes place, so that year 1 is the first full calendar year of a public firm.

Figure 2 and Table IA.I in the Internet Appendix show the mean conditional acquisition rate for each cohort from year 0 to year 25.[4] We do not examine cohorts past year 25 because there are few firms in each cohort after that year. Firms make acquisitions steadily over their life. Except for the 1982 cohort in year 24, no cohort with an IPO after 1978 has a year without acquisitions. The peak acquisition year is year 1, the first full calendar year that a firm is public. The highest year 1 conditional acquisition rate is 1.64 for the 1997 cohort. Five cohorts have an average conditional acquisition rate that exceeds one in year 1. All of these cohorts are in the second half of the 1990s, when the M&A market was extremely active.

There is a striking change in the peak year of the conditional acquisition rate over time. Until 1990, all cohorts have a conditional acquisition rate that peaks after year 5, with all but one peaking in year 10 or later. After 1990, in contrast, each cohort's conditional acquisition rate peaks before year 5, with half (9 out of 18) peaking in year 1. The phenomenon of high acquisition activity by new firms is therefore one that holds for the 1990s but not earlier. It is well known, however, that characteristics of IPO firms changed in the 1990s, in that new public firms were less well established than their predecessors (see Fama and French (2004)). In particular, firms that went public before the 1990s were more likely to be profitable when they went public. Another important consideration is that the firms that went public in the 1990s faced a hot M&A

[4] The Internet Appendix is available in the online version of the article on the *Journal of Finance* website.

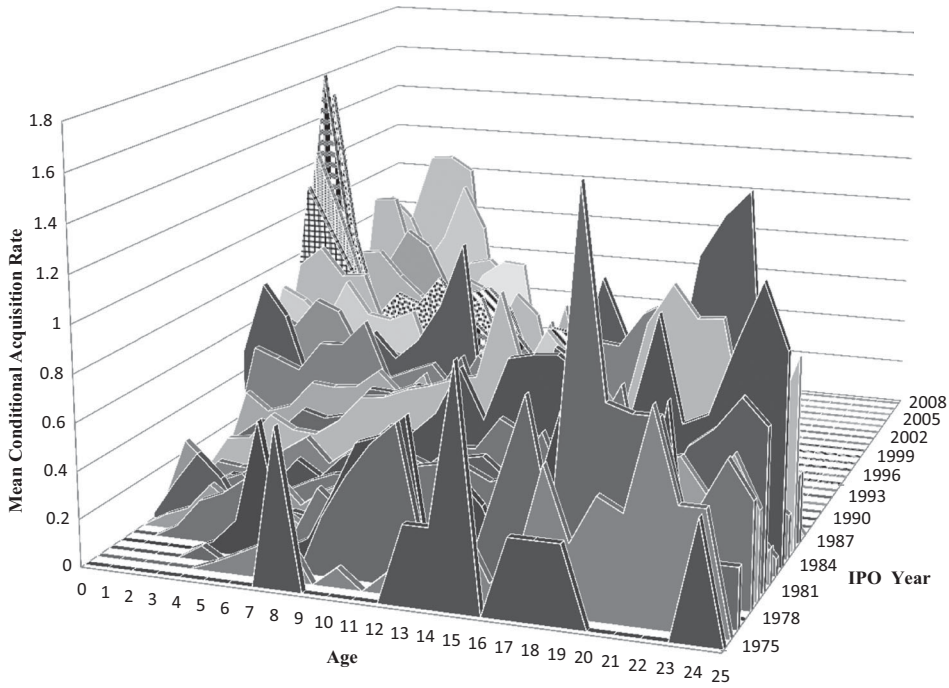


**Figure 2. Mean conditional acquisition rate per event-year by IPO-cohort.** IPOs are identified using the SDC Global Issues Database. The IPO sample includes all IPOs from 1975 to 2008 excluding reverse LBOs, spinoffs, rights and unit offerings, ADRs, closed-end funds, REITs, and IPO firms with stock price data available from CRSP before their IPO announcement date. Acquisition deals of the IPO firms include all acquisitions in SDC's M&A database from 1981 to 2012. Age refers to number of years since the IPO year. The acquisition rate is the number of acquisition announcements of an IPO cohort in year $t$ divided by the number of firms in that cohort that are alive at the beginning of year $t$.

market in their youth. We investigate the relevance of this last consideration in the next section and of firm characteristics in Section V.

The mean conditional acquisition rate falls after year 1 (as shown in Table IA.I), reaching a minimum of 0.34 in year 7, and then increases again, so that the conditional acquisition rate of firms after year 9 is higher than that of firms in years 4–9. These observations suggest that the mean conditional acquisition rate over a firm's life cycle is U-shaped: it is high in a firm's youth, lower in its middle age, and high again in its maturity. This pattern holds when we consider the median conditional acquisition rate (see Table IA.I and Figure 3) as well as when we use the restricted subsample (see Figure 3). These results are not due to serial acquirers, as they continue to hold when we eliminate firms with more than five acquisitions in a year or exclude financial firms, utilities, rollups, and penny stocks with stock prices below \$5 (see Figure 3).

So far, we have focused on the number of acquisitions by IPO firms. The same number of acquisitions at different stages of a firm's life could have very

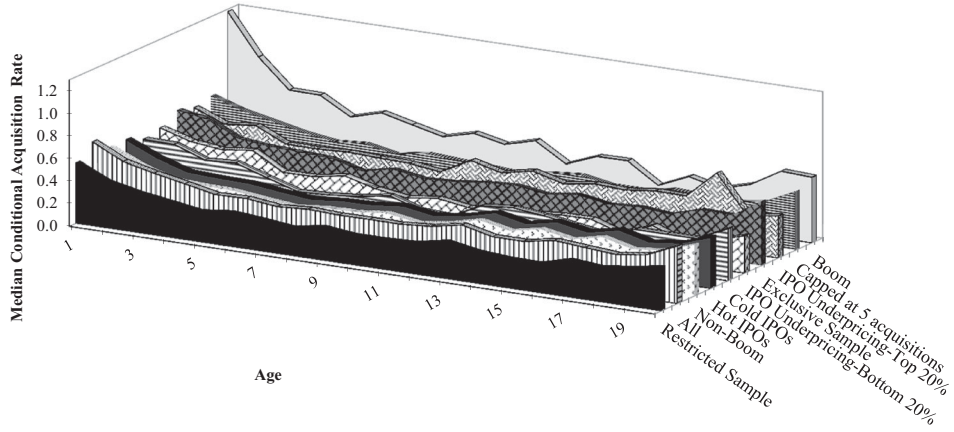


**Figure 3. Median conditional event-year acquisition rate by the state of the IPO market and of the M&A market.** IPOs are identified using the SDC Global Issues Database. The IPO sample includes all IPOs from 1975 to 2008 excluding reverse LBOs, spinoffs, rights and unit offerings, ADRs, closed-end funds, REITs, and IPO firms with stock price data available from CRSP before their IPO announcement date. Acquisition deals of the IPO firms include all acquisitions in SDC's M&A database from 1981 to 2012. Age refers to number of years since the IPO year. The acquisition rate is the number of acquisition announcements of an IPO cohort in year $t$ divided by the number of firms in that cohort that are alive at the beginning of year $t$. The IPO market is classified as hot (fourth and fifth quintiles), cold (first quintile), or neutral (second and third quintiles) based on a quintile ranking of the quarterly number of IPOs following Yung, Çolak, and Wang (2008). The merger wave denotes the period from 1995 to 2000. IPO underpricing is calculated as the percentage initial return $(P_1-P_0)*100/P_0$, where $P_1$ is the first-day closing stock price or bid-ask average (from CRSP) and $P_0$ is the IPO offer price. The IPO underpricing quintiles are obtained using the 7,271 IPOs (out of 7,506) for which we have data. The restricted sample eliminates all deals for which we cannot determine that the acquirer owns less than 50% of the acquired firm before the acquisition announcement. Within this subset of acquisitions, we then keep only the acquisitions for which we can ascertain that the acquirer owns 100% of the acquired firm after the acquisition. The exclusive sample excludes financial firms, utilities, and rollups following Ritter (2015) and stocks with prices below $5.

different implications if in one event year the acquisitions are small and in another they are large. Ideally, therefore, we would also examine the amount spent on acquisitions by firms during their life cycle. As already explained, however, SDC does not report the dollar amount paid for a large fraction of acquisitions. For the acquisitions considered in Figure 1, the dollar amount paid is not available for 52% of the acquisitions. Nevertheless, we report results for the amount spent on acquisitions as a fraction of the assets owned by firms in a cohort at the beginning of the year in Internet Appendix Table IA.II. To account for deals with no information, we construct this ratio each year using only those firms for which information on the amount paid is available for each acquisition they make and for which total assets is available at the beginning of the year. We refer to this statistic as the conditional dollar acquisition rate. Because we exclude firms that make acquisitions for which we do not have deal size information, some cohort years drop out in this analysis. We find that

the mean conditional dollar acquisition rate is highest in year 1 and is higher for young firms in general. Similarly, the median conditional dollar acquisition rate is highest in year 1 and never reaches a rate half as high as its year 1 rate after year 4. It is useful to note, however, that the high values of the dollar acquisition rate in years 1 and 2 are driven by extremely high conditional dollar acquisition rates in the second half of the 1990s. For instance, when we consider year 1, the conditional dollar acquisition rate peaks in 1999 and is more than three times the average. Similar results hold when we analyze the sample of completed acquisitions.

The results of this section show that no case can be made for the sample as a whole that mature firms pursue more acquisitions than young firms. Since the early 1990s, firms' conditional acquisition rates peak early in their life. However, while the acquisition rate follows a clear U-shaped pattern, the dollar acquisition rate, while more variable, follows a decreasing trend over the firm's life cycle. All of these conclusions hold if we restrict the sample, or if we exclude financial firms, utilities, rollups, and firms with stock prices below $5.

Another way to investigate the acquisition behavior of new firms is to look at when they make their first acquisition. We compute the fraction of firms in a cohort that have their first acquisition in a given event year. We refer to this ratio as the first-deal acquisition ratio. We find that the peak year of the first-deal acquisition ratio changes over time. In the earlier part of our sample, the peak year of first-deal acquisitions is later in the life of firms. After 1988, the peak year is year 1 for all years but one. On average, 32% of IPO firms pursue their first acquisition in year 1 and 70% of IPO firms have made an acquisition by the end of year 2. Surprisingly, 42% of first acquisitions are considered diversifying acquisitions when defined as an acquisition outside a firm's main two-digit SIC code, and 25% of first acquisitions are considered diversifying when all of the two-digit SIC codes of the acquired firm are outside the two-digit SIC codes of the acquirer.

## IV. The Acquisition Rate of Young and Mature Firms

In this section, we first compare the acquisition behavior of young and mature firms, where we classify as young those firms that are in the first three complete calendar years after their IPO and as mature those firms that are at least nine years old relative to their IPO. Although we primarily focus on the conditional acquisition rate, we also report results for the conditional dollar acquisition rate. Finally, we investigate whether the results are explained by differences in the age since incorporation of firms that go public.

In Table II, we compare the conditional acquisition rate of young and mature firms. We construct the average conditional acquisition rate for young and mature firms by averaging across cohorts in an event year and then averaging across event years for the event-year windows of interest. Table II reports results for the full sample as well as the restricted subsample. We focus our discussion on the results for the full sample, as the results for the restricted subsample are similar.

**Table II**

## Conditional Acquisition Rate of Young versus Mature Firms

IPOs are identified using the SDC Global Issues Database. The IPO sample includes all IPOs from 1975 to 2008 excluding reverse LBOs, spinoffs, rights and unit offerings, ADRs, closed-end funds, REITs, and IPO firms with stock price data available from CRSP before their IPO announcement date. Acquisition deals of the IPO firms include all acquisitions in SDC's M&A database from 1981 to 2012. The restricted sample includes only completed acquisitions in which 100% of the equity is acquired. *Age* refers to the number of years since IPO year. The *conditional acquisition rate* is the ratio of acquisitions of a given type in a year divided by the number of firms that are alive and public at the beginning of the year. The IPO market is classified as *hot* (fourth and fifth quintiles), *cold* (first quintile), or *neutral* (second and third quintiles) based on a quintile ranking of the quarterly number of IPOs following Yung, Çolak, and Wang (2008). The *merger wave* is the period from 1995 to 2000. *Relatedness across all SICs* is defined as having at least one two-digit SIC code in common between the acquirer and the target. IPO underpricing is calculated as the percentage initial return $(P_1-P_0)*100/P_0$, where $P_1$ is the first-day closing stock price or bid-ask average (from CRSP) and $P_0$ is the IPO offer price. The *IPO underpricing quintiles* are obtained using the subsample of 7,271 IPOs (out of 7,506) for which we have data, where the lowest quintile corresponds to the IPOs with the lowest first-day returns. The *method of payment* is reported by SDC for deals classified as having disclosed the transaction details. The *target's organizational form* is classified using the data available in SDC into private, public, subsidiary, and unknown. $^{*}$, $^{**}$, and $^{***}$ denote statistical significance at the 10%, 5%, and 1% level, respectively. The tests of means use a *t*-statistic and the tests of proportions use a *z*-statistic.

| | All Acquisitions | | | Restricted Sample | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | Test of Means (3) = (1)–(2) | (4) | (5) | Test of Means (6) = (4)–(5) |
| Age | Young 1–3 | Mature 10–20 | | Young 1–3 | Mature 10–20 | |
| Mean conditional acquisition rate | 0.53 | 0.40 | 2.11** | 0.42 | 0.31 | 2.13** |
| Mean conditional acquisition rate by IPO year | | | | | | |
| (1) Hot | 0.67 | 0.40 | 2.61*** | 0.55 | 0.32 | 2.43** |
| (2) Cold | 0.41 | 0.38 | 0.27 | 0.30 | 0.28 | 0.29 |
| Neutral | 0.55 | 0.41 | 1.57 | 0.43 | 0.32 | 1.51 |
| Test of means: (1) –(2) | 2.24** | 0.20 | | 2.42** | 0.70 | |
| IPO underpricing quintiles (IPO cohort) | | | | | | |
| (1) Quintile 1 | 0.49 | 0.31 | 2.74*** | 0.38 | 0.22 | 2.71*** |
| (2) Quintile 2 | 0.48 | 0.39 | 1.29 | 0.37 | 0.31 | 0.99 |
| (3) Quintile 3 | 0.51 | 0.39 | 1.45 | 0.39 | 0.27 | 1.87 |
| (4) Quintile 4 | 0.58 | 0.45 | 1.49 | 0.46 | 0.36 | 1.39 |
| (5) Quintile 5 | 0.62 | 0.61 | 0.04 | 0.51 | 0.47 | 0.28 |
| Test of means: (1)–(5) | −0.98 | −3.39*** | | −1.00 | −3.42*** | |
| Acquisition year | | | | | | |
| (1) Merger wave | 0.93 | 0.51 | 3.77*** | 0.76 | 0.37 | 4.21*** |
| (2) Other | 0.44 | 0.37 | 1.20 | 0.35 | 0.29 | 1.08 |
| Test of means: (1) –(2) | 4.66*** | 1.90* | | 4.47*** | 1.37 | |
| Relatedness across all SICs | | | | | | |
| (1) Not in same two-digit SIC | 0.11 | 0.08 | 2.37** | 0.08 | 0.06 | 2.52** |
| (2) In same two-digit SIC | 0.42 | 0.32 | 1.88* | 0.34 | 0.25 | 1.93* |
| Test of proportions: (1)–(2) | −2.70*** | −2.27** | | −2.45** | −2.05** | |

