Note: Preliminary, please ask authors before citing

Do Corporate Cash Holdings Cause Agency Problems?

Deniz Okat

Hong Kong University of Science and Technology

Mikael Paaso

Aalto University of School of Business

Current Draft: December 2018

Abstract

We test Jensen (1986)'s free cash flow hypothesis using quasi-random cash infusions to firms. These arise from the exercise of the overallotment option during their IPOs. Firms receiving such cash windfalls are more likely to make acquisitions and these acquisitions are more likely to be value destroying. These firms also offer higher managerial compensation. Our results are robust to running several placebo tests to account for the potential endogeneity of the overallotment option, such as controlling for two-month returns after the IPO.

JEL Classification: G31, D22, G02

Keywords: Free cash flow hypothesis, cash holdings, overallotment option.

I. Introduction

In an influential paper, Jensen (1986) argues that cash inflows (equivalently, cash holdings) enable managers to extract private benefits at the expense of shareholders. This theory, also known as the free cash flow hypothesis, suggests that a firm with high cash holdings and poor investment opportunities may still choose to invest in value-destroying projects instead of returning the cash to shareholders. Indeed, the prior literature has documented an association between corporate cash holdings and value destroying expansion, for instance in the form of mergers.

However, cash holdings may be the function of economic conditions, managerial choices (Nikolov and Whited, 2014) or behavioral biases. These may also affect corporate investment. Empirical research testing the hypothesis, however, has largely ignored the endogeneity of corporate cash holdings and reported potentially spurious correlations between cash holdings and corporate policies.[1] For example, both cash levels and the type of investment may be determined by general economic conditions or a manager's personality. In these cases, cash itself does not cause overinvestment and as such policies to reduce cash levels (for instance share repurchases) may be harmful to firms.

In this paper, we make two contributions. Firstly, we use a large sample of quasi-random cash infusions to firms to provide evidence supporting the free cash flow hypothesis. Second, we provide further evidence for the existence of manager-shareholder agency conflicts in young firms. The initial formulation of the theory focused on mature firms with significant cash flows and a lack of investment opportunities, but we show that firms that have recently completed an initial public offering (IPO), i.e. relatively young firms, also make value-destroying acquisitions after receiving cash windfalls.

[1] There are several exceptions to this. The most relevant are Blanchard, Lopez-de-Silanes and Shleifer (1994), Blouin et al. (2018) and von Beschwitz (2017) which we discuss in detail later.

The quasi-random cash infusions we use arise from the exercise of the overallotment (greenshoe) option during the IPO. The greenshoe is a call option that allows the underwriter to purchase extra shares from the issuer at the IPO price any time within one month after the IPO.[2] As the exercise of the greenshoe depends on the one-month return, any cash infusion due to the exercise of the greenshoe is not completely random. To account for this, we *control for the firm's cumulative two-month and one-year post-IPO returns*. The idea is this: greenshoe exercise depends on the 1-month return, which contains information about the firm and/or investment opportunities. The 2-month return and 1-year return should incorporate all this information and more. However, within firms with similar 2-month returns, there will still be variation in greenshoe exercise, leading to variation in cash levels. We also conduct a placebo analysis using secondary greenshoe exercise (a secondary greenshoe is one where the selling shareholders receive cash from exercise instead of the firm) and find that, after controlling for 2-month returns, exercise of the greenshoe does not appear to affect investment. The identification strategy is discussed further in the "Research Design"-section of this paper. We also discuss several potential threats to the validity of our identification strategy.

In this paper, we focus on a common agency problem: managers growing firms beyond an optimal size, often called "empire building". There are several reasons why managers might have an incentive to empire build. One reason is the link between executive compensation and the firm size. Another is the existence of non-pecuniary benefits from running a large firm (see for instance the hubris motive described by Roll, 1986). We find evidence supporting the idea that cash does indeed cause these agency problems. We first observe that greenshoe firms make more acquisitions, being 5-13

[2] The greenshoe allows the underwriter to provide price support if the share price falls after the offer. In an IPO, the underwriter typically sells short 15% of the offering (*i.e.,* it places 115% of the offering with investors). If the share price goes down, then the underwriter covers his short position by buying shares from the market, which helps the price recover. If, on the other hand, the share price goes up, the underwriter exercises the greenshoe and buys extra shares from the issuer. The latter case leads to a cash infusion of 15% of the offering to the issuer. Virtually all bookbuilt US IPOs contain a greenshoe (Jiao, Kutsuna and Smith, 2017), and our identification strategy differentiates between firms where the option is exercised and those where it isn't. We explain the mechanics of the greenshoe further in the "Research Design" section.

pp more likely to make an acquisition in any given financial year. These acquisitions have announcement returns that are about 2-3 percentage points lower than those of other firms. We also provide weak evidence that the CEOs of these firms see higher compensation growth. These results are all consistent with the idea that higher cash holdings enable managers to take suboptimal actions.

The free cash flow hypothesis has been widely influential both in practice and in academia. In practice, it has been used as partial justification for the debt-laden capital structures of leveraged buyouts as well the staged structure of venture financing (Gompers, 1995). It has been used frequently as an argument for demanding that firms return cash to shareholders. In academia, it triggered a stream of literature testing either the hypothesis or variants of it. Most find that firms with higher cash holdings make unproductive investments such as acquisitions with negative returns (*e.g.,* Blanchard, Lopez-de-Silanes and Shleifer, 1994 [henceforth BLS]; Harford, 1999; Opler et al., 1999; von Beschwitz, 2017 *etc*). This effect is compounded in poorly governed firms (Dittmar and Mahrt-Smith, 2007).

However, several papers find that, in many cases cash, provides firms with valuable flexibility and relaxes financial constraints. For example, Blouin et al. (2018) finds a positive correlation between a tax cut in the US in 2004, which increased cash holdings of firms, and the announcement returns of mergers after the cut, suggesting that many firms are financial constrained. There are also other benefits to cash: Fresard (2010) shows that cash allows firms to gain market share at the expense of their rivals following shocks to competition.

Surprisingly though, with the exceptions of BLS (1994), Blouin et al. (2018) and von Beschwitz (2017), the endogeneity of a firm's cash holdings has not been addressed and, thus, a casual relation between cash holdings and firm behavior has not been analyzed in the literature.

BLS (1994) conduct a case study analysing several characteristics of firms before and after they win cash awards in lawsuits. They find evidence in line with Jensen's (1986) free cash flow hypothesis:

firms that receive cash windfalls increase investment and reduce debt. However, their sample consists only of 11 companies and the analysis lacks statistical power.

In a more recent paper, von Beschwitz (2017) looks at firms that received cash windfalls through a tax reform in Germany. The reform allowed firms holding minority stakes in other firms to sell these stakes without facing capital gains tax. Firms that sold their equity stakes used proceeds to undertake value-destroying acquisitions. However, holding minority stakes prior to the reform could already be considered as a sign of weak corporate governance. That is, firms which sold their minority stakes after the reform could engage in value-destroying behavior not because of the cash they received, but because of they represent a subset of poorly governed firms that became unconstrained as a result of the tax change. We, on the other hand, are able to, after matching on 2-month or 1-year returns, have a cash infusion that is almost random instead of one that relies on an endogenous choice (owning a minority stake). Moreover, compared to von Beschwitz (2017), our analysis spans many years as opposed to a one-off policy change. This allows us to control for time trends that may have influenced different firms in different ways. Finally, we document that the executives themselves directly benefit from cash infusions through higher pay. We also extend the analysis to show that overall asset growth is higher and that the acquisitions are funded at least partly with new debt.

We also contribute to the literature on the free cash flow hypothesis by showing that it also holds for young firms under significant market scrutiny. Jensen's (1986) argument focused mainly on mature firms with high cash flows which are also the firms that have been studied widely in prior papers. Our sample consists of young firms that recently completed an IPO and are thus likely to be under more scrutiny from the markets.

More broadly, our paper is also related to the general literature on investment-cash flow sensitivity (the tendency of firms' cash flows to be correlated with the level of investment, which shouldn't happen with perfect capital markets). This effect may be driven by a number of reasons, but most

of the literature has argued for an agency costs perspective or the relaxing of financial constraints. Fazzari, Hubbard and Petersen (1988), for example, argue that the correlation between investment and cash flow increases as financial constraints are tightened (*i.e.,* as the cost of external financing relative to the internal financing increases).

