On the Interplay between Financing and Investment Decisions: Evidence from Debt and Equity Issues*

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Abstract

We study the implications of investment–financing interactions for firm issuance decisions. Previous literature reports a negative relation between internal funds (profitability) and the demand for external funds (e.g., debt issuance). This negative relation has been interpreted as evidence for external financing costs arising from asymmetric information (e.g., the pecking order theory). In contrast, we argue that, because investment is endogenous to the availability of financing, higher costs of external finance need not imply a negative relation between internal and external financing. For firms that face costly external finance, the high opportunity cost of (constrained) investment, the need to save resources, and changes in credit capacity associated with profitability generate a complementary effect between internal and external funds. This complementary effect mitigates (or eliminates) the well-known negative relation between internal funds and external finance. Consistent with these arguments, we find robust evidence that the negative effect of internal funds on the demand for external financing is concentrated among firms that are *least likely* to face financing frictions (firms that distribute large amounts of dividends, that are large, and whose bonds and commercial papers are rated). For firms in the other end of the spectrum (low payout, small, and unrated), external financing is insensitive to innovations to internal funds. These cross-firm differences are economically and statistically significant, hold separately for debt and equity financing, and are magnified in the aftermath of macroeconomic movements that tighten financing frictions.

Key words: External financing, credit frictions, investment endogeneity, GMM, business cycles.

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1 Introduction

Corporate managers in the US and Europe claim that maintaining "financial flexibility" is the primary objective of their firms' financial policies (see Graham and Harvey (2001) and Bancel and Mittoo (2002)). Their stated policies are consistent with the notion of ensuring funding for present and future investment undertakings in a world where financing frictions force firms to pass up profitable opportunities. In spite of these assertions, empirical work on capital structure often ignores the interplay between corporate investment and financing decisions. Most recent papers take investment as *exogenous* to financial policy, and focus on issues such as the relative costs of issuing debt versus equity (e.g., Shyam-Sunder and Myers (1999) and Fama and French (2002, 2005)), market timing (Baker and Wurgler (2002)), security return dynamics (Welch (2004)), and the relevance of elements of the tradeoff theory; taxes and financial distress costs (Hovakimian et al. (2001)).[1] While these issues are undoubtedly important for our understanding of corporate financial policies, the literature abstracts from crucial aspects influencing the supply and demand for external funds across firms: capital market frictions and real investment demand.

In this paper we study the implications of investment–financing interactions for external financing decisions. In essence, we explore the idea that capital market frictions cause investment to become *endogenous* to external financing. The endogeneity of investment, in turn, affects the relationship (or substitutability) between firms' use of internal funds and their demand for new external financing. We argue that the effect of endogenous investment on external financing demand adds new insights to the research on financial policy-making, and that it highlights important limitations with standard tests that build on the assumption of investment exogeneity.

There is ample evidence that more profitable firms demand less external finance. The literature commonly interprets this finding as evidence of financing frictions (e.g., asymmetric information) that increase the cost of external funds and generate a preference for internal funds to finance investments (e.g., Myers (1993), Fama and French (2002)).[2] This standard interpretation is, however, based on the assumption that investment is exogenous to external financing decisions, an unlikely proposition if financing costs are high. We argue that higher costs of external finance do not imply a clear-cut relation between internal and external finance, once we take the endogeneity of investment into account. Consistent with this argument, we present robust evidence that the negative effect of internal funds on issuance activity is concentrated among firms that are least likely to face strong financing frictions. Our analysis suggests that a negative relation between profitability and the

[1] Earlier papers on financial policy attribute a prominent role to the interplay between investment and financing, as exemplified by Jensen and Meckling's (1976) risk-shifting and Myers's (1977) debt-overhang ideas.

[2] As we discuss below, there are also alternative interpretations for the negative association between profitability and external financing demand.

demand for external finance should *not* be interpreted as evidence for costly external financing (à la pecking order theory).

To illustrate our basic argument, consider first a situation in which firms face no frictions when raising funds for positive NPV projects (i.e., firms are *financially unconstrained*). In this case, investment spending is a function only of investment opportunities, and is *determined independently* of firm financial policy. In particular, financially unconstrained firms need not change their investment away from first-best levels in response to variations in current profitability. While the standard tradeoff theory suggests that more profitable firms should raise more external finance (debt) because of tax shields, the bulk of the literature shows that firms seem to display a preference for financing investment with internal funds: empirically, more profitable firms appear to demand less external financing. We take this pattern as given, and hypothesize that it will generally characterize the financial policies of unconstrained firms in the data.