(*Continued*)

**Table II**—*Continued*

| | All Acquisitions | | | Restricted Sample | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | Test of Means (3) = (1)−(2) | (4) | (5) | Test of Means (6) = (4)−(5) |
| Age | Young 1–3 | Mature 10–20 | | Young 1–3 | Mature 10–20 | |
| Target's organizational form | | | | | | |
| (1) Private | 0.35 | 0.23 | 2.74*** | 0.29 | 0.19 | 2.72*** |
| (2) Public | 0.04 | 0.04 | −1.54 | 0.02 | 0.03 | −1.46 |
| (3) Subsidiary | 0.14 | 0.12 | 1.00 | 0.11 | 0.09 | 1.57 |
| Test of proportions: (1)−(2) | 3.13*** | 2.00** | | 2.89*** | 1.89* | |
| Test of proportions: (1)−(3) | 1.92* | 1.03 | | 1.74* | 1.01 | |
| Method of payment | | | | | | |
| (1) Cash | 0.15 | 0.13 | 0.79 | 0.12 | 0.10 | 1.08 |
| (2) Stock | 0.05 | 0.03 | 2.27** | 0.04 | 0.02 | 2.23** |
| Both | 0.03 | 0.01 | 3.45*** | 0.02 | 0.01 | 3.24*** |
| Unknown | 0.30 | 0.23 | 1.96* | 0.24 | 0.17 | 1.88* |
| Test of proportions: (1)−(2) | 1.36 | 1.49 | | 1.19 | 1.25 | |
| Mean fraction of acquisitions by Relatedness across all SICs | | | | | | |
| (1) Not in same two-digit SIC | 0.24 | 0.20 | 1.44 | 0.22 | 0.19 | 1.46 |
| (2) In same two-digit SIC | 0.76 | 0.80 | −1.44 | 0.78 | 0.81 | −1.46 |
| Test of proportions: (1)−(2) | −4.02*** | −4.43*** | | −4.28*** | −4.63*** | |
| Target's organizational form | | | | | | |
| (1) Private | 0.64 | 0.57 | 3.23*** | 0.66 | 0.60 | 2.27** |
| (2) Public | 0.09 | 0.11 | −1.33 | 0.07 | 0.08 | −1.23 |
| (3) Subsidiary | 0.26 | 0.32 | −2.48** | 0.27 | 0.31 | −1.74* |
| Test of proportions: (1)−(2) | 4.36*** | 3.58*** | | 4.77*** | 4.10*** | |
| Test of proportions: (1)−(3) | 2.92*** | 1.89* | | 2.98*** | 2.17** | |
| Method of payment | | | | | | |
| (1) Cash | 0.27 | 0.34 | −2.24** | 0.26 | 0.33 | −2.03** |
| (2) Stock | 0.09 | 0.06 | 1.82* | 0.10 | 0.07 | 1.32 |
| Both | 0.04 | 0.03 | 1.92* | 0.05 | 0.04 | 1.51 |
| Unknown | 0.60 | 0.57 | 0.97 | 0.59 | 0.56 | 0.87 |
| Test of proportions: (1)−(2) | 1.82* | 2.59*** | | 1.64 | 2.39** | |

The acquisition rate of young firms is 32.5% higher than that of mature firms, with the difference significant at the 5% level. The higher acquisition rate of young firms holds if we consider the restricted subsample, if we eliminate financial firms and utilities from the sample, if we eliminate penny stocks, if

we eliminate rollups, and if we eliminate high-tech firms (see Table IA.III). Strikingly, the result is not a high-tech firm result, as these firms acquire as much when they are mature as when they are young. One might be concerned that our results hold because of young firms that do not survive. This is not the case. When we consider only firms that survive at least 10 years, the results are the same (see Table IA.III).

It is common in the IPO literature to distinguish between hot and cold IPO markets. The literature makes this distinction in a number of different ways. We use the approach of Yung, Çolak, and Wang (2008), who define a heat measure of the IPO market based on a quintile ranking approach using the quarterly number of IPOs. We categorize the heat measure as hot (fourth and fifth quintiles), cold (first quintile), or neutral (second and third quintiles). As a robustness check, we also use the approach of Helwege and Nellie (2004), who define hot and cold IPO markets using the three-month moving average of the number of IPOs scaled by new business formations each month—the top tercile of their measure corresponds to hot IPO months and the bottom tercile to cold IPO months. The correlation between the hot versus cold indicator variables based on these two methods is 97.7%. Firms that go public in a hot IPO market have a much higher acquisition rate when young than firms that go public in a cold market. Specifically, their acquisition rate is 64.8% higher than that of firms that go public in a cold market. Mature firms that go public in a hot market have an insignificantly different acquisition rate from firms that go public in a cold market. For firms that do not go public in a hot IPO market, there is no significant difference in the acquisition rate between young and mature firms, while firms that go public in a hot IPO market have a much higher acquisition rate when young than when mature.

We next consider the relation between underpricing and the acquisition rate. Signaling theories of underpricing (Allen and Faulhaber (1989), Welch (1989)) suggest that firms with greater underpricing are expected to have more growth opportunities. Firms with greater underpricing are thus expected to acquire more if acquisitions allow them to exploit these opportunities. Alternatively, if greater underpricing means that a firm received too little cash for its IPO, then we should see the opposite result. We report results for the conditional acquisition rate by first-day return quintiles, where quintiles are computed within cohorts. We see that, for young firms, there is no difference in the acquisition rate by firms in the lowest and highest IPO return quintiles. However, mature firms that were in the lowest return quintile at IPO have a significantly lower acquisition rate than mature firms that were in the highest return quintile. Further, the conditional acquisition rate falls significantly as firms in the lowest return quintile mature, but it does not fall significantly for firms in the other quintiles. In related evidence, Maksimovic, Phillips, and Yang (2013) find that a firm's size and productivity at the time it goes public predicts asset purchases and sales 10 years later. When we recalculate the quintiles without dividing the sample into IPO cohorts, young firms from the first four quintiles have a significantly higher acquisition rate than older firms, but firms in the fifth quintile do not (see Table IA.III).

To evaluate the relation between the level of acquisition activity in the economy and the conditional acquisition rate of the IPO cohorts, we separately consider the merger wave years of the 1990s versus the other years. We date the merger wave from 1995, the year of the Netscape IPO, to 2000, the year of the collapse of the Internet bubble. We see that the difference between the conditional acquisition rate of young firms and mature firms is dramatic for the 1990s merger wave years. However, there is no difference in these conditional acquisition rates when the merger wave years are excluded. This lack of a difference is not an issue of statistical power since we have more observations outside the merger wave period. Further, the rate of acquisition activity of young firms is more than twice as high during the 1990s merger wave years than in other years. It follows that, in a univariate setting, the merger rate of young and mature firms differs because of the merger wave of the 1990s.

The literature emphasizes the importance of the industry life cycle (Maksimovic and Phillips (2008)) and of industry merger waves (Harford (2005), Maksimovic, Phillips, and Yang (2013)). In the Internet Appendix Table IA.III, we also examine the acquisition rate of firms by industry-year quintiles constructed according to industry-level merger activity. Our results continue to hold irrespective of the intensity of industry-level merger activity. In Section V, we report firm-level regressions that control for industry-level merger activity.

Figure 3 provides further evidence on the importance of merger activity for the acquisition behavior of IPO firms. We plot the median conditional acquisition rate per event year for the full sample, for the event years during the merger wave of the 1990s, and for the other years, as well as for whether a firm goes public in a hot or cold IPO market. The figure shows that there is a sharp difference in the acquisition behavior of firms early in their post-IPO life depending on whether the market for acquisitions is active or not.

Turning to acquisition characteristics, we first consider the rate at which firms make diversifying acquisitions. We estimate a conditional acquisition rate for acquisitions in the firm's main two-digit SIC code industry, which we refer to as related acquisitions, as well as a conditional acquisition rate for other acquisitions, which we refer to as diversifying acquisitions.[5] We find that young firms have a higher rate of diversifying acquisitions than mature firms (see Table IA.III). This result could be mechanical, in that firms that diversify while young will have fewer industries in which to diversify when old. However, for the result to be mechanical, it has to be the case that firms actively diversify while they are young, which is not a prediction of agency

[5] Under this definition, a firm that integrates vertically is treated as a diversifying firm. An alternative approach left for further research would be to identify vertical integration separately using input-output tables (Fan and Lang (2000), Matsusaka (1993), Ozbas and Scharfstein (2010)). Note, however, that acquiring a firm that produces inputs for the industry or buys outputs from the industry does not mean that the acquisition is related in the sense that the acquirer would necessarily have sufficient knowledge to manage the acquired firm. For instance, a car maker that acquires a tire producer would become more vertically integrated, but the car maker may have no skills or specialized knowledge that would be useful in managing the tire producer.

theories of diversification. These acquisitions are diversifying in that they occur outside of the firm's main two-digit SIC code industry, but they could take place in an industry in which the firm is already active. Therefore, we also investigate a stricter definition of diversification. Under this definition, an acquisition is diversifying if it is in a two-digit SIC code in which the firm has no existing activity according to SDC (Compustat, if missing) at the time of the acquisition. The results using this definition are reported in Table II. Under this stricter definition of diversification, the rate at which firms make diversifying acquisitions drops in half and is significantly lower than the rate at which they make related acquisitions. The rate at which young firms make diversifying acquisitions is higher than the rate at which mature firms make such acquisitions. Thus, we do not find support for the prediction that firms diversify more when they are mature. We also conduct proportion tests and find that the proportion of acquisitions that are diversifying is higher for young firms than for mature firms when we use the main SIC code of the firm and is not significantly different when we use all SIC codes. Taken together, the evidence is inconsistent with the agency theories of diversification summarized in Section I.

While the use of SIC codes to identify diversifying acquisitions is the most common approach to do so, this approach has obvious limitations. It is well known that firms in seemingly identical activities can have different two-digit SIC codes. One way to address this issue is to use a coarser classification of industries. The Fama-French 49 industry classification sorts industries into 49 related two-digit SIC code groups. Unfortunately, a coarser classification may also understate the extent of diversifying acquisitions. When we use the Fama-French 49 industry classification, we find that young firms do not diversify more than mature firms (see Table IA.III). An alternative to identifying firms in related activities is to use a text-based approach. Hoberg and Phillips (2010) use 10-Ks to identify competitors. We use their (static) identifiers as our fourth measure of diversification. The limitation of this approach for our study is that their identifiers are available for only part of our sample period and only for public firms, but there are many more acquisitions of private firms in our sample than acquisitions of public firms. Nevertheless, using their identifiers, we find no evidence that the rate at which firms acquire unrelated public firms increases with age (see Table IA.III). Consequently, our result that firms do not make more diversifying acquisitions as they age is robust to this alternative approach of measuring diversification.

We find that the high acquisition rate of young firms is driven by their acquisitions of private firms. Young firms acquire private firms at a higher rate than mature firms, and the fraction of private firm acquisitions by young firms is higher than the same fraction for mature firms. The difference in the rate of acquisition of public firms between young and mature firms is not significant, nor is the difference for acquisitions of subsidiaries. It is clear that acquisitions of public firms are a small minority of all acquisitions both for young and mature firms. Specifically, 9% (11%) of the acquisitions of young (mature) firms are

public firms, and, when we focus on the restricted subsample, this percentage is 7% (8%). Note that Hovakimian and Hutton (2010) show that the fraction of acquisitions of public firms in their IPO sample is 8.3%, which is very similar to the fraction we compute. They also show that 18.3% of the acquisitions by firms that have at least three years of data in CRSP are acquisitions of public firms. This fraction is substantially higher than the one we compute, and they find that mature firms are more likely to acquire a public firm than young firms. Their sample requires that deal size be available, while ours does not.

Lastly, we consider how the acquisition is paid for. The rate of acquisitions paid for exclusively with stock is higher for young firms than for mature firms, but not the rate of acquisitions paid for with cash. Not surprisingly, therefore, the fraction of cash acquisitions is significantly higher for mature firms. It is important not to forget, however, that data on how acquisitions are paid for are missing for the majority of the acquisitions. Another important caveat is that a firm could pay cash for an acquisition but might have issued equity to raise the cash. We investigate whether the results on how acquisitions are paid for differ depending on whether a firm goes public in a hot IPO market or a cold IPO market. We find that the proportion of acquisitions that are paid for with stock is not significantly higher for firms that go public in a hot IPO market than for firms that go public in a cold IPO market (see Table IA.III). Hot IPO markets have higher underpricing. In related work, Hovakimian and Hutton (2010) find that, with year fixed effects, more underpriced firms are more likely to pay for acquisitions with equity.

We also examine the conditional dollar acquisition rate. The results are available in Internet Appendix Table IA.IV. The sample used in this analysis excludes each year all deals of firms with at least one missing transaction value that year. We focus here on the sample of restricted acquisitions. The results for the sample of acquisition attempts are similar. We find that mature firms spend less on acquisitions than young firms. Firms that go public in a hot market or a neutral market spend a lot more on acquisitions when young. There is no evidence that dollar acquisition activity depends in any way on first-day returns. However, while the difference between the acquisition rates of firms in the first quintile and firms in the fifth quintile of first-day returns is not significant, its economic magnitude is large. Young firms spend a lot more on acquisitions during the merger and IPO wave of the 1990s than at other times.