Several studies in this area have looked at exogenous cash flow or level shocks (as noted by von Beschwitz (2017), these shocks have mostly been negative shocks instead of cash windfalls), with the majority attributing the change in investment to tightened cash flow constraints or other non-agency reasons. For example, Lamont (1997) and Rauh (2006) show that shocks to cash flows that are unrelated to investment opportunities cause the overall level of firm investment to decrease. They argue for a financial constraints channel, whereas we show in a sample of unconstrained firms that cash infusions increase investment. Other studies have also found evidence supporting a credit constraints channel. Thakor (2018) studies the investments of farmers receiving cash infusions from the sale of fracking rights on their land and finds that farmers purchase more land following these shocks. While the loosening of credit constraints is more likely to be the driver of this effect, credit constraints are unlikely to be an issue in our setup (we discuss this later). There may also be behavioral reasons for investment-cash flow sensitivity. Malmendier and Tate (2005) argue that managerial overconfidence leads to managers overinvesting internal funds and Paaso (2018) shows that a positive cash flow shock leads to overinvestment because managers extrapolate from past cash flows (the shock is a temporary weather shock). Extrapolation and overconfidence cannot be the reason for the acquisitions we observe as the source of the cash (*i.e.,* exercise of the greenshoe) is clear and unrelated to business fundamentals (we discuss this further in Section 3).

In the next section, we describe the data used in this paper. Section 3 explains our research design and identification approach. Section 4, "Results", describes the key results of the paper. We conclude in section 5.

II. Data

IPO Data

Our data on IPOs come from Dealogic. Our primary reason for using Dealogic is the poor reliability of greenshoe data in the SDC database (see for example Ellis, Michaely and O'Hara, 2000). We start our sample in 1996, when Dealogic's coverage of greenshoe exercise improves dramatically.

We start with all bookbuilt IPOs on US exchanges from 1996 to 2015. Next, we drop all IPOs by financial companies (SIC codes 60-67). Our reason for doing this is to exclude both funds (whose investment patterns are not comparable to most firms) and firms with different balance sheet structures (a typical example is banks: for most firms, short-term securities are equivalent to cash on hand, a source of liquidity. For banks, short-term securities may be investments used to reduce the duration of the bank's assets). To focus on economically meaningful offerings, we drop all offerings of less than $10 million or where the offer price is less than $5.

Greenshoe Data

Our variable of interest is the exercise of the greenshoe option. Almost all US IPOs include a greenshoe option (Jiao, Kutsuna and Smith, 2017), but our focus is on whether it is exercised or not. Our primary data source for our main variable of interest is the greenshoe indicator provided. Due to the potential for data errors, we supplement this data with hand-collected data on greenshoe exercise[3]. For each firm in our sample we check the IPO prospectus and the nearest Form 10Q or 10K filings to determine whether the greenshoe is exercised i) fully, ii) partially, or iii) not at all.

[3] Our process for selecting which data to use is as follows: We attempted to hand-collect data for every deal in our sample. For about 300, we were unable to find data on greenshoe exercise. For the under 10% of the sample where we found a discrepancy between the hand-collected and Dealogic "greenshoe exercised"-variable, we used our hand-collected result. For the deals where we were unable to manually find data, we used the Dealogic variable. The exception to this is in our secondary greenshoe tests, where we only used hand-collected data due to Dealogic's poor coverage of the primary/secondary-nature of the greenshoe.

Using the EDGAR database we also collect information on whether the greenshoe consists of primary or secondary shares.[4] When a "primary" greenshoe is exercised, proceeds are received by the firm, while in the case of a "secondary" greenshoe, cash is received by the selling shareholders, not by the firm.

Financial Data

Other financial data and stock return data come from CRSP and COMPUSTAT. We link the Dealogic IPO data to CRSP by merging on 6-digit CUSIP at the earliest date that this CUSIP exists in the CRSP database. We then compare the first date that the CUSIP appears in the CRSP database and the Dealogic provided pricing date, creating a variable called "datesdiff" which is the difference between these two dates. We exclude all IPOs where with a negative datesdiff (appears in CRSP before pricing date) and those with a datesdiff greater than 10 (appears in CRSP more than 10 days after pricing).[5] We then merge contemporaneous financial information from COMPUSTAT using the WRDS CRSP-COMPUSTAT links provided. We assign the current fiscal year ongoing during the IPO as year 0, the fiscal year prior to that as year -1 and so on. All accounting variables are winsorized at 1% (within each calendar year) and the net income / assets ratio is also winsorized at 1%. Ratios and variables are described in the appendix.

---

[4] Coverage of the primary/secondary nature of the greenshoe is sparse in Dealogic and therefore we use the hand-collected data as our main data source here.

[5] This accounts for a small minority of deals. We exclude securities that were included in the CRSP database prior to the IPO pricing date because this implies that the company was listed prior to the IPO. This could be due to a mistake by Dealogic or other reasons such as Dealogic classifying non-IPOs are IPOs (an example would be a company with a small free float of 1 or 2% which proceeds to do a larger offering, which is often classified as an IPO even though it is technically not one). We also exclude deals where the first observation in CRSP is more than 10 days after the pricing date. 10 days is an arbitrary cutoff that in our opinion allows for most common delays between pricing and trading (such as weekends, holidays, the books being closed early and so on).

M&A Data

Data on mergers also come from Dealogic – we use data on all completed acquisitions (deal equity value > $10 million) of at least 90% of a target by US companies. We append this sample to our IPO sample by first merging the mergers to CRSP using the 6-digit CUSIP and announcement date and then using the WRDS CRSP-COMPUSTAT links to obtain a fiscal year and gvkey for each merger. These are used to append deal information to the existing IPO dataset (we treat each missing link as a fiscal year without an acquisition).

We calculate the announcement return by calculating the return from the day prior to the announcement of the deal to the day after and subtract the CRSP value-weighted market return for the same days (we exclude deals that are flagged as having been rumored prior to the announcement date according to Dealogic).[6]

III. Research Design

Cleanly identifying the impact of cash holdings on firm behavior is challenging because it is difficult to come up with an environment in which a firm receives a cash infusion that is unrelated to future investment opportunities and firm characteristics. One commonly used aspect of IPOs (the overallotment option, commonly known as greenshoe[7]) provides us with an environment where firms receive quasi-random cash during their IPO. First, we provide a brief overview of the greenshoe.

The greenshoe is an option granted by the issuer or selling shareholders to the underwriters in an IPO, allowing the underwriters to purchase up to 15% of the offering in the 30-days following the

[6] This is because estimating Betas for recently IPOed firms involves significant difficulty. It should also be noted that the average announcement return we observe is positive. This is consistent with von Beschwitz's (2017) European sample as well as the observation in Moeller, Shlingemann and Stulz (2004) that on average, acquisition returns, especially on smaller acquisitions (which make up the bulk of our sample), are positive.

[7] The first IPO to include this option was one by the Green Shoe Manufacturing Company in 1960, hence the name.

offering. The underwriter thus places 115% of the offering to investors at the offering time, leaving it with a 15% short position. This option is included in offerings to provide price stabilization. If the price of the company falls after the offering, the underwriter in charge of stabilization can purchase shares in the open market to cover the short position. Otherwise, the underwriter exercises the option and purchases shares from the company, delivering them to investors. If the greenshoe has been granted by the issuing firm and not the selling shareholders, this leads to a cash infusion for the firm.

Because the greenshoe is more likely to be exercised when the stock price within 30 days after the IPO is high (*i.e.,* when there is underpricing in the IPO), exercise decision, and thus the cash infusion, is partly a function of firm characteristics and future investment opportunities. There are three main sources for such correlation: first, firm-level characteristics may drive both underpricing and investment. This might happen, for example, if firms with better future prospects have higher underpricing in their IPOs. Second, by pushing the stock price up just after the IPO (and at the same time making greenshoe exercise more likely), investors might be providing positive feedback to managers about future opportunities of the firm and thus encouraging them to undertake more investment (Chen, Goldstein and Jiang, 2007). Third, underpricing may be a function of the overall market return, which may be correlated with investment opportunities.