Consider now firms that face strong financing frictions, such that they might pass on positive NPV investments due to the high costs of external funds (i.e., firms are *financially constrained*). In this case, multiple mechanisms mitigate the negative effect of internal funds on external financing. These mechanisms are distinct yet related, in that they all rely on the observation that investment and financing policies are *jointly determined* when external financing costs are high. Let us briefly discuss these countervailing effects (more on this in Section 2).

First, notice that a firm that faces high external financing costs deals with a tradeoff between using internal funds to (1) reduce the demand for external financing or (2) increase current capital expenditures. This tradeoff arises from the fact that a financially constrained firm's investment is, by definition, lower than desired levels. Under this scenario, the firm may use internal funds for additional investment, rather than reducing its use of external financing, given the high opportunity cost of investment. Second, a firm that is financially constrained worries not only about the funding of current investments, but also future ones. The need to fund future investments under credit constraints increases the firm's demand for liquid assets such as cash and working capital (see Almeida et al. (2004)). This also decreases the firm's propensity to use internal funds to reduce external financing. Finally, note that high costs of external finance create a direct complementarity between internal funds and the firm's capacity to raise external finance. A constrained firm with high internal funds can direct some of those funds to investments in pledgeable assets, which in turn increase the firm's collateral and its ability to raise additional external funds. Those new external funds allow for further investments in pledgeable assets, amplifying the positive effect of internal funds on the demand for external financing.[3]

[3] This mechanism is known as the "credit multiplier" (Bernanke and Gertler (1989) and Kiyotaki and Moore (1997)).

All of these effects point to the same direction. Following increases in profitability, financially constrained firms' use of external financing will *decline by less* than what is observed for unconstrained firms experiencing similar income windfalls. Analogously, financially constrained firms will be unable to fully offset the impact of shortfalls in profitability by way of raising external funds; hence, their external financing will *increase by less* than what is observed for unconstrained firms experiencing a similar income shock. In sum, the endogeneity of investment implies that the well-known negative relation between profitability and the demand for external financing should be significantly weaker (possibly disappearing) when firms are financially constrained.

We examine the data to check if the sensitivity of external financing to internal cash flows is associated with financing constraints along the lines of our argument. We do so by looking at firms' propensity to resort to external funding sources (debt and equity issuance) in response to innovations in profitability (cash flows). Using a large sample of firms over thirty years, we estimate that propensity for various subsamples partitioned on the basis of the likelihood that firms have constrained/unconstrained access to external finance. Following standard literature, we consider four alternative firm characteristics in identifying constrained and unconstrained subsamples: payout policy, asset size, bond ratings, and commercial paper ratings. As hypothesized, under each one of our constraint criteria, we find that the cash flow sensitivity of external financing is negative, statistically significant for the subsample of financially unconstrained firms, but indistinguishable from zero for the subsample of constrained firms. Importantly, all cross-sample differences in internal–external funding sensitivities are statistically and economically significant. The patterns that we observe in our base tests remain after various robustness checks involving changes in empirical specifications, variable construction methods, sampling restrictions, and econometric techniques.[4]

Besides performing robustness checks on the reliability of our empirical estimates, we report a number of additional tests supporting our story's underlying logic. For example, using a system-regression framework, we also show that those firms that are unable to raise external financing when cash flows are low systematically allocate a large portion of their profits into assets that can be used to smooth out the investment process (such as cash and other working capital items). Results from these system regressions support our conjecture that internal and external financing policies are determined jointly with investment spending under financing frictions. We also show evidence that differences in external financing–cash flow sensitivities across constrained and unconstrained firm samples are magnified during macroeconomic recessions; that is, precisely at times when financing constraints are likely to be tightened. These difference-in-differences estimations further address potential concerns with spurious biases affecting our panel estimations.

[4] Among other checks, our robustness tests address concerns with errors-in-variables problems in our measure of investment opportunities using the estimators proposed by Erickson and Whited (2000) and Cummins et al. (2006).