Looking at the extent to which firms pursue diversifying acquisitions, we find that young firms spend more than mature firms on related acquisitions but not on diversifying acquisitions when we use all the SIC codes of a firm to identify diversifying acquisitions. Young firms spend much more on acquisitions of private firms than do mature firms. There is no difference in spending on acquisitions of public firms between young and mature firms. Note that, while young firms have a high acquisition rate of private companies, these acquisitions involve small firms and thus there is no significant difference between

young firms' spending on public firms and private firms. The conditional dollar acquisition rate is not significantly different for acquisitions paid for with cash and acquisitions paid for with stock regardless of whether firms are young or mature.

So far, we have ignored the fact that firms that go public in a calendar year vary in age since incorporation. It could be the case that the results above are due to the age since incorporation rather than the age since IPO. To investigate this possibility, we rerun the above analysis taking into account the age of incorporation (see Table IA.V in the Internet Appendix). When we divide firms into quintiles based on their age of incorporation, we find that the IPO firms have a surprisingly wide range of age since incorporation. For the youngest quintile, the median age since incorporation is two years, whereas for the oldest quintile, it is 40 years. The acquisition rate of young firms is higher than the acquisition rate of mature firms for all quartiles; the difference is significant only for the first and fourth quintiles. This result indicates that firms acquire more immediately after going public irrespective of their incorporation age, which is consistent with firms going public so that they have more resources to make acquisitions.

The results presented in this section show that, for the full sample, young firms make more acquisitions than mature firms. However, this result is sensitive to the organizational form of the target and to the state of the market for acquisitions. When we remove from our sample the merger wave of the late 1990s or when we focus on public firm acquisitions, there is no evidence that young firms acquire more. Strikingly, in contrast to the predictions of agency theories, young firms are at least as likely to make diversifying acquisitions as mature firms. Finally, firms' high post-IPO acquisition rate cannot be attributed to their age since incorporation, since firms with vastly different age since incorporation have high post-IPO acquisition rates.

## V. The Acquisition Rate and Firm Age

In this section, we estimate life cycle effects in the acquisition rate. It is well known that estimation of such effects in cross sections is biased because firms in a given year differ in both age and IPO cohort. The problem is even worse here as the number of firms varies across IPO cohorts and depends on economic conditions, since firms choose when to go public. Estimation that uses cohort- rather than firm-level variables avoids this endogeneity problem as the existence of an IPO cohort in a given year is not endogenous. However, we expect the acquisition rate of a cohort in a given calendar year to depend on economic conditions as well as characteristics of the cohort. For instance, we expect the acquisition rate of a cohort that is 10 years old to be different in the middle of a merger wave as opposed to a recession. It is also possible that the acquisition rate of a cohort depends on whether the cohort went public in a hot or cold market.

A widely used approach to estimate life cycle effects is to use indicator variables for age, period, and cohort (APC),[6] where the period indicator variables capture economic conditions. Such models are called APC models. In particular, a simple approach to allow for cohort, age, and economic condition effects is to estimate a regression of a cohort's acquisition rate in year $t$ ($Y_{iht}$) on an indicator variable for cohort $i$ (with effect $C_i$), an indicator variable for the age of firm $h$ in the cohort (with effect $A_h$), where the age is defined in relation to the IPO, and an indicator variable for calendar year $t$ (with effect $T_t$) to control for economic conditions that affect all firms in a cohort. The regression model can be represented as follows:

$$Y_{iht} = \sum_{j=1} C_i I_{\{i=j\}} + \sum_{j=1} A_h I_{\{h=j\}} + \sum_{j=1} T_t I_{\{t=j\}} + \epsilon_{iht}. \quad (1)$$

If the time intervals over which cohort, age, and calendar time take values are of the same width, the regression cannot be estimated because the age of firms in a cohort is given by the calendar time when the cohort is observed minus the calendar time at the start of the cohort. The literature proposes a number of approaches to address this issue (see Yang (2011) for a recent review and references). The most frequently used approaches involve using nonlinear functions of the APC effects, imposing constraints on the coefficients of the effects, or using proxies for these effects. We use all three approaches. Our conclusions do not depend on the approach chosen. In our case, regression (1) can be estimated because the age and period variables do not take values over the same intervals: using our data, we have no observations for the dependent variable from 1975 to 1980 and no observations for the cohort variable from 2009 to 2012. Further, we require a cohort year to have at least 20 firms at the start of an event year. Because of this restriction, the maximum age in our sample is 31 years. These restrictions together identify our model without having to impose extra assumptions typically used in the literature. Regression (1) in Table III shows that the age-, cohort-, and calendar-year effects are each significant. Figure 4 shows that there is a strong U-shape in the age effects. An earlier version of the paper considers a shorter sample period, with IPO cohorts ending in 2002 and acquisitions ending in 2006; using this shorter sample, estimation of regression (1) yields similar results, which suggests that our results do not appear to be sensitive to the years omitted.

To assess the robustness of the life cycle effects and to help with their interpretation, we next estimate alternative APC models suggested in the literature that employ different assumptions about the economic effects we are estimating. We first estimate a regression in which the age effect follows a quadratic function, while period effects and cohort effects are modeled with indicator variables. Regression (2) shows that the age effect decreases significantly with age and increases significantly with age squared. The convex function reaches a minimum between years 5 and 6.

[6] A vast social sciences literature addresses estimation of APC models. See, for instance, Mason and Fienberg (1985).

**Table III**

## Fixed-Effects Regressions for the Conditional Acquisition Rate of IPO Cohorts from 1975 to 2008

IPOs are identified using the SDC Global Issues Database. The IPO sample includes all IPOs from 1975 to 2008 excluding reverse LBOs, spinoffs, rights and unit offerings, ADRs, closed-end funds, REITs, and IPO firms with stock price data available from CRSP before their IPO announcement date. Acquisition deals of the IPO firms include all acquisitions in SDC's M&A database from 1981 to 2012. *Age* refers to the number of years between the deal year and the IPO year. Unrelated acquisitions have no two-digit SIC code in common between the acquirer and the target. This table presents regression coefficients for panel regression models where the dependent variable is the conditional acquisition rate for IPO cohorts in year $t$. An *IPO cohort* is defined as the group of firms that went public in the same calendar year. We start with 34 IPO cohorts that are followed longitudinally until December 31, 2012. IPO cohorts with less than 20 firms alive as of January 1 of an event year are excluded. The final sample for the regressions includes 32 IPO cohorts. *Merger wave* is the period from 1995 to 2000. *Merger index* is constructed by dividing the total number of acquisitions in SDC by the number of active firms in Compustat. The IPO market is classified as *hot* (fourth and fifth quintiles), *cold* (first quintile), or *neutral* (second and third quintiles) based on a quintile ranking of the quarterly number of IPOs following Yung, Çolak, and Wang (2008). Robust standard errors with clustering on IPO cohorts identified by IPO years are reported below the coefficient estimates. $^{*}$, $^{**}$, and $^{***}$ denote statistical significance at the 10%, 5%, and 1% level, respectively.

| | All Acquisitions | | | | | | Unrelated Acquisitions | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| Age | | $-0.01^{**}$ | | | | | | 0.009 | | | | |
| | | 0.03 | | | | | | 0.01 | | | | |
| $Age^2$ | | $0.001^{***}$ | | | | | | $0.0003^{***}$ | | | | |
| | | 0.0001 | | | | | | 0.00004 | | | | |
| Age 4–9 Years | | | $-0.07^{**}$ | $-0.04^{*}$ | $-0.08^{***}$ | 0.001 | | | $-0.02^{**}$ | $-0.01^{*}$ | $-0.02^{***}$ | −0.005 |
| | | | 0.03 | 0.02 | 0.03 | 0.03 | | | 0.01 | 0.01 | 0.01 | 0.01 |
| Age > 9 Years | | | 0.01 | $0.09^{**}$ | −0.01 | 0.09 | | | −0.01 | 0.01 | −0.02 | 0.003 |
| | | | 0.05 | 0.04 | 0.05 | 0.06 | | | 0.01 | 0.01 | 0.01 | 0.01 |
| $\text{Merger Wave}_t$ | | | $0.21^{***}$ | | $0.21^{***}$ | $0.26^{***}$ | | | $0.05^{***}$ | | $0.05^{***}$ | $0.06^{**}$ |
| | | | 0.03 | | 0.03 | 0.8 | | | 0.01 | | 0.01 | 0.03 |
| $\text{Merger Index}_t$ | | | | $0.19^{***}$ | | | | | | $0.05^{***}$ | | |
| | | | | 0.04 | | | | | | 0.01 | | |

(*Continued*)

**Table III**—*Continued*

| | All Acquisitions | | | | | | Unrelated Acquisitions | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| Hot IPO Cohort | | | | | −0.01 | | | | | | 0.003 | |
| | | | | | 0.02 | | | | | | 0.005 | |
| Cold IPO Cohort | | | | | −0.004 | | | | | | −0.004 | |
| | | | | | 0.04 | | | | | | 0.01 | |
| Merger Wave$_t$*Age 1–3 Years | | | | | | 0.35*** | | | | | | 0.06*** |
| | | | | | | 0.08 | | | | | | 0.02 |
| Merger Wave$_t$*Age 4–9 Years | | | | | | −0.07 | | | | | | −0.02 |
| | | | | | | 0.09 | | | | | | 0.03 |
| Merger Wave$_t$*Age >9 Years | | | | | | −0.16 | | | | | | −0.03 |
| | | | | | | 0.10 | | | | | | 0.03 |
| IPO Year Dummies (1976 to 2008) | Incl. 265.26*** | Incl. 216.86*** | | | | | Incl. 124.31*** | Incl. 139.59*** | | | | |
| Time Dummies (1982 to 2012) | Incl. 207.97*** | Incl. 247.59*** | | | | | Incl. 111.77*** | Incl. 107.59*** | | | | |
| Age Dummies (1–32) | Incl. 328.05*** | | | | | | Incl. 207.84*** | | | | | |
| IPO cohort fixed effects | No | No | Yes | Yes | No | Yes | No | No | Yes | Yes | No | Yes |
| Constant | −0.21 | −0.02 | 0.40*** | 0.20*** | 0.40*** | 0.43*** | −0.04 | −0.03 | 0.09*** | 0.04*** | 0.10*** | 0.09*** |
| | 0.15 | 0.17 | 0.03 | 0.02 | 0.03 | 0.02 | 0.09 | 0.17 | 0.00 | 0.01 | 0.01 | 0.01 |
| Adjusted $R^2$ | | | 0.18 | 0.17 | | 0.28 | | | 0.15 | 0.15 | | 0.20 |
| Number of IPO cohorts identified by IPO year | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 |
| Number of observations | 533 | 533 | 533 | 533 | 533 | 533 | 533 | 533 | 533 | 533 | 533 | 533 |
| Model | RE | RE | FE, Robust | FE, Robust | RE, Robust | FE, Robust | RE | RE | FE, Robust | FE, Robust | RE, Robust | FE, Robust |

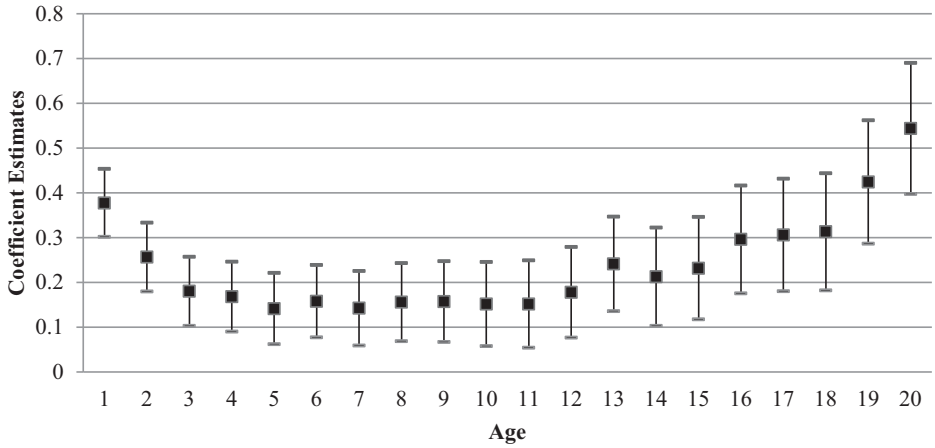


**Figure 4. Coefficient estimates of the age indicator variables in the model (1) of Table III**. This figure presents estimates with 95% confidence intervals of the age indicator variables in the panel regression corresponding to model (1) of Table III. The dependent variable is the conditional acquisition rate for IPO cohorts in year *t*.

Since we are interested in comparing young and mature firms, a natural constraint to impose on regression (1) is that the age effects depend on whether a firm is young, middle-aged, or mature. We also constrain the period indicator variable to have the same coefficient for each merger wave year and to have the same coefficient for each non–merger wave year, which amounts to assuming that the relevant economic condition effects are captured by the state of the market for corporate control. This assumption is strong, but it is reasonable to think that the state of the market for corporate control proxies for the most important effects common to all firms in a cohort in terms of economic conditions. We employ cohort fixed effects to control for cohort effects. Regression (3) estimates this specification. We find that middle-aged firms acquire less than young and mature firms, which is consistent with the U-shape estimated in regression (1). Mature firms' acquisition rate is not different from that of young firms. Not surprisingly, the indicator variable for a merger wave has a strong positive coefficient.

In regression (4), we use an index of merger activity as our proxy for period effects. This variable has the advantage of being a continuous variable. The index has a significantly positive coefficient. Again, middle-aged firms acquire less, but now mature firms acquire more than young firms. In regression (5), we use the merger wave indicator variable and indicator variables for whether a cohort started in a hot or cold IPO market. We find that whether a cohort started in a hot or cold market is not related to its acquisition rate when we control for the state of the market for corporate control. The coefficients on the indicator variables for young and middle-aged firms are similar to the coefficients in regression (2). Finally, in regression (6), we introduce the interaction between the merger wave indicator variable and the age indicator variable. We find

that the merger wave is associated with a much higher acquisition rate for young firms but the interaction is not significant for middle-aged or mature firms. In other words, the acquisition rate of young firms is extremely sensitive to aggregate merger waves. It follows from Table III that young and mature firms' acquisition rates are similar after accounting for economic conditions.