We tackle this endogeneity concern by controlling for (and matching on) the 2-month and 1-year post-IPO returns. Our test, therefore, compares two firms with the same 2-month (and 1-year) returns, where one firm had its greenshoe exercised while the other didn't. By matching firms on their 2-month returns, we effectively control for the effect of firm characteristics and future opportunities on the probability of greenshoe exercise. Bernstein (2015) applies similar idea (in the sense of taking a potentially endogenous instrument and showing using alternative periods that the instrument is not endogenous) and use first 2-month market returns after the book building date as an instrument for the IPO completion choice. If IPO underpricing is related to investment because

of the learning-from-share-prices channel, why would firms only learn from the 1-month share price change[8] which determines greenshoe exercise? If the concern is that manager or firm characteristics affect post-IPO returns, why do these characteristics also not affect 2-month returns?

We also run another placebo test where we show that for IPOs that include secondary greenshoes (where the issuing company does not receive any cash, with all the cash going to the selling shareholders), the exercise of the greenshoe does not correlate with empire-building behavior. In this test, we run our basic regressions on a subset of IPOs where the firm receives no proceeds from the offering – a test of a greenshoe without the cash component. Within this subsample, we find no significant differences in empire building behavior.

Finally, we provide evidence that our sample of greenshoe and non-greenshoe firms are very similar on a range of observable pre-IPO characteristics and that it is only after the IPO that we begin to observe divergence in outcomes. While this is not strong evidence, it is comforting to know that these firms are *ex ante* very similar on many dimensions.

Threats to Validity

Of course, even with the identification strategy described above, there are several potential threats to the validity of our estimates. We discuss several potential concerns below as well as arguments for why they do not significantly impact our estimates.

One concern might be that that the greenshoe changes the firm in ways other than simply cash holdings. While we acknowledge that greenshoe exercise leads to several changes (increase in free

[8] The exercise of a primary greenshoe (*i.e.,* one where the issuer receives the proceeds) can be determined by the t+3 share price change (typically from issue pricing to the end of the first date of trading) if the pre-IPO shareholders are unwilling to lend shares as the underwriters will have a naked short position which needs to be covered. However, as we do not have data on whether the selling shareholders are willing to lend shares, we use the 1-month return in all cases.

float, potentially more dispersed ownership), it is unlikely that any of the direct mechanical effects of the greenshoe are likely to have an impact on future acquisitions made by the firm. There may also be non-mechanical effects arising from greenshoe exercise. Dambra, Gustafson and Pisciotta (2018) show that greenshoe exercise leads to an increase in analyst coverage and institutional ownership as well as a decrease in bid-ask spreads. Comfortingly, all these factors are likely to bias our finding of cash causing acquisitions downwards, as analysts and institutional investors should restrain managers from making value-destroying acquisitions. Our secondary greenshoe placebo test also suggests that these are not a concern. In IPOs with a secondary greenshoe, we would still expect to see an increase in analyst coverage and institutional ownership following greenshoe exercise. However, we observe no differences between greenshoe and non-greenshoe firms when the greenshoe is secondary, suggesting that the increase in analyst coverage and institutional ownership do not significantly affect acquisition activity.

In addition to this, we use a slightly different empirical strategy than Dambra et al (2018) which should mitigate some concerns. Dambra et al (2018) instrument for 1-month post-IPO returns by using NASDAQ returns. To rule out the idea that NASDAQ returns might be affecting their outcome variables, they follow Bernstein (2015) and control for NASDAQ returns during alternative, non-overlapping time intervals, finding no effect on their outcome variables. We on the other hand control for *cumulative* returns from the IPO date to 2-months and 1-year later. In unreported results, we find that, at the firm-level, there are no significant (at 10%) differences in analyst coverage (# of analysts) or institutional holdings (# of institutions holding a stock) at the end of year 1 or year 2 after controlling for 2-month returns. We find a positive but not significant coefficient for institutional holdings, but as mentioned earlier, this (possibly mechanical) effect is unlikely to contribute to acquisitions.

Another concern could be that a forward-looking manager would already have an investment plan (*e.g.,* to acquire another company) that incorporates proceeds from the exercise of the greenshoe. This would imply that firms without greenshoe exercise become financially constrained (or at least

unable to invest as planned without new outside capital). This is implausible as firms are likely to be conservative in terms of proceeds in order to avoid having to raise new (costly) external equity soon after the IPO. The price range presented by investment bankers to managers typically has significantly more variation and creates significant uncertainty about total proceeds.

Some may argue that a "successful" IPO (one with underpricing) may cause a manager to become overconfident and, as a result, overestimate the value derived from an acquisition. Our research design (*i.e.,* matching firms on two-month and one-year returns after their IPO) should alleviate this concern unless there is something special about the immediate return just after the IPO, perhaps in terms of salience. However, we observe that when matched on one-year returns, greenshoe firms are more likely to make acquisitions in years two and three, when the salience of the IPO return declines and the relevance of the one-year return increases.

IV. Results

First, brief summary statistics and univariate tests are presented. We also show that the greenshoe affects cash holdings of firms, a necessary and expected condition for our analysis to work. Next we cover the main results of the paper, namely that greenshoe exercise predicts empire-building behavior. We do this by showing that greenshoe exercise is associated with more acquisitions, lower acquisition returns, and higher executive compensation. We then attempt to address the endogeneity of the greenshoe by conducting two robustness tests. First, we repeat the main analyses above with controls/matching for 2-month and 1-year returns. Second, we conduct a placebo test using secondary-only greenshoes.

Summary Statistics and the Impact of Greenshoe Exercise on Cash Holdings

Our sample covers all bookbuilt IPOs on US exchanges from 1995 to 2015. Table 1 provides descriptive statistics. Of the 1718 IPOs, the greenshoe is exercised in 1299 IPOs. In line with the

observation of cycles in IPO market (see, for example, Helwege and Liang, 2004), the exercise of greenshoe option shows cyclicality over the sample period as seen in Figure 1.

First, it is important to show that the exercise of the greenshoe indeed results in an increase in cash holdings. While this is mechanical (for all non-secondary IPOs), a rough correspondence between the numbers and the expected value is a sanity check for the data. The typical cash infusion in our sample due to the exercise of the greenshoe is 15% of the IPO, with the typical IPO raising the $\frac{Cash+cash\ equivalents}{Book\ assets}$ ratio from 29% to 44% (Figure 2). Hence the exercise of the greenshoe should increase cash holdings as a percentage of assets about 2.25 (15*0.15) percentage points, or slightly less than 10% of pre-IPO cash holdings. Graphically, Figure 2 shows that greenshoe firms have roughly 4 pp higher $\frac{Cash+cash\ equivalents}{Book\ assets}$ ratios at the end of the IPO year, suggesting that greenshoe exercise may be correlated with higher cash holdings for other reasons (greenshoe exercisers end up issuing more debt than non-exercisers, something that is discussed later). We present this result more formally in Table 2, where we control for fiscal year and 2-digit industry fixed-effects (column 2) as well as firm fixed-effects (columns 3-5, with fiscal year effects in columns 4-5) and industry-year fixed effects (column 5).

Main Results

We first show that firms that receive a greenshoe-related cash infusion make more acquisitions. Figure 3 presents the mean number of acquisitions made in each of the post-IPO years by greenshoe and non-greenshoe firms. The left panel includes all firms in our sample while the left panel includes only firms which state in their IPO prospectus their intention to use IPO proceeds for making an acquisition.[9] The univariate results suggest that firms where the greenshoe is exercised make approximately 0.05-0.12 more acquisitions per year, compared to a baseline of roughly 0.2. It should be noted that recently IPOed firms are prolific acquirers – 42% of the firms in our sample made an

[9] We attempt to exclude firms which simply announced every possible use of proceeds by focusing only on those firms which include "acquisitions" but not "general corporate purposes".

acquisition in the 3 years after the IPO (this is fewer than in Celikyurt, Sevilir and Shivdasani (2010), who examine a different sample period and larger IPOs [minimum $100 million]).