In regressions (7)–(12), we repeat the above tests on the subsample of diversifying acquisitions to investigate whether older firms diversify more than younger firms. We use the narrower definition of diversification and classify acquisitions as diversifying if there are no overlapping industries between the acquirer's and the target's at the two-digit SIC level. We again find that cohort, age, and calendar time effects are significant. The significance of the age effects is strongest for young firms and weakens as firms age. In regression (8), where we estimate the age effect using a quadratic function, we find that the level effect is estimated very imprecisely while the squared term has a positive and significant coefficient. In regression (9), we find that middle-aged firms diversify less. There is no difference in the rate of diversifying acquisitions between young and mature firms. The coefficient on the merger wave indicator variable is positive and significant. The significant coefficients on the indicator variables in regression (9) are approximately a fourth of the value of the coefficients in regression (3). This result does not mean that the age and merger wave effects are much smaller for diversifying acquisitions than for the full sample, as the average event-year acquisition rate for the full sample is larger than the average event-year acquisition rate for diversifying acquisitions. The other regressions for the diversifying acquisitions reproduce the results for the full sample of acquisitions. While we find some evidence of a U-shape for diversifying acquisitions when we control for cohort and calendar-year effects, this evidence is mixed compared to the evidence for the sample of all acquisitions.

## VI. Determinants of the Acquisition Rate over the Firm's Life Cycle

In this section, we use firm-level characteristics to investigate whether the determinants of the acquisition rate and of diversifying acquisitions differ for young and mature firms and whether these determinants support agency theories or neoclassical theories. We also investigate whether the life cycle effects documented earlier can be explained by firm characteristics. In other words, we examine whether changes in firm characteristics over the life cycle can explain the life cycle effects we estimate in Section V. As explained earlier, the number of firms in a cohort is endogenous. The cost of the approach used in this section is that this endogeneity is not controlled for other than by allowing for cohort fixed effects.

### *A. Firm Characteristics and the Acquisition Rate*

Under the agency view discussed in Section I, we expect firms to acquire and diversify when they run out of growth opportunities. They do so not to exploit some valuable asset, but to keep growing to benefit management. Hence, we

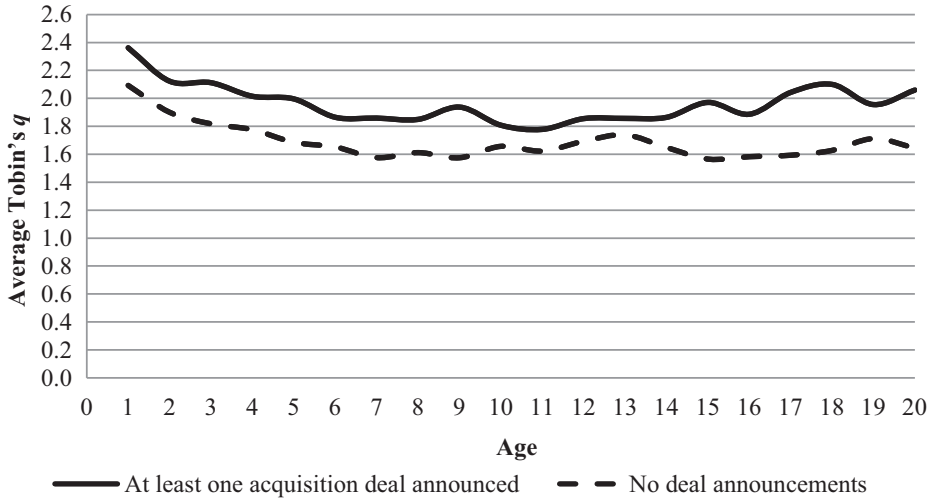


**Figure 5. Average Tobin's q over the life cycle of the public firm.** IPOs are identified using the SDC Global Issues Database. The IPO sample includes all IPOs over the 1975 to 2008 period excluding reverse LBOs, spinoffs, rights and unit offerings, ADRs, closed-end funds, REITs, and IPO firms with stock price data available from CRSP before their IPO announcement date. Acquisition deals of the IPO firms include all acquisitions in SDC's M&A database over 1981 to 2012. Age refers to the number of years since the IPO year. Tobin's q, $TQ_{t-1}$, is calculated as (((common shares outstanding*fiscal year-end closing price)+ $Debt_{t-1}$)/$Total\ Assets_{t-1}$).

would expect mature firms that acquire and diversify to be firms with a low Tobin's $q$. Figure 5 shows that this is not the case. We see that the mean $q$ ratio of acquirers is always higher than the mean $q$ ratio of nonacquirers irrespective of firm age. The annual mean difference between acquiring firms and nonacquiring firms is significant at the 1% level. We also see that $q$ is highest for young firms, as shown by Pástor and Veronesi (2003).

To investigate the relation between the acquisition rate and firm characteristics, we estimate negative binomial count models. Our regressions use lagged firm characteristics, so there is no concern that acquisitions affect these characteristics. Hovakimian and Hutton (2010) estimate logit models for acquisition activity by young firms. Their focus is quite different from ours as they are mostly concerned with how IPO-related firm characteristics are related to acquisition behavior. Logit models estimate whether a firm is likely to acquire during a year. Instead, negative binomial count models estimate how many acquisitions a firm is likely to make. The dependent variable of the negative binomial count models we estimate is therefore the acquisition rate of a firm in a given event year. For robustness, we also estimate, and tabulate in Table IA.VI, a regression using a Poisson count model and reach similar conclusions. The negative binomial model is a more flexible model as it accommodates the overdispersion in our dependent variable. Given that readily available fixed effect regressions for negative binomial models are not true fixed effect models

(Allison and Waterman (2002)), we estimate regressions with random effects using the generalized equation estimation method and specify all time-varying covariates as deviations from firm-specific means to achieve as close a model as feasible to a true fixed effects model.[7] We use robust standard errors clustered at the firm level.[8] We estimate all the regressions using a sample with no financial firms, no penny stocks, and no rollups. The results in the Internet Appendix, Table IA.VII, lead to similar inferences.

Under neoclassical theories' prediction that firms acquire to make the best use of valuable scarce assets, we would expect better-performing firms and firms with better growth opportunities to acquire more, irrespective of whether they are young or mature. In contrast, if firms acquire to replenish their growth opportunities to further the interests of managers as predicted by agency theories, we would expect the acquisition rate of firms to be higher when they have lower growth opportunities and poorer performance. We use two measures of performance: a firm's stock return in the previous year, and a firm's operating cash flow in the previous year, defined as operating income before depreciation, taxes, dividends, and related expenses. For our measure of growth opportunities, we use Tobin's $q$. These three variables are commonly used in models that predict acquisition behavior (e.g., Palepu (1986)). Since the agency theories also predict that firms with higher cash holdings acquire more, we capture the role of excess cash holdings using cash and short-term assets divided by total assets minus the industry median at the four-digit SIC level as in Harford, Mansi, and Maxwell (2008).

We also include a number of variables that have been shown to affect firms' acquisition rate. We use two measures of financial strength. First, we use the firm's debt-to-assets ratio in the previous year. Everything else equal, we would expect more highly levered firms to be less likely to acquire. Second, we use indicator variables for whether the firm has a high investment-grade credit rating (above BBB using S&P's long-term ratings) or a low credit rating (BBB and below) as in Maksimovic, Phillips, and Yang (2013). Again, we expect firms with a credit rating to be more likely to acquire, particularly firms with a high investment-grade rating. We also use a firm's capital expenditures normalized by total assets as a regressor. The coefficient on this variable does not have clear implications for our hypotheses. As Warusawitharana (2008) shows, firms that want to grow quickly are more likely to do so through acquisitions than through capital expenditures, which implies a negative coefficient on capital expenditures. However, it could also be the case that acquisitions are complementary with capital expenditures. In particular, firms with good growth opportunities could have high capital expenditures as well as a high acquisition rate. Theories that predict that firms acquire because of poor internal investment opportunities would imply a negative relation between acquisitions and

[7] We thank Paul Allison for helping us think through some of the estimation issues. The problem with existing statistical packages is that they do not eliminate all time-invariant variables.

[8] We also estimate, but do not tabulate, zero-inflated negative binominal models to account for firms that make no acquisitions.

capital expenditures. We use three proxies for economic conditions. First, we use a credit spread measure constructed as the difference between the yields on AAA bonds and BAA bonds. Second, we use the indicator variable for aggregate merger waves. To account for industry-specific conditions, we use the extent of delistings due to acquisitions in the firm's two-digit SIC code and the rate of IPOs in the firm's two-digit SIC code. Both variables are normalized by the number of firms in that two-digit SIC code at the end of the previous year on CRSP. Finally, we control for firm size. We winsorize the explanatory variables at the 1% and 99% levels to eliminate variables whose extreme values could affect the regression coefficient meaningfully.

The first two regressions of Table IV test for the existence of life cycle effects when we control for firm characteristics, industry conditions, and economic conditions. Regressions (1)–(5) use the full sample. In regression (1), we model life cycle effects using the quadratic formulation of regression (2) in Table III. The dependent variable is the number of acquisitions. The regression has a negative coefficient on age and a positive coefficient on age squared. Both of these coefficients are positive and significant. However, the minimum of the convex function is now at 10 years, which is more than the minimum in Table III. Hence, controlling for firm characteristics does not explain the life cycle effects. As expected from the neoclassical models, the acquisition rate increases with Tobin's $q$. Firms with better performance acquire more, so that firms with a higher stock return or higher cash flow acquire more. We find that the acquisition rate is increasing in the number of delistings. Not surprisingly given the results of Maksimovic, Phillips, and Yang (2013), a higher credit spread is associated with a lower acquisition rate. Firms with a credit rating acquire more, and so do firms with lower leverage. Also, as expected, firms acquire more during a merger wave. Larger firms do not acquire more, and the relation between the acquisition rate and capital expenditures is not significant. We also estimate regression (1) with industry indicator variables, and find no meaningful difference in the results (see Internet Appendix, Table IA.VIII). Though many of the coefficients are consistent with the predictions of neoclassical theories, we find a highly significant positive coefficient on cash holdings, which is consistent with the predictions of agency theories.

Regression (2) reports OLS estimates of regression (1). We cluster the standard errors at the firm- and calendar-year levels. The advantage of using OLS is that we can obtain true fixed effects. The regression also uses calendar-year indicator variables, which subsume the effects of the aggregate credit spread and of the merger wave indicator variable. As with regression (1), all firm variables are demeaned. Using this specification, we find that the age effects persist and the minimum of the convex function is at approximately 15 years, which is higher than that of the results of Table III. The firm performance variables and Tobin's $q$ have significantly positive effects. In contrast to regression (1), the number of IPOs in the industry has a positive and significant coefficient, but the number of delistings via acquisitions, assets, and cash holdings does not.

It follows from regressions (1) and (2) that the life cycle effects cannot be explained with firm characteristics and, as predicted by the neoclassical model,

## Table IV
## Number of Deals Announced in Years Following the IPO

IPOs are identified using the SDC Global Issues Database. The IPO sample includes all IPOs from 1975 to 2008 excluding reverse LBOs, spinoffs, rights and unit offerings, ADRs, closed-end funds, REITs, and IPO firms with stock price data available from CRSP before their IPO announcement date. Acquisition deals of the IPO firms include all acquisitions in SDC's M&A database from 1981 to 2012. We estimate negative binomial models (models (1), (3), (4), and (6)–(8)), and OLS models (models (2) and (5)) where the dependent variable is the total number of acquisitions made by firm $i$ in year $t$. *Age* refers to the number of years since the IPO year. Young (mature) firms are firms that are less than four years (greater than nine years) from their IPO. Middle-aged firms are firms that are more than 3 years but less than 10 years from their IPO. *New Firm Rate* 2-digit SIC, $t-1$ is calculated as (the number of IPOs in year $t-1$/firms alive as of beginning of year $t-1$). *Delisting Rate via Acquisitions* 2-digit SIC, $t-1$ is calculated as (the number of firms delisted in year $t-1$/firms alive as of beginning of year $t-1$). *(BAA-AAA) Spread*$_{t-1}$ is the difference between the Moody's BAA and the AAA rates in year $t-1$. Corporate bonds above (below) BBB by S&P correspond to *High (low) Investment Grade Bond*$_{t-1}$. The book values of the acquirer's accounting variables are measured at the end of fiscal year $t-1$, which is the year-end immediately preceding announcement year $t$. *Return*$_{t-1}$ is calculated as (Closing Stock Price$_{t-1}$+Dividends$_{t-1}$−Closing Stock Price$_{t-2}$)/(Closing Stock Price$_{t-2}$). We use the first-day closing stock price or bid-ask average (from CRSP) as the closing stock price at $t-2$ for $t = 1$. *Debt*$_{t-1}$ (sum of the current and long-term liabilities), *Capital Expenditure*$_{t-1}$, *Operating Cash-Flow*$_{t-1}$ (operating income before depreciation, interest, and related expenses), and *Cash & Short-Term Investments*$_{t-1}$ are divided by the book value of fiscal year-end *Total Assets*$_{t-1}$. Industry median at the four-digit SIC level is further subtracted from *Cash & Short Term Investments*$_{t-1}$/*Total Assets*$_{t-1}$ ratio following Harford, Mansi, and Maxwell (2008). *Merger Wave*$_t$ equals 1 if the deal is in the period from 1995 to 2000. Tobin's q, $TQ_{t-1}$, is calculated as ((common shares outstanding*fiscal year-end closing price) + *Debt*$_{t-1}$)/*Total Assets*$_{t-1}$). All firm-level continuous lagged variables are demeaned and *Return*$_{t-1}$ is further standardized at the firm level. The dependent variable is also demeaned at the firm level for models (2) and (5) following Douglas Miller's suggestion for implementing his STATA code CGMREG. Event year zero corresponds to the year the IPO drops out of the regressions when lagged accounting variables are included. We used the data for the fiscal year-end of the IPO year to calculate lagged values for the first event year following the IPO (event year = 1). Standard errors are presented under the coefficients. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

| | All | | | | | Young | Middle | Mature |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Age | −0.04*** | −0.03*** | | | | | | |
| | 0.01 | 0.01 | | | | | | |
| Age$^2$ | 0.002*** | 0.001*** | | | | | | |
| | 0.0004 | 0.0002 | | | | | | |
| Age 4–9 Years | | | −0.33*** | −0.16*** | −0.11*** | | | |
| | | | 0.03 | 0.04 | 0.02 | | | |

(*Continued*)

**Table IV**—*Continued*

| | All | | | | | Young | Middle | Mature |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Age > 9 Years | | | −0.39*** | −0.51*** | −0.16*** | | | |
| | | | 0.06 | 0.07 | 0.03 | | | |
| New Firm Rate$_{2\text{-digit SIC},t-1}$ | 0.03 | 0.06*** | 0.02 | −0.02 | 0.05** | 0.02 | 0.03 | 0.14** |
| | 0.03 | 0.02 | 0.03 | 0.02 | 0.03 | 0.03 | 0.04 | 0.06 |
| New Firm Rate$_{2\text{-digit SIC},t-1}$*Age 4–9 Years | | | | 0.05 | −0.01 | | | |
| | | | | 0.04 | 0.03 | | | |
| New Firm Rate$_{2\text{-digit SIC},t-1}$*Age >9 Years | | | | 0.12* | 0.05 | | | |
| | | | | 0.07 | 0.04 | | | |
| Delisting Rate via | 0.17*** | 0.00 | 0.17*** | 0.14*** | 0.01 | 0.13*** | 0.16*** | 0.17*** |
| Acquisitions$_{2\text{-digit SIC},t-1}$ | 0.03 | 0.01 | 0.03 | 0.03 | 0.02 | 0.03 | 0.03 | 0.04 |
| Delisting Rate via | | | | 0.02 | −0.01 | | | |
| Acquisitions$_{2\text{-digit SIC},t-1}$*Age 4–9 Years | | | | 0.03 | 0.02 | | | |
| Delisting Rate via | | | | 0.04 | −0.01 | | | |
| Acquisitions$_{2\text{-digit SIC},t-1}$*Age >9 Years | | | | 0.05 | 0.02 | | | |
| [BAA-AAA] Spread$_{t-1}$ | −0.45*** | | −0.44*** | −0.47*** | | −0.85*** | −0.41*** | −0.22*** |
| | 0.05 | | 0.05 | 0.06 | | 0.11 | 0.13 | 0.07 |
| High Investment-Grade Bond$_{i,\,t-1}$ | 1.58*** | 0.13* | 1.58*** | 1.09*** | 0.02 | 1.06*** | 1.41*** | 1.55*** |
| | 0.16 | 0.07 | 0.16 | 0.22 | 0.20 | 0.22 | 0.33 | 0.18 |
| High Investment-Grade Bond$_{i,\,t-1}$ | | | | 0.32 | −0.05 | | | |
| *Age 4–9 Years | | | | 0.25 | 0.29 | | | |

(*Continued*)

**Table IV**—*Continued*

| | All | | | | | Young | Middle | Mature |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| High Investment-Grade Bond$_{i,\,t-1}$ | | | | 0.47$^{*}$ | 0.20 | | | |
| *Age >9 Years | | | | 0.27 | 0.24 | | | |
| Low Investment-Grade Bond$_{i,\,t-1}$ | 0.93$^{***}$ | −0.06 | 0.93$^{***}$ | 0.86$^{***}$ | 0.13$^{*}$ | 0.84$^{***}$ | 0.94$^{***}$ | 0.83$^{***}$ |
| | 0.06 | 0.04 | 0.06 | 0.09 | 0.08 | 0.09 | 0.08 | 0.10 |
| Low Investment-Grade Bond$_{i,\,t-1}$ | | | | 0.09 | −0.24$^{**}$ | | | |
| *Age 4–9 Years | | | | 0.1 | 0.1 | | | |
| Low Investment-Grade Bond$_{i,\,t-1}$ | | | | −0.02 | −0.27$^{***}$ | | | |
| *Age >9 Years | | | | 0.14 | 0.09 | | | |
| Return$_{i,\,t-1}$ | 0.06$^{***}$ | 0.02$^{**}$ | 0.07$^{***}$ | 0.12$^{***}$ | 0.07$^{***}$ | 0.12$^{***}$ | 0.03 | 0.06$^{**}$ |
| | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.03 |
| Return$_{i,\,t-1}$*Age 4–9 Years | | | | −0.08$^{**}$ | −0.03 | | | |
| | | | | 0.03 | 0.02 | | | |
| Return$_{i,\,t-1}$ *Age >9 Years | | | | −0.05 | −0.09$^{***}$ | | | |
| | | | | 0.04 | 0.03 | | | |
| [Debt/Total Assets]$_{i,t-1}$ | −1.18$^{***}$ | −0.50$^{***}$ | −1.17$^{***}$ | −0.91$^{***}$ | −0.72$^{***}$ | −0.90$^{***}$ | −1.22$^{***}$ | −1.29$^{***}$ |
| | 0.13 | 0.07 | 0.12 | 0.20 | 0.12 | 0.20 | 0.19 | 0.21 |
| [Debt/Total Assets]$_{i,t-1}$*Age 4–9 Years | | | | −0.31 | 0.26$^{*}$ | | | |
| | | | | 0.28 | 0.14 | | | |
| [Debt/Total Assets]$_{i,t-1}$*Age >9 Years | | | | −0.40 | 0.37$^{***}$ | | | |
| | | | | 0.30 | 0.11 | | | |
| [Capital Exp./Total Assets]$_{i,t-1}$ | −0.27 | −0.26$^{**}$ | −0.32 | −1.54$^{***}$ | −0.22 | −1.49$^{***}$ | 0.89$^{**}$ | 0.09 |
| | 0.23 | 0.12 | 0.22 | 0.37 | 0.16 | 0.37 | 0.36 | 0.57 |
| [Capital Exp./Total Assets]$_{i,t-1}$ | | | | 2.43$^{***}$ | 0.11 | | | |
| *Age 4–9 Years | | | | 0.57 | 0.16 | | | |

(*Continued*)

**Table IV**—*Continued*

| | All | | | | | Young | Middle | Mature |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| [Capital Exp./Total Assets]$_{i,t-1}$ | | | | 1.58** | −0.43** | | | |
| *Age >9 Years | | | | 0.71 | 0.20 | | | |
| [Operating Cash Flow/Total Assets],$_{it-1}$ | 1.06*** | 0.14*** | 1.07*** | 1.27*** | 0.16** | 1.23*** | 1.41*** | 0.20 |
| | 0.07 | 0.05 | 0.07 | 0.10 | 0.07 | 0.10 | 0.13 | 0.16 |
| [Operating Cash Flow/Total Assets]$_{i,t-1}$*Age 4–9 Years | | | | 0.12 | 0.01 | | | |
| | | | | 0.17 | 0.07 | | | |
| [Operating Cash Flow/Total Assets]$_{i,t-1}$*Age >9 Years | | | | −1.10*** | −0.13 | | | |
| | | | | 0.20 | 0.09 | | | |
| Merger Wave$_t$ | 0.40*** | | 0.40*** | 0.59*** | | 0.43*** | 0.32*** | 0.35*** |
| | 0.04 | | 0.04 | 0.05 | | 0.06 | 0.07 | 0.07 |
| Merger Wave$_t$*Age 4–9 Years | | | | −0.29*** | | | | |
| | | | | 0.07 | | | | |
| Merger Wave$_t$*Age >9 Years | | | | −0.31*** | | | | |
| | | | | 0.09 | | | | |
| TQ$_{i,t-1}$ | 0.09*** | 0.08*** | 0.09*** | 0.09*** | 0.08*** | 0.09*** | 0.11*** | 0.08*** |
| | 0.01 | 0.02 | 0.01 | 0.01 | 0.02 | 0.01 | 0.02 | 0.02 |
| TQ$_{i,t-1}$*Age 4–9 Years | | | | 0.01 | −0.02 | | | |
| | | | | 0.03 | 0.02 | | | |
| TQ$_{i,t-1}$*Age >9 Years | | | | −0.02 | −0.01 | | | |
| | | | | 0.02 | 0.02 | | | |

(*Continued*)

**Table IV**—*Continued*

| | All | | | | | Young | Middle | Mature |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| [Cash & Short-Term Invest./Total Assets]$_{i,t-1}$−[Cash & Short Term Invest./Total Assets]$_{\text{4-Digit SIC Ind. Median},t-1}$ | 0.31*** | 0.11** | 0.32*** | −0.25* | 0.08 | −0.26** | 0.98*** | 0.33 |
| | 0.10 | 0.05 | 0.10 | 0.14 | 0.08 | 0.13 | 0.18 | 0.23 |
| [Cash & Short-Term Invest./Total Assets]$_{i,t-1}$−[Cash & Short -Term Invest./Total Assets]$_{\text{4-Digit SIC Ind. Median},t-1}$*Age 4–9 Years | | | | 1.22*** | 0.16* | | | |
| | | | | 0.22 | 0.09 | | | |
| [Cash & Short-Term Invest./Total Assets]$_{\text{i, }t-1}$−[Cash & Short -Term Invest./Total Assets]$_{\text{4-Digit SIC Ind. Median},t-1}$*Age >9 Years | | | | 0.55** | −0.08 | | | |
| | | | | 0.26 | 0.10 | | | |
| Logged Total Assets$_{i,t-1}$ | 0.05 | 0.03 | 0.04 | −0.30*** | −0.01 | −0.30*** | 0.02 | 0.51*** |
| | 0.03 | 0.03 | 0.03 | 0.03 | 0.05 | 0.03 | 0.05 | 0.05 |
| Logged Total Assets$_{i,t-1}$*Age 4–9 Years | | | | 0.32*** | −0.01 | | | |
| | | | | 0.05 | 0.03 | | | |
| Logged Total Assets$_{i,t-1}$*Age >9 Years | | | | 0.81*** | 0.13* | | | |
| | | | | 0.06 | 0.07 | | | |
| Constant | −0.55*** | −0.46*** | −0.49*** | −0.50*** | −0.48*** | 0.04 | −0.62*** | −1.14*** |
| | 0.06 | 0.09 | 0.06 | 0.06 | 0.11 | 0.10 | 0.12 | 0.09 |
| Adjusted $R^2$ | | 0.039 | | | 0.043 | | | |
| Robust std. errors | Yes | | Yes | Yes | Yes | Yes | Yes | Yes |
| Number of time periods for clustering errors | | | | | | | | |
| Number of firms for clustering errors | 6,143 | 6,143 | 6,143 | 6,143 | 6,143 | 5,807 | 4,815 | 2,371 |
| Number of observations | 49,991 | 49,991 | 49,991 | 49,991 | 49,991 | 14,791 | 19,607 | 15,593 |

better-performing firms acquire more. The mean of the dependent variable in regressions (1) and (2) is 0.51. Using the OLS regression, at age 20, the acquisition rate increases by 0.01 a year. In contrast, for a one-year-old firm, an additional year reduces the acquisition rate by 0.03, or by 6% of the mean acquisition rate for the sample. Using regression (1), we can use the average marginal effect multiplied by the standard deviation of the variable to estimate the economic effect of the variable. Proceeding this way, a one-standard-deviation increase in Tobin's $q$ in year $t$ predicts an increase in the acquisition rate in year $t+1$ of 15%, or 0.08 acquisitions. A one-standard-deviation increase in operating cash flow is associated with an increase in the acquisition rate of 18%, or 0.09 acquisitions. A one-standard-deviation increase in the return in year $t$ predicts an increase in the acquisition rate of 6% in year $t+1$. The economic impact of the credit spread is more than three-fourths the impact of Tobin's $q$, but of the opposite sign. Lastly, a one-standard-deviation increase in cash holdings in excess of the industry increases the acquisition rate by 4%, which is slightly less than one-third of the effect of Tobin's $q$.

We next reestimate regression (1) using indicator variables for middle-aged and mature firms. Since regression (1) shows that the acquisition rate reaches its lowest level when firms are mature, we would expect the coefficients on the indicator variables for firms' stage of the life cycle to have different estimates than in Table III when we control for firm characteristics. Regression (3) shows that this is the case, both coefficients are negative. This specification has no impact on the other coefficients in the regression.

To examine whether the determinants of a firm's acquisition rate depend on its life cycle stage, in regression (4), we estimate a regression in which we interact the indicator variables for middle-aged and mature firms with the determinants of the acquisition rate used in regression (3). Note that there are two issues with regression (4). First, multicollinearity is a concern. This problem is substantially reduced by not interacting the credit spread variable. Second, interpretation of interactions in nonlinear regressions is problematic. When we employ OLS in regression (5), the inferences are often but not always similar. The key differences are with respect to total assets and cash holdings. These variables have significant coefficients in regression (4) but not in regression (5) for the full sample. We also estimate regressions for young, middle-aged, and mature firms in regressions (6)–(8), respectively. These regressions lead to similar conclusions as regression (4).

From Section I, the agency view implies that mature firms should acquire more if they have poor growth opportunities. We find no evidence consistent with this prediction. The relation between the acquisition rate and Tobin's $q$ is the same irrespective of the firm's life cycle stage. The neoclassical view predicts that better firms should acquire more. For young firms, the acquisition rate increases with the previous year's stock return and cash flow. However, for mature firms, the relation between the acquisition rate and cash flow as well as that between the acquisition rate and the stock return are weaker. These results suggest that performance is less of a determinant of the acquisition rate for mature firms than for young firms. The relation between the

acquisition rate and capital expenditures depends on a firm's stage of the life cycle. Acquisitions appear to be substitutes for capital expenditures for young firms but unrelated to capital expenditures for mature firms. The acquisition rate falls with size for young firms but increases with size for mature firms. Lastly, cash holdings have different effects for young and mature firms. The acquisition rate is inversely related to cash holdings for young firms, but unrelated to cash holdings for mature firms. Hence, the evidence for cash holdings is inconsistent with agency models. A stronger test of the agency view is to check whether the acquisition rate is negatively related to the interaction between $q$ and cash holdings. We find no such result when we reestimate regression models (1)–(3) and (6)–(8) in Table IV with the interaction term using an indicator variable that takes the value of one when $q$ is above the sample median and zero otherwise and excess cash. We use the indicator variable for $q$ for the ease of interpretation and exclude models (4) and (5) due to three-way interactions increasing multicollinearity. The statistically insignificant coefficients (standard errors) of the interaction terms are 0.16 (0.29) for the young and −0.40 (0.40) for the mature firms with $p$-values much larger than 10%.

In the last three regressions, we compare the economic significance of the covariates for young and mature firms using marginal effects and the standard deviation of the covariates. The economic significance of Tobin's $q$ as a determinant of the acquisition rate is slightly higher for young firms than for mature firms. Specifically, a one-standard-deviation increase in Tobin's $q$ in year $t$ is associated with an increase in the acquisition rate of 17% for young firms and 11% for mature firms. The economic significance of operating cash flow for young firms is large, as a one-standard-deviation increase in operating cash flow for young firms is associated with an increase in the acquisition rate of 23%. Most strikingly, a one-standard-deviation increase in the credit spread leads to a decrease in the acquisition rate of young firms of 28%. In contrast, the acquisition rate of mature firms decreases by only 8% for a similar increase in the credit spread.