Next, we show this result in a multivariate setting. We regress the number of acquisitions made by a firm in any given year on the greenshoe dummy interacted with IPO-year dummies. Table 3 presents these results. The dependent variable is the number of acquisitions in a year. Once again, the results imply that firms receiving cash through the exercise of the greenshoe make more acquisitions. The effect is economically highly significant, with the coefficient ranging from 0.05 to 0.12 (which can be compared to the coefficients on the year dummies which give the baseline acquisition rates by year[10], ranging from 0.08 to 0.23), an increase of 25% to 50%. Columns 4 and 5 introduce controls for the two-month and 1-year post-IPO returns (both decile and continuous), addressing some of the potential endogeneity concerns related to greenshoe exercise.

The announcement returns made by these firms are lower (near zero), suggesting that markets perceive them to be less value-enhancing than those made by non-greenshoe firms. Note that the announcement return just captures the change in the stock price of the acquirer in a small window around the acquisition and is not a perfect proxy for acquisition quality. For the announcement return to reflect the true value added to the firm, one must make a couple of assumptions. For example, announcements should come as a surprise. There should not be any other news that affect firm value around the acquisition date. Markets should be efficient to incorporate the value generated through the acquisition etc. Even though many assumptions are needed to use the announcement return as a proxy for acquisition quality, it has been widely used in the literature due to the difficulty of benchmarking and attributing long-run returns.

To calculate the announcement return of an acquisition, we calculate the total return for the stock from the closing price 2 days prior to the announcement to the closing price 1 day after the

[10] It appears that the fixed effects in column 3 create a fairly saturated specification, making interpreting the coefficients on the year dummies in this case difficult

announcement (in effect this gives us the return from day t-1 to t+1). Then we subtract the market return for these days. We regress announcement returns on a greenshoe dummy and several controls and find that the greenshoe consistently predicts lower returns than deals without a greenshoe.

The results are presented in Table 4. The coefficient on the greenshoe dummy is consistently negative. The magnitude of the coefficient (0.025-0.035 depending on specification) is as large as the mean announcement return for acquisitions in our sample, suggesting that the market perceives greenshoe-driven acquisitions as value destroying. 46 percent of acquisitions made by greenshoe firms have negative abnormal announcement returns, whereas for non-greenshoe firms this ratio is 36 percent. We show this graphically in Figure 4, where we plot the percentage of acquisitions with negative returns for greenshoe and non-greenshoe firms.

Next, we show that the managers themselves benefit from greenshoe exercise. We match our IPO sample to EXECUCOMP using the gvkey identifier and fiscal year variable. Unfortunately, EXECUCOMP only covers S&P 1500 firms as well as firms that have previously been included in the S&P 1500 and our sample consists of newly IPOed firms (typically smaller firms), leading to a reduced sample size. The sample is further reduced by the fact that in our regressions, we require that the firm exists in EXECUCOMP from its IPO onwards. Fortunately, EXECUCOMP backfills data for companies to cover the year prior to the IPO.

We regress the logarithm total compensation (EXECUCOMP data item tdc1, winsorized at 1% both tails in each calendar year) on our greenshoe dummy. As in the previous cases, we use a range of specifications, starting from a simple specification including only the greenshoe and year dummies, then including calendar-year and industry fixed effects while finally running a full model with firm and industry-year fixed effects. We find greenshoe firms pay higher compensation to managers, especially in the second post-IPO year, with a coefficient that is significant and positive in all specifications except when excluding industry-year fixed-effects (years 0 and 1 are generally positive and economically meaningful but not significant). As with the previous tests, columns 5 and 6 introduce controls for the 2-month and 1-year return as well as fixed effects for their decile.

While these results strongly support the idea that executives benefit personally from excess cash post-IPO, we must however urge some caution in the interpretation of these results as they are estimated on a very small sample of companies. We also note that the inclusion of calendar-year FE (through the inclusion of the industry-year FE) has a significant impact on the coefficient, with the coefficient being close to 0 prior to their inclusion. This is reasonable – there has been a strong upwards trend in executive compensation which may also correlate with greenshoe exercise trends.

Endogeneity

As mentioned previously, the greenshoe may be correlated with factors that affect investment other than through the increase in cash. These may include unobservable characteristics of the firm, future returns (on their own stock) that firms "learn" from or the general market return. To address this, we do several things:

- First, in our previous tests, we control for the decile (calculated within each calendar year) of 2-month and 1-year returns. We also include continuous controls for these variables.
- Second, we match on 2-month and 1-year returns. This test essentially asks the question: "Is there anything in the 1-month return (that affects the cash level) that the 2-month return does not capture that also affects investment?" In other words, we compare two firms that have the same long-run returns but different 1-month post-IPO returns

We start by matching on returns. Figure 5 shows the relationship between greenshoe exercise and the total number of acquisitions and the sum of announcement returns (the two variables where the simple post-IPO number is relevant as opposed to the change) in different quintiles of post-IPO returns. The graphs clearly show that the relationship between greenshoe exercise and number of acquisitions in positive in almost all quintiles of 2-month returns and in all quintiles of 1-year returns. Similarly, acquisition returns are higher for non-greenshoe firms in two out of five quintiles of 2-month returns (and almost identical in two) and higher in three out of five quintiles of 1-year returns.

We formalize this setting by using nearest-neighbor matching. In this setup, we first match firms with and without greenshoe on three categorical variables: the decile of 2-month/1-year returns, the 2-digit SIC code and the calendar year of the IPO as well as several continuous ones (cash holdings pre-IPO, total assets pre-IPO, total liabilities pre-IPO). We then define the total number of acquisitions, the sum of acquisition returns, the log of total assets and the log of total liabilities as our outcome variables.[11] We see if within the same industry, year and 2-month return decile the greenshoe affects our outcome variables (note that we lose a lot of power with this setup).

The results are presented in Table 6. Our results are mostly robust, with the greenshoe being positively associated with the number of acquisitions in both setups and negatively associated with the sum of announcement returns when matching on 1-year return decile.

V. Conclusion

The level of corporate cash holdings is an increasingly studied topic in academic finance and also an issue that has been noticed in the financial media recently. Starting from Jensen's (1986) free cash flow hypothesis, the general view in the finance literature has been that "excess" cash should not be kept in the firm and rather distributed to shareholders. However, as recent work (for example Fresard, 2010) has highlighted the benefits of cash holdings for firms, the optimal level of cash holdings is a relevant and unanswered question. Given the importance of the topic, it is surprising that empirical research has failed to provide casual evidence for the free cash flow hypothesis.

In this paper, we address the endogeneity problem by analyzing the firm behavior after it experiences a quasi-random cash infusion due to the exercise of overallotment option in the IPO. Our results support Jensen's (1986) hypothesis. Firms that receive extra cash in their IPO's in our sample engage in value-destroying projects such as hubristic mergers. Additionally, our results highlight that cash-related agency problems exist in young firms that are under intense scrutiny by the

[11] For the tests of total assets and liabilities, we do not look at changes but instead pool all observations post-IPO and test for differences

market, suggesting that these problems are prevalent in all sorts of firms instead of just the mature firms with high cash flows mentioned in Jensen (1986).

Bibliography

Bernstein, S., 2015, "Does Going Public Affect Innovation?", *Journal of Finance*, 70, 1365-1403.

Beschwitz, B., 2018, "Cash windfalls and acquisitions", *Journal of Financial Economics*, 128, 287-319.

Blanchard, O., F. Lopez-de-Silanes, and A. Shleifer, 1994, "What do firms do with cash windfalls?", *Journal of Financial Economics*, 36, 337-360.

Blouin, J., E. Fich, E. Rice and A. Tran, 2018, "Corporate Tax Cuts, Merger Activity and Shareholder Wealth" Working Paper

Celikyurt, U., M. Sevilir and A. Shivdasani, 2010, "Going Public to Acquire? The Acquisition Motive in IPOs", *Journal of Financial Economics*, 96, 345-363

Chen, Q., I. Goldstein, and W. Jiang, 2007, "Price Informativeness and Investment Sensitivity to Stock Price", *Review of Financial Studies*, 20, 619-650.