In the Internet Appendix, we reestimate all the regressions in Table IV adding a proxy for misvaluation (see Internet Appendix, Table IA.IX). We use a measure of firm-specific misvaluation developed by Rhodes-Kropf, Robinson, and Viswanathan (2005). This measure is obtained from yearly within-industry regressions. We estimate this measure using all public firms during our sample period. An obvious limitation of this measure is that it uses variables that are highly correlated with covariates in our regression (for instance, net income and excess cash). We find that misvaluation is significant in regressions (1) and (3). In regression (1), a one-standard-deviation increase in the misvaluation measure increases the acquisition rate by 6%, while a one-standard-deviation increase in Tobin's $q$ increases it by 11%. However, when we evaluate separately the relation between the acquisition rate for firms at different stages of the life cycle, misvaluation is insignificant for young and mature firms.

The agency explanation for the U-shape in the acquisition rate is that older firms make acquisitions to acquire growth opportunities because they have exhausted their growth opportunities. This view implies that mature firms

that have low growth opportunities and performance make more acquisitions. Our evidence is contrary to that view. Mature firms make more acquisitions when they have higher returns and a higher Tobin's $q$, but not when they have higher cash flow. Strikingly, the acquisition rate of mature firms is almost as sensitive to Tobin's $q$ as that of young firms.

### *B. The Determinants of Diversifying Acquisitions*

We now investigate the choice between announcing no deal, a related deal, or an unrelated deal in a given year. To do so, one approach is to assume that a firm considers each of these options as separate projects; it evaluates the NPV of each project and picks one. Under this approach, the three independent options are evaluated simultaneously, in which case a multinomial logit specification is appropriate to model firm behavior. We estimate models where the choices are not necessarily independent. Using these models, we fail to reject the hypothesis that the choices are independent (Wald test for collapsing three outcome categories is rejected for all possible combinations into pairs at $p$-values less than 1%), and reject that they are ordered (Brant test of parallel regression assumption is rejected with $\text{Chi}^2 = 3{,}484.57$, $p$-value $< 0.01$). We want to understand whether the determinants of making a diversifying acquisition differ between young and mature firms. Since a firm can make multiple acquisitions in a year, we classify a firm that makes multiple acquisitions as a diversifying firm if it makes more diversifying acquisitions than related acquisitions in that year. We omit the small number of firm-years for which a firm makes an equal number of diversifying and related acquisitions. We report in Table V results for acquisitions identified as diversifying if all of the two-digit SIC codes of the target differ from the two-digit SIC codes of the acquirer. We also report the results using a broader definition of diversification based on the commonality of the primary two-digit SIC codes between the acquirer and target firms in the Internet Appendix, Table IA.X. These regressions yield similar results.

The first two regressions of Table V investigate whether the rate of related and diversifying, or unrelated, acquisitions exhibit life cycle effects when controlling for industry, firm, and economic condition characteristics. We use the same regressors as in Table IV. We find that the life cycle effects are similar for related and unrelated acquisitions irrespective of the specification we use. For most regressors, the coefficients are very similar between related and unrelated acquisitions. The main exceptions are for the industry variables. While the IPO rate in an industry has no effect on the probability of acquisitions when we define diversification based on the narrower definition of diversification, a high IPO rate in an industry has more of an impact on diversifying than on related acquisitions when we define diversification based on the primary two-digit SIC codes of the acquirer and the target firms (see Internet Appendix, Table IA.X). A possible explanation for this result is that new firms are particularly productive, which leads them to use their skills in industries other than their primary ones. In contrast, more delistings because of acquisitions lead the survivors to acquire more within the industry, which is what we would

**Table V**

## Probability of Announcing No Deal, a Related Deal Based on all SIC Codes, or an Unrelated Deal in a Year Following IPO

IPOs are identified using the SDC Global Issues Database. The IPO sample includes all IPOs from 1975 to 2008 excluding reverse LBOs, spinoffs, rights and unit offerings, ADRs, closed-end funds, REITs, and IPO firms with stock price data available from CRSP before their IPO announcement date. Acquisition deals of the IPO firms include all acquisitions in Young (mature) firms are firms that are less four years (greater than nine years) from their IPO. Middle-aged firms are firms that are greater than 3 years but less than 10 years from their SDC's M&A database from 1981 to 2012. In the multinomial logit regression, the dependent variable takes the value of 0 if the firm announced no acquisitions in year $t$, 1 if it had a related acquisition, and 2 if it had an unrelated acquisition. Base outcome is when the firm has no deal in year $t$. *Related* acquisitions have at least one four-digit SIC code in common between the acquirer and the target. If a firm has more than one deal in a given year, we collapse it into one deal and classify it as related if the number of related deals is higher than unrelated ones and vice versa. We exclude firm-years in which there are equal numbers of related and unrelated deals from the regressions. *Age* refers to the number of years since the IPO year. *New Firm Rate*$_{\text{2-digit SIC, }t-1}$ is calculated as (the number of IPOs in year $t-1$/firms alive as of beginning of year $t-1$). *Delisting Rate via Acquisitions*$_{\text{2-digit SIC, }t\text{-}1}$ is calculated as (the number of firms delisted in year $t-1$/firms alive as of beginning of year $t-1$). *(BAA-AAA) Spread*$_{t-1}$ is the difference between the Moody's BAA and the AAA rates in year $t-1$. Corporate bonds above (below) BBB by S&P correspond to *High (low) Investment Grade Bond* $t-1$. The book values of the acquirer's accounting variables are measured at the end of fiscal year $t-1$, which is the year-end immediately preceding announcement year $t$. *Return*$_{t-1}$ is calculated as (Closing Stock Price$_{t-1}$+Dividends$_{t-1}$−Closing Stock Price$_{t-2}$)/(Closing Stock Price$_{t-2}$). We use the first-day closing stock price or bid-ask average (from CRSP) as the closing stock price at $t-2$ for $t = 1$. *Debt*$_{t-1}$ (sum of the current and long-term liabilities), *Capital Expenditure*$_{t-1}$, *Operating Cash-Flow*$_{t-1}$ (operating income before depreciation, interest, and related expenses), and *Cash & Short-Term Investments*$_{t-1}$ are divided by the book value of fiscal year-end *Total Assets*$_{t-1}$. Industry median at the four-digit SIC level is further subtracted from *Cash & Short Term Investments*$_{t-1}$/*Total Assets*$_{t-1}$ ratio following Harford, Mansi, and Maxwell (2008). *Merger Wave*$_t$ equals 1 if the deal is in the period from 1995 to 2000. Tobin's q, $TQ_{t-1}$, is calculated as ((common shares outstanding*fiscal year-end closing price)+ *Debt*$_{t-1}$)/*Total Assets*$_{t-1}$. All firm-level continuous lagged variables are demeaned and *Return*$_{t-1}$ is further standardized at the firm level. Event year zero corresponds to the year the IPO drops out of the regressions when lagged accounting variables are included. We used the data for the fiscal year-end of the IPO year to calculate lagged values for the first event year following the IPO (event year = 1). Standard errors are presented under the coefficients. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

| | All | | | | | | Young | | Middle | | Mature | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | | (4) | | (5) | | (6) | |
| | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. |
| Age | −0.07*** | −0.09*** | | | | | | | | | | |
| | 0.01 | 0.01 | | | | | | | | | | |
| Age$^2$ | 0.002*** | 0.002*** | | | | | | | | | | |
| | 0.0003 | 0.0006 | | | | | | | | | | |

(*Continued*)

**Table V**—*Continued*

| | All | | | | | | Young | | Middle | | Mature | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | | (4) | | (5) | | (6) | |
| | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. |
| Age 4–9 Years | | | −0.34*** | −0.37*** | −0.22*** | −0.33*** | | | | | | |
| | | | 0.03 | 0.06 | 0.04 | 0.08 | | | | | | |
| Age > 9 Years | | | −0.44*** | −0.59*** | −0.48*** | −0.77*** | | | | | | |
| | | | 0.05 | 0.08 | 0.07 | 0.11 | | | | | | |
| New Firm Rate$_{2\text{-digit SIC},t-1}$ | 0.03 | 0.03 | 0.03 | 0.04 | 0.04 | 0.01 | 0.09*** | 0.04 | 0.01 | 0.06 | 0.08* | 0.07 |
| | 0.02 | 0.03 | 0.02 | 0.03 | 0.03 | 0.04 | 0.03 | 0.05 | 0.03 | 0.06 | 0.05 | 0.08 |
| New Firm Rate$_{2\text{-digit SIC},t-1}$ | | | | | −0.03 | 0.05 | | | | | | |
| *Age 4–9 Years | | | | | 0.04 | 0.07 | | | | | | |
| New Firm Rate$_{2\text{-digit SIC},t-1}$ | | | | | −0.01 | 0.03 | | | | | | |
| *Age >9 Years | | | | | 0.06 | 0.10 | | | | | | |
| Delisting Rate via | 0.26*** | −0.04 | 0.26*** | −0.04 | 0.31*** | −0.07 | 0.30*** | −0.07 | 0.25*** | −0.05 | 0.22*** | 0.03 |
| Acquisitions$_{2\text{-digit SIC},t-1}$ | 0.02 | 0.03 | 0.02 | 0.03 | 0.03 | 0.06 | 0.03 | 0.06 | 0.03 | 0.05 | 0.04 | 0.06 |
| Delisting Rate via | | | | | −0.06* | 0.01 | | | | | | |
| Acquisitions$_{2\text{-digit SIC},t-1}$* | | | | | 0.03 | 0.07 | | | | | | |
| Age 4–9 Years | | | | | | | | | | | | |
| Delisting Rate via | | | | | −0.08* | 0.10 | | | | | | |
| Acquisitions$_{2\text{-digit SIC},t-1}$* | | | | | 0.05 | 0.08 | | | | | | |
| Age >9 Years | | | | | | | | | | | | |
| [BAA-AAA] Spread$_{t-1}$ | −0.44*** | −0.35*** | −0.43*** | −0.34*** | −0.49*** | −0.38*** | −1.04*** | −0.62*** | −0.42*** | −0.38** | −0.13** | −0.13 |
| | 0.04 | 0.09 | 0.04 | 0.09 | 0.05 | 0.10 | 0.10 | 0.17 | 0.09 | 0.17 | 0.06 | 0.16 |
| High Investment-Grade | 1.43*** | 1.46*** | 1.42*** | 1.44*** | 1.14*** | 0.91* | 1.12*** | 0.90* | 1.31*** | 1.17*** | 1.33*** | 1.66*** |
| Bond$_{i,t-1}$ | 0.16 | 0.29 | 0.16 | 0.29 | 0.34 | 0.46 | 0.34 | 0.46 | 0.19 | 0.43 | 0.22 | 0.31 |

(*Continued*)

**Table V**—*Continued*

| | All | | | | | | Young | | Middle | | Mature | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | | (4) | | (5) | | (6) | |
| | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. |
| High Investment-Grade | | | | | 0.17 | 0.27 | | | | | | |
| $Bond_{i,t-1}$*Age 4–9 Years | | | | | 0.35 | 0.43 | | | | | | |
| High Investment-Grade | | | | | 0.20 | 0.76 | | | | | | |
| $Bond_{i,t-1}$*Age >9 Years | | | | | 0.40 | 0.47 | | | | | | |
| Low Investment-Grade | 1.05*** | 0.58*** | 1.04*** | 0.58*** | 1.02*** | 0.21 | 1.00*** | 0.20 | 1.09*** | 0.56*** | 0.87*** | 0.81*** |
| $Bond_{i,t-1}$ | 0.06 | 0.09 | 0.06 | 0.09 | 0.09 | 0.17 | 0.09 | 0.17 | 0.08 | 0.13 | 0.10 | 0.15 |
| Low Investment-Grade | | | | | 0.07 | 0.35* | | | | | | |
| $Bond_{i,t-1}$*Age 4–9 Years | | | | | 0.11 | 0.20 | | | | | | |
| Low Investment-Grade | | | | | −0.14 | 0.60*** | | | | | | |
| $Bond_{i,t-1}$*Age >9 Years | | | | | 0.13 | 0.23 | | | | | | |
| $Return_{i,t-1}$ | 0.04*** | 0.03 | 0.04*** | 0.03 | 0.07*** | 0.03 | 0.06** | 0.03 | 0.05** | 0.05 | 0.01 | 0.02 |
| | 0.01 | 0.02 | 0.01 | 0.02 | 0.03 | 0.05 | 0.03 | 0.05 | 0.02 | 0.04 | 0.02 | 0.04 |
| $Return_{i,t-1}$*Age 4–9 Years | | | | | −0.02 | 0.02 | | | | | | |
| | | | | | 0.03 | 0.06 | | | | | | |
| $Return_{i,t-1}$*Age >9 Years | | | | | −0.04 | −0.01 | | | | | | |
| | | | | | 0.03 | 0.06 | | | | | | |
| [Debt/Total | −1.24*** | −1.25*** | −1.22*** | −1.23*** | −0.90*** | −0.82*** | −0.89*** | −0.82** | −1.44*** | −1.60*** | −1.23*** | −1.37*** |
| $Assets]_{i,t-1}$ | 0.11 | 0.19 | 0.11 | 0.19 | 0.19 | 0.32 | 0.19 | 0.32 | 0.19 | 0.36 | 0.21 | 0.36 |
| [Debt/Total | | | | | −0.54** | −0.78 | | | | | | |
| $Assets]_{i,t-1}$*Age 4–9 Years | | | | | 0.26 | 0.48 | | | | | | |
| [Debt/Total | | | | | −0.33 | −0.55 | | | | | | |
| $Assets]_{i,t-1}$*Age >9 Years | | | | | 0.29 | 0.47 | | | | | | |

(*Continued*)

**Table V**—*Continued*

| | All | | | | | | Young | | Middle | | Mature | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | | (4) | | (5) | | (6) | |
| | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. |
| [Capital Exp./Total | 0.12 | 0.45 | 0.06 | 0.41 | −1.06*** | −0.01 | −0.99** | 0.04 | 1.22*** | 1.57** | 0.46 | −1.10 |
| Assets]$_{i,t-1}$ | 0.25 | 0.44 | 0.25 | 0.44 | 0.39 | 0.64 | 0.40 | 0.64 | 0.44 | 0.75 | 0.66 | 1.19 |
| [Capital Exp./Total | | | | | 2.29*** | 1.59 | | | | | | |
| Assets]$_{i,t-1}$*Age 4–9 Years | | | | | 0.60 | 1.00 | | | | | | |
| [Capital Exp./Total | | | | | 1.49* | −1.11 | | | | | | |
| Assets]$_{i,t-1}$*Age >9 Years | | | | | 0.78 | 1.36 | | | | | | |
| [Operating Cash Flow/Total | 1.14*** | 0.85*** | 1.15*** | 0.88*** | 1.40*** | 1.49*** | 1.40*** | 1.49*** | 1.33*** | 0.73*** | 0.56*** | −0.10 |
| Assets]$_{i,t-1}$ | 0.08 | 0.18 | 0.08 | 0.18 | 0.14 | 0.28 | 0.14 | 0.28 | 0.15 | 0.26 | 0.18 | 0.38 |
| [Operating Cash Flow/Total | | | | | −0.07 | −0.76** | | | | | | |
| Assets]$_{i,t-1}$*Age 4–9 Years | | | | | 0.20 | 0.38 | | | | | | |
| [Operating Cash Flow/Total | | | | | −0.84*** | −1.60*** | | | | | | |
| Assets]$_{i,t-1}$*Age >9 Years | | | | | 0.23 | 0.47 | | | | | | |
| Merger Wave$_t$ | 0.31*** | 0.33*** | 0.32*** | 0.34*** | 0.48*** | 0.39*** | 0.25*** | 0.27*** | 0.32*** | 0.27** | 0.23*** | 0.49*** |
| | 0.03 | 0.06 | 0.03 | 0.06 | 0.05 | 0.09 | 0.06 | 0.10 | 0.06 | 0.11 | 0.07 | 0.13 |
| Merger Wave$_t$ | | | | | −0.18*** | −0.11 | | | | | | |
| *Age 4–9 Years | | | | | 0.07 | 0.12 | | | | | | |

(*Continued*)

**Table V**—*Continued*

| | All | | | | | | Young | | Middle | | Mature | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | | (4) | | (5) | | (6) | |
| | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. |
| Merger Wave$_t$*Age >9 Years | | | | | $-0.35^{***}$ | 0.04 | | | | | | |
| | | | | | 0.09 | 0.15 | | | | | | |
| $TQ_{i,t-1}$ | $0.09^{***}$ | $0.07^{***}$ | $0.10^{***}$ | $0.07^{***}$ | $0.12^{***}$ | $0.08^{***}$ | $0.13^{***}$ | $0.08^{***}$ | $0.08^{***}$ | $0.05^{*}$ | $0.05^{**}$ | $0.08^{**}$ |
| | 0.01 | 0.02 | 0.01 | 0.02 | 0.01 | 0.02 | 0.01 | 0.02 | 0.02 | 0.03 | 0.02 | 0.04 |
| $TQ_{i,t-1}$*Age 4–9 Years | | | | | $-0.04^{**}$ | $-0.03$ | | | | | | |
| | | | | | 0.02 | 0.04 | | | | | | |
| $TQ_{i,t-1}$*Age >9 Years | | | | | $-0.08^{***}$ | $-0.01$ | | | | | | |
| | | | | | 0.03 | 0.05 | | | | | | |
| [Cash & Short-Term Invest./Total Assets]$_{i,t-1}$ − [Cash & Short Term Invest./Total Assets]$_{4\text{-Digit SIC Ind. Median},t-1}$ | $0.72^{***}$ | $0.68^{***}$ | $0.72^{***}$ | $0.69^{***}$ | $0.36^{**}$ | 0.40 | $0.34^{**}$ | 0.40 | $1.35^{***}$ | $0.93^{***}$ | 0.27 | $0.67^{*}$ |
| | 0.10 | 0.18 | 0.10 | 0.18 | 0.16 | 0.28 | 0.16 | 0.28 | 0.18 | 0.33 | 0.21 | 0.38 |
| [Cash & Short-Term Invest./Total Assets]$_{i,t-1}$ − [Cash & Short -Term Invest./Total Assets]$_{4\text{-Digit SIC Ind. Median},t-1}$* Age 4–9 Years | | | | | $1.00^{***}$ | 0.53 | | | | | | |
| | | | | | 0.24 | 0.43 | | | | | | |

(*Continued*)

**Table V**—*Continued*

| | All | | | | | | Young | | Middle | | Mature | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | | (4) | | (5) | | (6) | |
| | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. | Rel. | Unrel. |
| [Cash & Short-Term Invest./Total Assets]$_{i,t-1}$−[Cash & Short -Term Invest./Total Assets]$_{\text{4-Digit SIC Ind. Median},t-1}$* Age >9 Years | | | | | −0.09 | 0.27 | | | | | | |
| | | | | | 0.27 | 0.47 | | | | | | |
| Logged Total Assets$_{i,t-1}$ | 0.02 | −0.01 | 0.01 | −0.03 | −0.32*** | −0.19*** | −0.32*** | −0.20*** | −0.01 | −0.02 | 0.39*** | 0.15* |
| | 0.03 | 0.04 | 0.02 | 0.04 | 0.03 | 0.05 | 0.03 | 0.05 | 0.04 | 0.07 | 0.04 | 0.08 |
| Logged Total Assets$_{i,t-1}$ *Age 4–9 Years | | | | | 0.30*** | 0.17** | | | | | | |
| | | | | | 0.05 | 0.09 | | | | | | |
| Logged Total Assets$_{i,t-1}$ *Age >9 Years | | | | | 0.71*** | 0.35*** | | | | | | |
| | | | | | 0.05 | 0.10 | | | | | | |
| Constant | −0.71*** | −2.17*** | −0.81*** | −2.30*** | −1.04*** | −2.58*** | −0.31*** | −2.02*** | −1.17*** | −2.62*** | −1.74*** | −3.24*** |
| | 0.06 | 0.11 | 0.05 | 0.10 | 0.05 | 0.10 | 0.10 | 0.17 | 0.09 | 0.17 | 0.08 | 0.16 |
| Robust std. errors | Yes | | Yes | | Yes | | Yes | | | Yes | | Yes |
| Number of firms (panels) for clustered errors | 6,136 | | 6,136 | | 6,136 | | 5,773 | | | 4,805 | | 2,368 |
| Number of observations | 49,391 | | 49,391 | | 49,391 | | 14,444 | | | 19,414 | | 15,533 |

expect if there is industry consolidation. Importantly, and in contrast to agency theories, there is no evidence that, overall, the relation between acquisitions and cash holdings differs for related and unrelated acquisitions.

Regression (3) allows the slopes to differ depending on the life cycle stage of the firm. Regressions (4)–(6) show estimates for firms in different life cycle stages. These estimates are similar to those implied by regression (3). In regression (3), there is no evidence that the relation between cash and the acquisition rate differs for related and unrelated acquisitions. This result is exactly the opposite of what one would expect based on the free cash flow theory.

We reestimate the regressions of Table V after adding the measure of firm-specific misvaluation. The misvaluation measure has a significant positive coefficient for related acquisitions but not for unrelated acquisitions for the full sample (see Table IA.XI). Regression (3) shows that misvaluation has more of an effect for acquisitions of related firms by middle-aged and mature firms. Finally, when we turn to the regressions for firms that are at a specific stage of their life cycle, we find that the firm-specific misvaluation is insignificant for related or unrelated acquisitions for both young and mature firms.

Overall, Table V finds no support for the view that mature firms with poor growth opportunities are more likely to diversify as predicted by agency theories. In robustness tests, we reestimate the regressions in Table V for a sample with no financial firms, no utilities, no penny stocks, and no rollups. The results, reported in the Internet Appendix, Table IA.XII, are mostly similar.

## VII. The Market's Reaction to Acquisitions by Young and Mature Firms

In this section, we investigate the stock price reaction to acquisition announcements by young and mature firms. If firms make acquisitions because of an unexpected lack of growth opportunities, we expect an especially poor reaction to acquisitions by young firms, since they just went public due in part to their investment opportunities. If young firms make acquisitions to exploit their growth opportunities because acquisitions are complementary to capital expenditures or to take advantage of newly developed capabilities, there would be no reason for the market to react adversely to acquisitions and it might react more positively to acquisitions made later in the firm's life cycle as the acquisitions might convey favorable information about the capabilities developed by the firm. Matsusaka (1993) predicts a positive reaction to acquisitions made by young firms that have developed new capabilities.

We estimate abnormal returns as net-of-market returns over the window $[-1,+1]$ around the first announcement date. Such an approach is especially appropriate for young firms since we do not have much data to estimate a market model. It is well known from the literature that announcement returns differ by both the type of target and the method of payment.[9] In Table VI, we therefore provide announcement return estimates for acquisitions by young

[9] See, for instance, Fuller, Netter, and Stegemoller (2002).

**Table VI**

## Cumulative Abnormal Returns around Acquisition Announcements by Young and Mature Firms Conditional on the Method of Payment and Organizational Form of the Target

IPOs are identified using the SDC Global Issues Database. The IPO sample includes all IPOs from 1975 to 2008 excluding reverse LBOs, spinoffs, rights and unit offerings, ADRs, closed-end funds, REITs, and IPO firms with stock price data available from CRSP before their IPO announcement date. Acquisition deals of the IPO firms include all acquisitions in SDC's M&A database from 1981 to 2012. *Age* refers to number of years since the IPO year. *Method of payment* is reported by SDC for deals classified as having disclosed the transaction details. We also provide data on acquisition and deal rates for deals that SDC classifies as "undisclosed" and provides no details on the method of payment. The *target's organizational form* is classified using the data available in SDC into private, public, subsidiary, and unknown. Cumulative abnormal returns (CARs) are calculated using the event window of [−1,+1]. Abnormal returns are calculated net of the equally weighted market portfolio. Rows give mean, median, and number of observations, respectively. We use *t*-statistics to test for differences in mean CARs and *z*-statistics for the Wilcoxon rank-sum (Mann-Whitney) test of differences in median CARs. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

| | All Acquisitions Difference Tests | | | Purely Cash Difference Tests | | | Purely Stock Difference Tests | | |
|---|---|---|---|---|---|---|---|---|---|
| Target's Organizational Form | Young 1–3 | Mature 10–20 | *t*-Statistic (*z*-statistic) | Young 1–3 | Mature 10–20 | *t*-Statistic (*z*-statistic) | Young 1–3 | Mature 10–20 | *t*-Statistic (*z*-statistic) |
| (1) Private target | 1.19%*** | 0.68%*** | 2.99*** | 1.09%*** | 0.72%*** | 1.17 | 1.76%*** | 1.94%** | −0.19 |
| | 0.53%*** | 0.20%*** | (3.78)*** | 0.55%*** | 0.33%*** | (1.65)* | 1.03%*** | −0.09% | (1.37) |
| | 8,262 | 3,970 | | 1,612 | 1,004 | | 979 | 238 | |
| (2) Public target | −0.44% | −0.92%*** | 1.02 | 1.25%** | −0.17%*** | 2.35** | −2.92%*** | −2.35%*** | −0.53 |
| | −0.30%** | −0.60%*** | (0.83) | 0.70%** | −0.05% | (2.48)** | −3.73%** | −1.39%*** | (−1.26) |
| | 868 | 784 | | 250 | 372 | | 298 | 196 | |
| (3) Subsidiary target | 1.91%*** | 1.14%*** | 3.25*** | 1.57%*** | 1.02%*** | 1.72* | 5.44%** | 3.87%** | 0.54 |
| | 0.77%*** | 0.30%*** | (3.17)*** | 0.99%*** | 0.34%*** | (2.46)** | 1.44%** | 2.05%** | (−0.88) |
| | 3,081 | 1,892 | | 1,283 | 773 | | 111 | 32 | |
| | Difference tests *t*-statistic (*z*-statistic) | | | Difference tests *t*-statistic (*z*-statistic) | | | Difference tests *t*-statistic (*z*-statistic) | | |
| (1)–(2) | 4.17*** | 5.32*** | | −0.27 | 2.65*** | | 5.35*** | 3.75*** | |
| | (5.55)*** | (6.14)*** | | (−0.24) | (2.34)** | | (6.68)*** | (3.44)*** | |
| (2)–(3) | −5.67*** | −6.51*** | | −0.54 | −3.50*** | | −3.46*** | −3.23*** | |
| | (−6.73)*** | (−6.77)*** | | (−0.81) | (−2.91)*** | | (−4.64)*** | (−3.55)*** | |
| (1)–(3) | −3.22*** | −2.39** | | −1.51 | −0.96 | | −1.58 | −0.98 | |
| | (−2.93)*** | (−1.94)* | | (−1.99)** | (−0.89) | | (−0.65) | (−2.15)** | |
| Total | 1.26%*** | 0.62%*** | 4.75*** | 1.30%*** | 0.67%*** | 3.01*** | 1.05%*** | 0.27% | 1.14 |
| | 0.54%*** | 0.16%*** | (5.51)*** | 0.71%*** | 0.27%*** | (3.96)*** | 0.35% | −0.48% | (1.70)* |
| | 12,211 | 6,646 | | 3,145 | 2,149 | | 1,388 | 466 | |

and mature firms across all combinations of target type and method of payment. However, only a subset of acquisitions has information on the method of payment.

The first panel reports abnormal returns for all acquisitions. We see that the abnormal return of young firms is 1.26% on average, which is twice the abnormal return of mature firms of 0.62%. When we consider different types of targets, we see that young firms have higher abnormal returns than mature firms for acquisitions of private targets and acquisitions of subsidiaries but these acquisitions have a positive significant abnormal return regardless of whether a firm is young or mature. In contrast, acquisitions of public firms do not have a positive abnormal return: the abnormal return is −0.92% and significant at the 1% level for acquisitions by mature firms, while for young firms, it is an insignificant −0.44%, although the abnormal return for young firms is not significantly different from that for mature firms.

We separately consider acquisitions paid for with cash and equity. Strikingly, young firms have higher abnormal returns than mature firms when they acquire public firms using cash. The same result holds for subsidiaries. However, there is no significant difference for acquisitions of private firms. All abnormal returns are significantly positive except for the abnormal return for mature firms that acquire public firms using cash, which is significantly negative. When we turn to acquisitions paid for with stock, we find that, for the full sample of such acquisitions, the average abnormal return for young firms is not higher than that for mature firms. The difference in abnormal returns between young and mature firms for acquisitions paid for with stock is insignificant for each type of target. However, it is well known that acquisitions paid for with stock are associated with positive abnormal returns for targets other than public firms and are associated with sharp negative abnormal returns for public firm targets. This result holds here for young as well as mature firms.

In summary, except for acquisitions of public firms, abnormal returns are significantly positive irrespective of the organizational form of the target or how the acquisition is paid for. However, for acquisitions of public firms, the abnormal return is significantly negative except for acquisitions by young firms paid for with cash. The evidence for acquisitions of public firms by mature firms is consistent with predictions of the agency models, but the evidence for acquisitions of private firms and subsidiaries by mature firms is not. While information asymmetry models can also explain negative abnormal returns for acquisitions of public firms paid for with equity, these models fail to explain negative abnormal returns for acquisitions of public firms paid for with cash. The difficulty agency theories have in explaining the negative abnormal returns of acquisitions of public firms with agency theories is that acquisitions of private firms and subsidiaries are not negative. If management makes poor acquisitions due to agency conflicts, it is not clear why it would make poor acquisitions on average when buying public firms but not when buying private firms or subsidiaries.