Dittmar, A. and J. Mahrt-Smith, 2007, "Corporate governance and the value of cash holdings", *Journal of Financial Economics*, 83, 599-634.

Ellis, K., R. Michaely, and M. O'Hara, 2000, "When the Underwriter Is the Market Maker: An Examination of Trading in the IPO Aftermarket", *Journal of Finance*, 55, 1039-1074.

Fazzari, S., RG. Hubbard, and B. Petersen, 1988, "Financing Constraints and Corporate Investment", *Brookings Papers on Economic Activity*, 1, 141-206.

Fresard, L, 2010, "Financial Strength and Product Market Behavior: The Real Effects of Corporate Cash Holdings", *Journal of Finance*, 65, 1097-1122.

Gompers, P., 1995, "Optimal Investment, Monitoring, and the Staging of Venture Capital", *Journal of Finance*, 50, 1461-1489

Harford, J., 1999, "Corporate Cash Reserves and Acquisitions", *Journal of Finance*, 54, 1969-1997.

Helwege, J. and N. Liang, 2004, "Initial Public Offerings in Hot and Cold Markets", *Journal of Financial and Quantitative Analysis*, 39, 541-569.

Jensen, M., 1986, "The Agency Costs of Free Cash Flow: Corporate Finance and Takeovers", *American Economic Review*, Vol. 76, No. 2.

Jiao, Y., K. Kutsuna, and R. Smith, 2017, "Why do IPO issuers grant overallotment options to underwriters?", *Journal of Corporate Finance,* 44, 34-47.

Lamont, O., 1997, "Cash Flow and Investment: Evidence from Internal Capital Markets", *Journal of Finance*, 52, 83-109.

Lyandres, E. and B. Palazzo, 2016, "Cash Holdings, Competition and Innovation", *Journal of Financial and Quantitative Analysis*, 51, 1823-1861.

Malmendier, U. and G. Tate, 2005, "CEO Overconfidence and Corporate Investment", *Journal of Finance*, 60, 2661-2700

Nikolov, B. and T. Whited, 2014, "Agency Conflicts and Cash: Estimates from a Dynamic Model", *Journal of Finance*, 69, 1883-1921.

Opler, T., L. Pinkowitz, R. Stulz, and R. Williamson, 1999, "The Determinants and Implications of Corporate Cash Holdings", *Journal of Financial Economics*, 52, 3-46.

Paaso, M., 2018, "It's Always Sunny in Finland: Investment and Extrapolation from Cash Flows" Working Paper.

Rauh, 2006, "Investment and Financing Constraints", *Journal of Finance,* 61, 33-71.

Roll, R., 1986, "The Hubris Hypothesis of Corporate Takeovers", *Journal of Business*, 59, 197-216.

Thakor, R., 2018, "Liquidity Windfalls and Reallocation: Evidence from Farming and Fracking" Working Paper.

Table 1

Summary Statistics

This table provides firm-year level summary statistics on several key variables used in our analyses. In Panel A, the summary statistics are split into pre-IPO and post-IPO statistics. The post-IPO statistics cover the year of the IPO (fiscal year end after the IPO) as well as two years after. In Panel B, means are presented both pre- and post-IPO years, split by whether the greenshoe was exercised, along with a t-test of the differences of means. All financial variables are winsorized yearly at the 1% level at both tails. Variable definitions and data sources are provided in the appendix.

Panel A

Pre-IPO	# of Firm-Years	mean	sd	p5	p50	p95
Assets (USD m)	1718	351	1484	3.5	45	1428
Cash + Equivalents (USD m)	1718	31	92	0.099	8.5	113
Cash + Equivalents / Assets	1718	0.29	0.29	0.0033	0.18	0.85
IPO Size (USD m)	1718	158	454	26	86	489
R&D Spending (USD m)	1190	11	25	0	5.3	39
Liabilities / Assets	1714	0.65	0.32	0.14	0.65	1.2
Post-IPO (all 3 years)						
Assets (USD m)	4760	571	1717	29	164	2340
Cash + Equivalents (USD m)	4760	98	192	1.7	49	334
Cash + Equivalents / Assets	4760	0.39	0.3	0.0071	0.35	0.9
IPO Size (USD m)	4760	161	470	26	86	490
R&D Spending (USD m)	3367	22	42	0	12	74
Liabilities / Assets	4744	0.39	0.26	0.078	0.33	0.89
IPO Size / Total Pre-IPO Assets	4747	4.7	19	0.18	1.6	15
Greenshoe Exercised Dummy	4734	0.77	0.42	0	1	1
Acquisition Made in FY Dummy	4760	0.15	0.35	0	0	1

Panel B	Pre-IPO			Post-IPO		
	Not Exercised	Exercised	Diff	Not Exercised	Exercised	Diff
Observations (firm-years)	409	1299		1095	3639	
Assets (USDm)	324.127	361.276	-37.149	496.254	596.213	-99.959
Cash+Equivalents (USDm)	32.467	30.473	1.994	76.543	104.450	-27.907***
(Cash+Equivalents) / Assets	0.285	0.292	-0.007	0.367	0.393	-.026*
IPO Size (USD m)	159.161	158.498	0.663			
R&D Spending (USD m)	12.245	11.071	1.175	20.028	22.739	-2.711
Total Liabilities / Total Assets	0.676	0.645	0.031	0.434	0.378	.056***
Long-term Debt / Total Assets	0.295	0.235	.0597**	0.170	0.129	.040***
Market Cap*	583.309	702.791	-119.482	644.396	1149.294	-504.897***

*Market cap at IPO offer price for pre-IPO firms

Figure 1

Greenshoe Exercise Percentage by Year

This figure plots the percentage of IPOs with a greenshoe exercised by year. The main greenshoe definition (left graph) is the Dealogic greenshoe exercised dummy variable. The alternative greenshoe definition is a dummy that we hand-collect from the IPO prospectuses and post-IPO 10Q/K filings (we ignore partially exercised greenshoes).

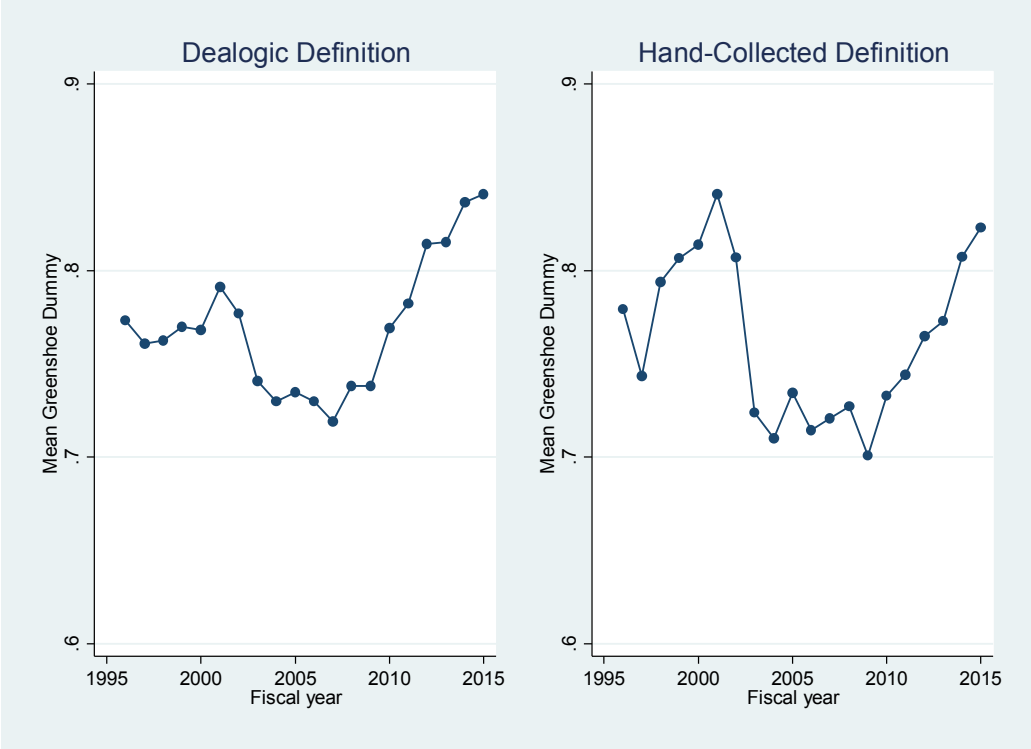

Table 2

Cash Holdings and Greenshoe Exercise (Multivariate)

This table shows the relationship between greenshoe exercise and firm cash holdings post-IPO. The table presents regression estimates of cash holdings (as a percentage of assets) on a greenshoe exercise dummy interacted with "IPO-year" dummies (from -1 to 2, with 0 being the first fiscal year ending after the IPO). The dependent variable is $\frac{(cash+equivalents)_t}{(total\ assets)_t}$. The second column includes 2-digit SIC and fiscal-year fixed-effects while columns 3-5 include firm fixed-effects (as well as fiscal year fixed-effects in columns 4 and 5) and column 5 includes industry-year fixed effects. The R-squared in columns 3-5 refers to the within-deal R-squared. All standard errors are clustered at the 2-digit SIC-code level.