In Table VII, we separate acquisitions into diversifying and related acquisitions using our stricter definition of diversification. For the full sample, the

**Table VII**

## Cumulative Abnormal Returns around Acquisition Announcements by Young and Mature Firms Conditional on Relatedness Based on All Two-Digit SIC Codes, the Method of Payment, and Organizational Form of the Target

IPOs are identified using the SDC Global Issues Database. The IPO sample includes all IPOs from 1975 to 2008 excluding reverse LBOs, spinoffs, rights and unit offerings, ADRs, closed-end funds, REITs, and IPO firms with stock price data available from CRSP before their IPO announcement date. Acquisition deals of the IPO firms include all acquisitions in the SDC's M&A database from 1981 to 2012. *Age* refers to number of years since the IPO year. *Unrelated deals* have no two-digit SIC code common between the acquirer and the target. *Method of payment* is reported by the SDC for deals classified as having disclosed the transaction details. We also provide data on acquisition and deal rates for deals that SDC classifies as "undisclosed" and provides no details on the method of payment. The target's organizational form is classified using the data available in SDC into private, public, subsidiary, and unknown. Cumulative abnormal returns (CARs) are calculated using the event window of [−1,+1]. Abnormal returns are calculated net of the equally weighted market portfolio. Rows give mean, median, and number of observations, respectively. We use $t$-statistics to test for differences in mean CARs and $z$-statistics for the Wilcoxon rank-sum (Mann-Whitney) test of differences in median CARs. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

| Target's Organizational Form | All Acquisitions | | | | Purely Cash | | | | Purely Stock | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Related Deals | | Unrelated Deals | | Related Deals | | Unrelated Deals | | Related Deals | | Unrelated Deals | |
| | Young (a) | Mature (b) | Young (c) | Mature (d) | Young (e) | Mature (f) | Young (g) | Mature (h) | Young (i) | Mature (j) | Young (k) | Mature (l) |
| (1) Private target | 1.06%*** | 0.63%*** | 1.69%*** | 0.89%*** | 0.92%*** | 0.48%** | 1.63%*** | 1.91%*** | 1.23%*** | 1.47%* | 4.20%*** | 3.48% |
| | 0.55%*** | 0.19%*** | 0.43%*** | 0.26%** | 0.49%*** | 0.24%** | 0.01*** | 0.06* | 0.87%*** | −0.27% | 1.97%*** | 1.51% |
| | 6,492 | 3,233 | 1,770 | 737 | 1,240 | 837 | 372 | 167 | 806 | 183 | 173 | 55 |
| (2) Public target | −1.02%** | −0.92%*** | 1.96%*** | −0.91% | 0.97% | 0.01% | 2.30%** | −1.22%* | −3.72%*** | −2.83%** | 1.62% | 1.33% |
| | −0.70%*** | −0.52%*** | 0.64% | −1.07%** | 0.70% | 0.07% | 0.01** | −0.01** | −4.13%*** | −1.63%*** | −0.40% | 2.39% |
| | 700 | 662 | 168 | 122 | 197 | 317 | 53 | 55 | 253 | 173 | 45 | 23 |
| (3) Subsidiary target | 2.10%*** | 1.25%*** | 1.18%*** | 0.69%** | 1.82%*** | 1.18%*** | 0.57% | 0.29% | 5.84%** | 4.23%* | 2.87% | 2.33% |
| | 0.95%*** | 0.32%*** | 0.24%** | 0.25%* | 1.12%*** | 0.45%*** | 0.31% | 0.11% | 1.27%** | 2.78%** | 1.57% | 1.33%** |
| | 2,440 | 1,518 | 641 | 374 | 1,029 | 633 | 254 | 140 | 96 | 26 | 15 | 6 |
| Total | 1.17%*** | 0.62%*** | 1.58%*** | 0.65%*** | 1.30%*** | 0.64%*** | 1.29%*** | 0.81%** | 0.53% | −0.29% | 3.61%*** | 2.84% |
| | 0.58%*** | 0.16%*** | 0.41%*** | 0.17%* | 0.73%*** | 0.27%*** | 0.68%*** | 0.24% | 0.22% | −0.83%** | 1.24%*** | 1.54% |
| | 9,632 | 5,413 | 2,579 | 1,233 | 2,466 | 1,787 | 679 | 362 | 1,155 | 382 | 233 | 84 |
| | Difference tests $t$-statistic ($z$-statistic) | | | | Difference tests $t$-statistic ($z$-statistic) | | | | Difference tests $t$-statistic ($z$-statistic) | | | |
| (1)–(2) | 4.69*** | 4.72*** | −0.33 | 2.45** | −0.06 | 1.32 | −0.54 | 3.29*** | 5.19*** | 3.76*** | 1.28 | 0.62 |
| | (6.10)*** | (5.45)*** | (−0.11) | (2.81)*** | (−0.05) | (−1.42) | (−0.42) | (2.57)*** | (6.40)*** | (3.63)*** | (1.88)* | (−0.21) |

(*Continued*)

**Table VII**—*Continued*

| Target's Organizational Form | All Acquisitions | | | | Purely Cash | | | | Purely Stock | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Related Deals | | Unrelated Deals | | Related Deals | | Unrelated Deals | | Related Deals | | Unrelated Deals | |
| | Young (a) | Mature (b) | Young (c) | Mature (d) | Young (e) | Mature (f) | Young (g) | Mature (h) | Young (i) | Mature (j) | Young (k) | Mature (l) |
| (2)–(3) | $-6.56^{***}$ | $-6.17^{***}$ | 0.98 | $-2.22^{**}$ | −1.25 | $-3.11^{***}$ | 1.44 | $-1.87^{*}$ | $-3.47^{***}$ | $-3.07^{***}$ | −0.41 | −0.36 |
| | $(-7.66)^{***}$ | $(-6.14)^{***}$ | (0.39) | $(-2.89)^{***}$ | (−1.54) | $(-2.53)^{***}$ | (1.42) | (1.63) | $(-4.74)^{***}$ | $(-3.93)^{***}$ | (−0.59) | (0.05) |
| (1)–(3) | $-4.39^{***}$ | $-2.87^{***}$ | 0.92 | 0.47 | $-2.58^{***}$ | $-2.06^{**}$ | 1.36 | $1.98^{**}$ | $-1.73^{*}$ | −1.19 | 0.49 | 0.42 |
| | $(-3.77)^{***}$ | $(-2.01)^{**}$ | (0.99) | (−0.32) | $(-3.12)^{***}$ | (−1.52) | $(1.77)^{*}$ | (1.11) | (−0.94) | $(-2.02)^{**}$ | (0.55) | (−0.44) |
| | Difference tests | | | | Difference tests | | | | Difference tests | | | |
| | (a)−(b) | (c) −(d) | (c) −(a) | (d) −(b) | (e) −(f) | (g) −(h) | (g) −(e) | (h) −(f) | (i) −(j) | (k) −(l) | (k) −(i) | (l) −(j) |
| | *t*-statistic (*z*-statistic) | | | | *t*-statistic (*z*-statistic) | | | | *t*-statistic (*z*-statistic) | | | |
| (1) Private target | $2.52^{**}$ | 1.56 | 1.50 | 0.74 | 1.37 | −0.31 | 1.11 | $2.01^{**}$ | −0.25 | 0.27 | $2.55^{***}$ | 0.77 |
| | $(3.35)^{***}$ | $(1.75)^{***}$ | (0.09) | (−0.11) | (1.31) | (0.77) | (1.18) | (0.75) | (0.93) | (1.34) | $(2.18)^{**}$ | (0.50) |
| (2) Public target | −0.19 | $2.99^{***}$ | $3.65^{***}$ | 0.01 | 1.39 | $2.75^{***}$ | 1.06 | $-1.71^{*}$ | −0.78 | 0.10 | $2.82^{***}$ | 1.59 |
| | (−0.33) | $(2.52)^{**}$ | $(2.83)^{***}$ | (−0.50) | (1.50) | $(2.77)^{***}$ | (0.78) | $(-1.72)^{*}$ | (−1.36) | (−0.71) | $(2.34)^{**}$ | $(2.08)^{**}$ |
| (3) Subsidiary target | $3.14^{***}$ | 1.02 | $-2.10^{**}$ | $-1.69^{*}$ | $1.77^{*}$ | 0.41 | $-2.20^{**}$ | $-1.70^{*}$ | 0.47 | 0.20 | 1.59 | −0.77 |
| | $(3.58)^{***}$ | (0.02) | $(-3.04)^{***}$ | (−0.75) | $(2.73)^{***}$ | (0.21) | $(-3.08)^{***}$ | (−1.48) | (−0.75) | (−0.39) | (−0.16) | (−0.29) |
| Total | $4.02^{***}$ | $2.52^{**}$ | 1.30 | 0.13 | $2.95^{***}$ | 0.88 | −0.03 | 0.41 | 1.15 | 0.41 | $3.16^{***}$ | $1.69^{*}$ |
| | $(5.04)^{***}$ | $(2.32)^{**}$ | (−0.65) | (−0.51) | $(3.59)^{***}$ | $(1.81)^{*}$ | (−0.80) | (−0.96) | (1.48) | (0.81) | $(2.95)^{***}$ | $(2.10)^{**}$ |

stock price reaction is significantly positive for related acquisitions as well as for diversifying acquisitions irrespective of whether a firm is young or mature. Throughout the table, the only negative abnormal returns are for acquisitions of public firms. Focusing on the full sample, mature firms have equally poor returns for related and diversifying acquisitions. In contrast, young firms have a positive and significant stock price reaction for unrelated acquisitions and a negative and significant stock price reaction for related acquisitions. Because of the lack of data on the mode of payment, we have relatively few diversifying acquisitions when we turn to cash and stock acquisitions. Nevertheless, no type of public firm acquisition significantly increases shareholder wealth for mature firms. Strikingly, the worst acquisitions are related acquisitions paid for with stock for both young and mature firms.

## VIII. Conclusion

In this paper, we investigate the acquisition behavior of IPO cohorts over their life cycle. We find that the acquisition rate of IPO cohorts follows a U-shaped pattern on average over our sample period: the acquisition rate is higher when firms are young (their first three complete calendar years, years 1–3) and when they are mature (years 10–20) than when they are middle-aged (years 4–9). This pattern is heavily influenced by the intensity of activity in the acquisition market, with the state of activity in the acquisition market explaining more of a cohort's acquisition rate in a given year than the life cycle stage of that cohort. During the merger/IPO wave of 1995 to 2000, young firms made dramatically more acquisitions than mature firms. In contrast, in other periods, mature firms make on average as many acquisitions as young firms. The higher acquisition rate of young firms is entirely due to their higher propensity to acquire private firms. There is no evidence that young firms acquire public firms at a higher rate than mature firms. Firms typically acquire firms that are smaller than they are. While the higher propensity of young firms to acquire private firms could be explained by the fact that young firms are small, so that there are relatively few smaller public firms, future research could help us better understand how new public firms choose the private firms they acquire and what benefits they obtain from such acquisitions. When we control for firm and industry characteristics, the life cycle effects remain. It follows that life cycle effects reflect factors that influence the acquisition rate that are not captured by the firm characteristics we use as regressors. Further research is needed to identify covariates that can help explain these life cycle effects.

Strikingly, we show that firms diversify throughout their life cycle, so that mature firms do not make more diversifying acquisitions than young firms. This evidence does not support the agency view that managers use diversification to further their interests when their firm has run out of growth opportunities internally. The finding that firms that diversify, whether young or mature, have good growth opportunities also does not support agency theories. Assuming that our measures of diversification are reliable, these results imply that

agency theories of diversification do not describe the diversification activities of the typical firm in our sample. To the extent that firms have valuable assets that would be underutilized without diversification, we would expect these firms to have a high Tobin's $q$. These results rely heavily on the use of SIC codes for the sample as a whole and are therefore subject to the limitations of the SIC codes. The use of SIC codes is common in the literature, but it suffers from the fact that firms can be quite similar in their activities even though they have different two-digit SIC codes. Unfortunately, newer approaches that help reduce these problems are not well suited for our sample, which is dominated by acquisitions of private firms. Further research that builds on these approaches would permit a better evaluation of whether acquisitions in general and acquisitions of private firms in particular are related or unrelated acquisitions and could develop richer measures of relatedness.

We focus on two views of the acquisition behavior of firms over their life cycle. The neoclassical view holds that firms acquire early because they are highly productive, and thus they should have more assets under their control. Over the course of the life cycle, the firms that acquire more are firms with better growth opportunities. The agency view predicts that firms acquire more when they are mature because they have to replace growth opportunities and spend their free cash flow to benefit managers. When we analyze the determinants of acquisitions of mature firms, we find that these determinants are surprisingly similar to the determinants of young firms. Mature firms that acquire are those that perform well and have good investment opportunities. They are not firms that squander resources or low $q$ firms that are trying to acquire growth opportunities. Our evidence offers no support for the prediction of agency theories that mature firms with high cash holdings but poor growth opportunities acquire more. Further, for mature firms, we find no difference in the relation between acquisitions and cash holdings when the acquisitions are diversifying acquisitions instead of related acquisitions. All these results strongly support the neoclassical theories. An important question for future research is why firms seem to acquire less in their middle age. A plausible explanation is that the return to acquisitions falls as $q$ falls, so that firms make fewer acquisitions, but eventually, their scarce assets are underemployed, in which case they increase their acquisition rate.

If diversifying acquisitions made by mature firms are inefficient because they involve using free cash flow to acquire growth opportunities for which they do not have a clear advantage, we would expect the market to react unfavorably to diversifying acquisitions by mature firms. There is no systematic evidence that shareholders of mature firms are hurt by diversifying acquisitions. In fact, they benefit from diversifying acquisitions of private firms and subsidiaries. However, for these types of acquisitions, shareholders of young firms benefit even more. At the same time, not all of our evidence is inconsistent with agency theories. We find that, overall, shareholders do not appear to benefit from acquisitions of public firms. Specifically, shareholders of mature firms lose when firms make related or diversifying acquisitions of public firms and shareholders of young firms lose when firms make related acquisitions of public firms.

Alternative theories emphasizing information asymmetry can also predict negative abnormal returns for acquisitions of public firms paid for with equity. Existing agency theories do not offer an explanation for why managers make poor acquisitions of public firms but wealth-creating acquisitions of private firms and subsidiaries.

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## Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's website:

**Appendix SI:** Internet Appendix.