	(1)	(2)	(3)	(4)	(5)
Greenshoe x Year 0	0.0333***	0.0337***	0.0342***	0.0348***	0.0332***
	(0.00940)	(0.00927)	(0.00933)	(0.00912)	(0.00832)
Greenshoe x Year 1	0.0136**	0.0120*	0.0135**	0.0133*	0.0146
	(0.00666)	(0.00655)	(0.00666)	(0.00688)	(0.00913)
Greenshoe x Year 2	0.0169	0.00793	0.0113	0.0117	0.0107
	(0.0129)	(0.0107)	(0.00971)	(0.00979)	(0.0120)
Greenshoe	0.00587	0.00758			
	(0.0234)	(0.00711)			
Year 0	0.130***	0.121***	0.130***	0.290***	0.349***
	(0.0151)	(0.0157)	(0.0151)	(0.0490)	(0.0349)
Year 1	0.0649***	0.0463***	0.0647***	0.385***	0.491***
	(0.00993)	(0.0110)	(0.00972)	(0.0992)	(0.0646)
Year 1	0.0358**	0.00977	0.0449***	0.514***	0.666***
	(0.0139)	(0.0129)	(0.0124)	(0.151)	(0.0980)
Log Assets (pre-IPO)		-0.0433***			
		(0.00869)			
Cash+Equiv/Assets (pre-IPO)		0.621***			
		(0.0162)			
Log Liabilities (pre-IPO)		-0.00177			
		(0.00890)			
Constant	0.287***	0.260***	0.290***	1.229***	1.436***
	(0.0459)	(0.0181)	(0.00823)	(0.294)	(0.169)
Observations	6,405	6,378	6,405	6,405	6,405
R-squared / Within R-squared	0.038	0.701	0.185	0.196	0.285
Firm FE	No	No	Yes	Yes	Yes
Calendar Year FE	No	Yes	No	Yes	No
Industry-Year FE	No	No	No	No	Yes
Number of Deals	1,700	1,680	1,700	1,700	1,700

Figure 2

First Stage – Greenshoe Exercise and Cash Holdings (Univariate)

This figure plots the mean $\frac{Cash+cash\ equivalents}{Book\ assets}$ ratios for firms before and after the IPO (year 0 is the fiscal year during which the IPO happens), split by whether the greenshoe is exercised. The error bars denote a 95% confidence interval.

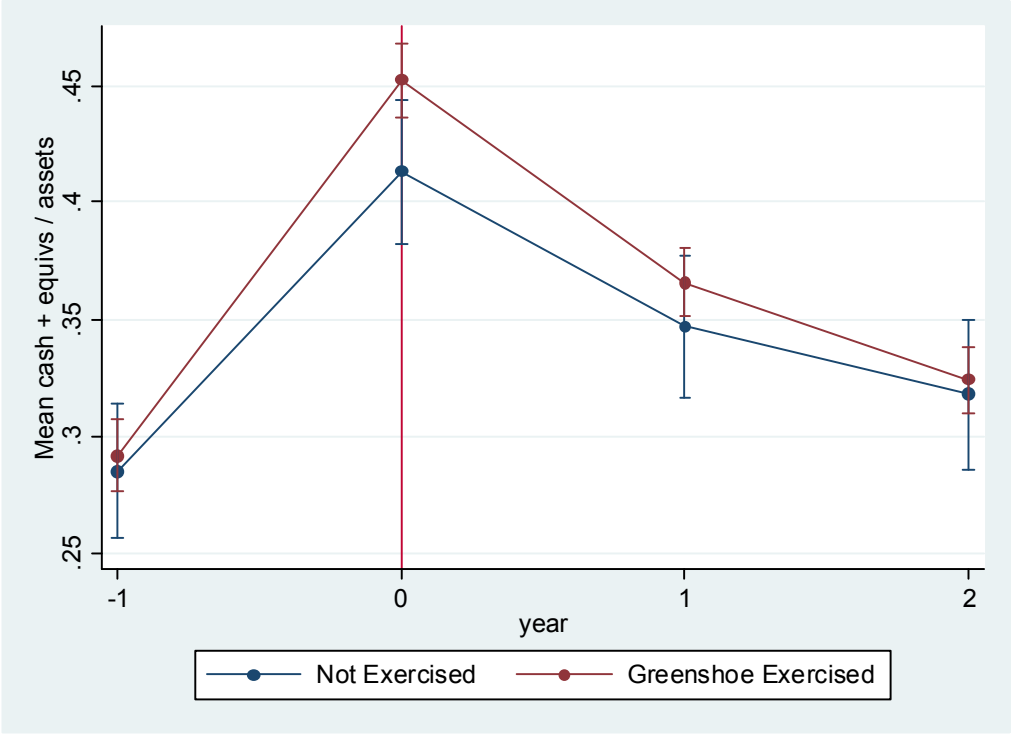

Figure 3

Use of Proceeds – Acquisitions

These graphs plot the number of acquisitions made by a firm in a given year. Each graph is split into two lines, one for firms with an exercised greenshoe and one without. The graph on the left depicts the relationship between greenshoe exercise and acquisitions for all IPO firms. The graph on the right presents the same relationship for firms which announce in their prospectus that the proceeds of the IPO will be used on acquisitions. We exclude firms which list "Acquisitions" as one of many uses alongside "General Corporate Purposes." The x-axis denotes the year relative to the IPO. Year 0 is the first fiscal year ending after the IPO.

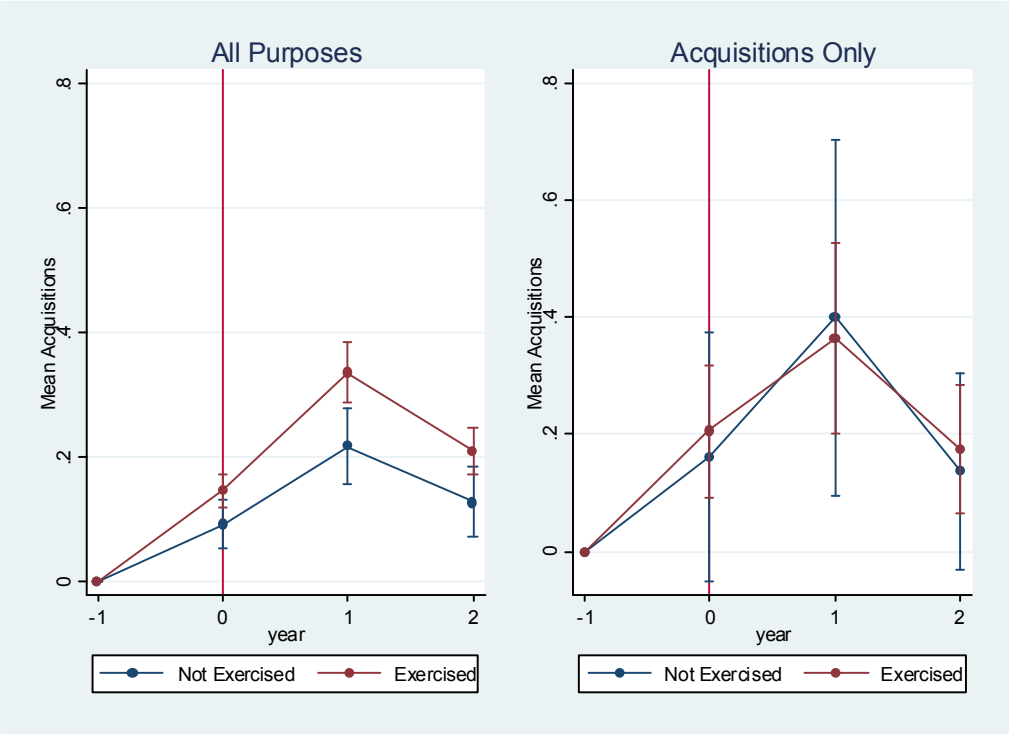

Table 3

Acquisition Probability and Greenshoe Exercise

This table presents evidence that firms with an exercised greenshoe make more acquisitions. The dependent variable is the total number of acquisitions made by a firm in a year. Firm, calendar year and industry-year fixed effects are introduced progressively. Columns 4-5 include 2-month/1-year return decile fixed effects and a continuous control for the return. The R-squared in columns 2-3 is the within-firm R-squared. Standard errors are clustered at the 2-digit SIC level.

	(1)	(2)	(3)	(4)	(5)
Greenshoe x Year 0	0.0520	0.0508	0.0582	0.0663**	0.0626**
	(0.0325)	(0.0313)	(0.0397)	(0.0289)	(0.0294)
Greenshoe x Year 1	0.105***	0.111***	0.110***	0.125***	0.120***
	(0.0256)	(0.0251)	(0.0338)	(0.0449)	(0.0450)
Greenshoe x Year 2	0.0819**	0.0789***	0.0737**	0.0897**	0.0896**
	(0.0319)	(0.0288)	(0.0365)	(0.0410)	(0.0410)
Greenshoe	0.00405			-0.0401**	-0.0352***
	(0.00763)			(0.0159)	(0.0131)
Year 0	0.0793***	0.0891***	-0.310*	0.0624**	0.0621**
	(0.0230)	(0.0214)	(0.161)	(0.0255)	(0.0260)
Year 1	0.228***	0.221***	-0.526	0.221***	0.217***
	(0.0464)	(0.0416)	(0.348)	(0.0399)	(0.0399)
Year 2	0.168***	0.132***	-0.924*	0.193***	0.182***
	(0.0355)	(0.0349)	(0.499)	(0.0388)	(0.0380)
Log Assets (pre-IPO)	0.0161**				
	(0.00627)				
Cash+Equiv/Assets (pre-IPO)	-0.0274				
	(0.0351)				
Log Liabilities (pre-IPO)	-0.000164				
	(0.00925)				
2-Month Return				0.0769**	
				(0.0316)	
1-Year Return					0.0300
					(0.0183)
Constant	-0.199***	0.00232	-2.023**	-0.135**	-0.0600
	(0.0360)	(0.0193)	(0.926)	(0.0603)	(0.0411)
Observations	6,386	6,405	6,405	6,405	6,360
R-squared / Within R-squared	0.087	0.065	0.201	0.178	0.186
Firm FE	No	Yes	Yes	No	No
Calendar Year FE	Yes	No	No	Yes	Yes
Return Decile FE	No	No	No	2m	1y
Industry-Year FE	No	No	Yes	Yes	Yes
Number of Deals	1,680	1,700	1,700	1,700	1,675

Table 4

Value Destruction in Mergers

This table shows that excess-cash driven mergers destroy value. The dependent variable in all regressions is the acquirer return from the closing price prior to the announcement of the merger to the day after it minus the CRSP value-weighted index return for these dates. Deals flagged as "rumored" prior to the announcement date by Dealogic are dropped. Standard errors are clustered by acquirer industry (2-digic SIC code).

	(1)	(2)	(3)	(4)
Greenshoe	-0.0237*	-0.0277**	-0.0288*	-0.0338**
	(0.0128)	(0.0130)	(0.0145)	(0.0165)
Relative Size (market cap)		0.00249	-0.00677	-0.00867
		(0.0141)	(0.0194)	(0.0139)
Log Deal Value		0.00713**	0.0101***	0.0135***
		(0.00270)	(0.00299)	(0.00322)
Horizontal Deal		0.00353	0.00411	0.00571
		(0.0169)	(0.0176)	(0.0205)
Log Assets (pre-IPO)			-0.00349	0.00236
			(0.00667)	(0.00322)
Log Market Cap (IPO)			-0.00808	-0.00600
			(0.00595)	(0.0104)
Cash+Equiv/Assets (pre-IPO)			-0.00178	-0.0242
			(0.0285)	(0.0190)
Log Liabilities (pre-IPO)			0.00288	0.00288
			(0.00815)	(0.00815)
Log Assets (current)				-0.0232
				(0.0157)
Log Liabilities (current)				0.00346
				(0.0175)
Leverage (current)				0.00183
				(0.0636)
Log Market Cap (Acquisition Day)				0.00949**
				(0.00463)
Constant	0.0324**	0.0147	0.0529	0.104
	(0.0144)	(0.0241)	(0.0422)	(0.0778)
Observations	684	672	664	664
R-squared	0.005	0.029	0.031	0.087
Calendar Year FE	No	Yes	Yes	Yes
Acquirer 2-Digit SIC FE	No	No	No	Yes

..

Figure 4

Value Destruction in Mergers

This figure shows the proportion of acquisitions having negative abnormal returns (-1,+1) for greenshoe and non-greenshoe firms. The error bars denote 95% confidence intervals.

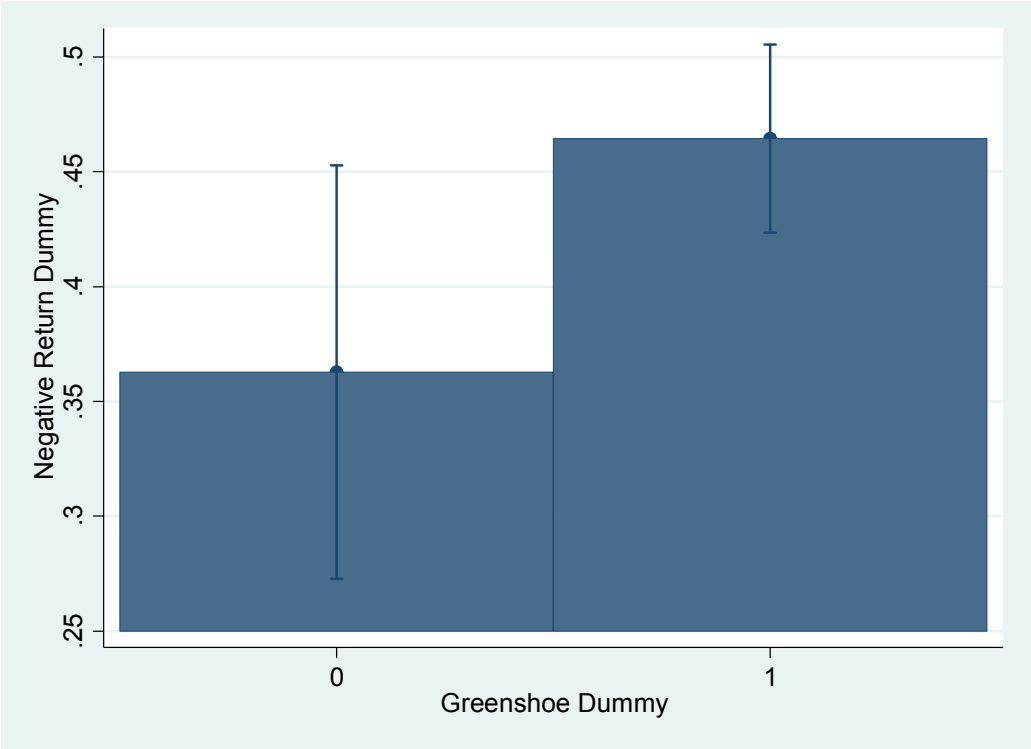

Table 5

Greenshoe Exercise and Executive Compensation

This table provides evidence that firms with higher cash due to greenshoe exercise increase managerial compensation. The dependent variable is the logarithm of total compensation (COMPUSTAT item tdc1). All other variables are defined in prior tables and the appendix. Standard errors are clustered by 2-digit SIC.

	(1)	(2)	(3)	(4)	(5)	(6)
Greenshoe x Year 0	-0.0641	0.817	-0.0641	0.718	0.740	0.520
	(0.429)	(0.934)	(0.428)	(0.786)	(1.073)	(1.207)
Greenshoe x Year 1	-0.108	0.411	-0.108	0.420	0.685	0.227
	(0.402)	(0.710)	(0.401)	(0.566)	(0.638)	(0.985)
Greenshoe x Year 2	0.128	1.378**	0.128	1.334***	1.900**	1.147
	(0.497)	(0.617)	(0.495)	(0.471)	(0.689)	(0.862)
Greenshoe	-0.166	-0.909			-0.827	-1.175
	(0.373)	(0.646)			(0.712)	(0.860)
Year 0	0.421	-0.200	0.421	-0.174	-0.192	0.422
	(0.403)	(0.837)	(0.402)	(0.808)	(0.835)	(1.051)
Year 1	0.441	0.0538	0.441	-0.246	-0.221	0.502
	(0.355)	(0.690)	(0.354)	(0.736)	(0.536)	(1.027)
Year 2	0.724	-0.305	0.724	-0.718	-1.022	0.350
	(0.427)	(0.948)	(0.426)	(0.779)	(0.658)	(0.945)
Log Assets (pre-IPO)		0.211				
		(0.143)				
Cash+Equivs/Assets (pre-IPO)		2.182**				
		(0.940)				
Log Liabilities (pre-IPO)		0.168				
		(0.106)				
Return index (2 months)					-2.328	
					(4.580)	
Return index (1 year)						0.700***
						(0.178)
Constant	6.993***	2.161	6.859***	6.520***	11.57**	2.832
	(0.369)	(1.519)	(0.0874)	(0.129)	(4.440)	(1.823)
Observations	248	248	248	248	248	248
R-squared	0.068	0.717	0.155	0.703	0.676	0.774
Firm FE	No	No	Yes	Yes	No	No
Industry-year FE	No	Yes	No	Yes	Yes	Yes
Number of Deals	62	62	62	62	62	62

Figure 5

Robustness – Return Quintiles

In these graphs we plot the two variables that are only relevant post-IPO (number of acquisitions and announcement returns) by the quintile of the 2-month and 1-year returns. Lines with N denote averages for firms where the greenshoe was not exercised and lines with Y denote averages for firms with an exercised greenshoe. The graphs on the top row sort by quintile of 2-month returns whereas the bottom row is sorted by quintile of 1-year return. The graphs on the left show the total number of acquisitions post-IPO by each company and the graphs on the right show the sum of announcement returns for these companies.

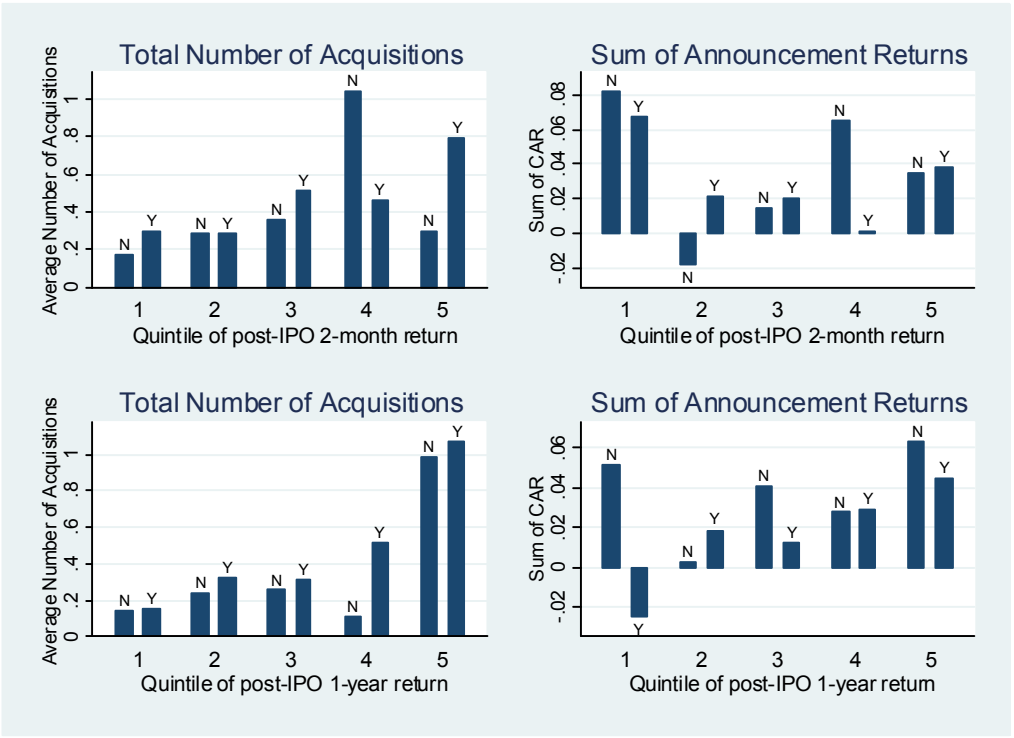

Table 6

Matching Results – Note: highly preliminary

This table shows that even when matching on 2-month or 1-year return deciles, most of the results of the paper are very similar. We use nearest-neighbor matching (on 2-digit industry, calendar year, 2-month or 1-year return decile, on the pre-IPO log of assets, pre-IPO log of liabilities and pre-IPO cash+equivalents/assets ratio) to determine the effect of greenshoe exercise on our outcome variables. These outcome variables are the total number of acquisitions made per company post-IPO, the sum of announcement returns on these acquisitions, the log of assets post-IPO and the log of liabilities post-IPO.

	(1)	(2)	(3)	(4)
	Total Number of Deals	Sum of CAR	Log Assets	Log Liabilities +1
Greenshoe (2-month match)	0.192***	0.0289	0.194***	0.0774
	(0.0508)	(0.0323)	(0.0493)	(0.0552)
Greenshoe (1-year match)	0.207***	-0.139*	0.236***	0.0647
	(0.0555)	(0.0825)	(0.0443)	(0.0528)
Observations (2-month)	6,384	677	4,690	4,692
Observations (1-year)	6,331	672	4,661	4,663

Appendix

Variable Definitions

The table below provides definitions and descriptions of key variables used in our paper

Variable	**Description / COMPUSTAT data items**	**Source**
Leverage	Total liabilities / Total assets (LT/AT) – winsorized 1% both tails by calendar year	COMPUSTAT
Cash holdings	Cash + Equivalents / Total assets (CHE/AT)) – winsorized 1% both tails by calendar year	COMPUSTAT
Total Assets	Total Assets (TA) from COMPUSTAT. Frequently as a logarithm.	COMPUSTAT
Total Liabilities	Total Assets (TA) from COMPUSTAT. Frequently as a logarithm (+1).	COMPUSTAT
1-month Return	First month return for the security. Calculated using CRSP (22 trading days after the first observation in CRSP)	CRSP
2-month return	Same as above, except 2 calendar months instead of 22 trading days	CRSP

Greenshoe exercise – main definition	Dummy for whether greenshoe option is exercised, calculated based on Dealogic variable "OvlExercisedShares" (but only if "OvlAuthorizedShares" is not missing)	Dealogic
Announcement Return	Acquirer return (including dividends etc.) from (-1,+1) from the announcement date of the merger	CRSP (return) /Dealogic (date)
Abnormal Announcement Return (CAR -1, 1)	Acquirer return from the closing price 2 days prior to the announcement to 1 day after (-1,+1) from the announcement date of the merger minus the return from the CRSP value-weighted index for the same period Note that we do not use an asset pricing model due to the difficulty of calibrating one for recently IPOed firms	CRSP
Total Compensation	Total executive compensation in a year (salary, bonus, other annual, restricted stock grants and LTI). Data item: tdc1 Winsorized at 1% in both tails by year, generally used as a logarithm.	EXECUCOMP