Taken altogether, our results show evidence that capital market frictions play a key role in firm financing decisions: cross-sectional and inter-temporal heterogeneity in firm financing constraints drive significant differences in external financing policies (debt and equity issuance). These systematic financing patterns provide new insights for research on corporate policy-making, yet they have been largely overlooked by the existing literature.[5] Noteworthy, our results show that the negative association between internal funds and external financing is *least likely* to obtain when financing costs are high, both cross-sectionally and inter-temporally. Our results imply that this negative association is not a good indicator of the way external financing costs shape corporate financing decisions.

It is important to be clear about what our results do *not* imply. They do not imply that asymmetric information is unimportant for external financing decisions. Instead, our results simply suggest that the negative relation between profitability and external financing is not strong evidence for asymmetric information. This message is consistent with that of recent studies that emphasize alternative explanations (other than the pecking order) for the existing evidence; see, among others, Hennessy and Whited (2005), Lewellen and Lewellen (2006), and Strebulaev (2007).[6] Indeed, one of these alternative arguments might very well explain the negative relation between profitability and external financing decisions for firms that do not face strong financing frictions (our benchmark case).

We follow the recent capital structure literature in that we focus on companies' marginal financing decisions — the issuance of new external financial claims — to learn about financial policy-making (e.g., Shyam-Sunder and Myers (1999) and Frank and Goyal (2003)). Note, however, that papers in that literature are generally concerned with firms' choice between debt *versus* equity. In contrast, we focus on the total financing that firms raise in the capital markets; i.e., new debt *and* equity issues. We do so because our implications should hold for debt and also for outside equity. To verify the logic of our approach, however, we also look at how debt and equity financing (separately) respond to variations in cash flows. The results that we obtain when we do so are consistent with the idea that the differences across constrained and unconstrained firms hold irrespective of firms' preferred source of marginal outside financing: the cash flow sensitivities of *both* debt and equity financing are significantly more negative for financially unconstrained firms.

One study that is directly related to ours is Lemmon and Zender (2004), who look at the ex-

[5] Korajczyk and Levy (2003) is a notable exception. They also look at macroeconomic movements in studying the impact of financing constraints on firm financing. Their study, however, focus exclusively on leverage ratios.

[6] Strebulaev (2007) argues that a dynamic trade-off model can also generate a negative relation between profitability and leverage, as the equity values of profitable firms increase and debt remains fixed due to adjustment costs. Hennessy and Whited (2005) and Lewellen and Lewellen (2006) argue that debt-related tax benefits are less attractive when the firm can also finance investments with internal funds, because internal equity financing allows the firm to defer taxes on payments to equityholders. As a consequence, more profitable firms may optimally issue less external finance (i.e., debt) than firms that are less profitable (which must choose between debt and outside equity). See also Chen and Zhao (2005) for a detailed discussion of these alternative interpretations, and some evidence on their success in explaining firms' observed preference for internal funds.

ternal financing patterns of firms sorted according to whether or not they have easy access to the capital markets; i.e., have rated bonds. Differently from our study, however, those authors focus on the determinants of the debt versus equity decision, running Shyam-Sunder and Myers (1999)-style regressions across samples of constrained and unconstrained firms. Based on cross-sectional differences in the estimates returned from these regressions, Lemmon and Zender conclude that some of the patterns observed in the data can be reconciled by the pecking order theory. Consistent with our analysis, Faulkender and Petersen (2006) show that financing constraints — proxied by the absence of a bond rating — are a key determinant of firms' capital structure. Faulkender and Petersen argue that observed leverage ratios endogenize issues related to the supply of funds by outside creditors.

Finally, our study has connections with the literature on real investment under financial constraints (see Hubbard (1998) for a review). We add to the financial constraints literature by providing *prima facie* evidence that firms often presumed to be "financially constrained" — those that pay little or no dividends to investors, those that are small, and those whose bonds and commercial papers are not rated — indeed access the capital markets (and save funds) in ways that are consistent with the presence of frictions in the availability of funding for their investments.

The remainder of the paper is organized as follows. In the next section we develop the argument that the sensitivity of external financing to internal funds may vary across firms along the lines of the financing constraints that they face. Section 3 describes our sampling and empirical methods. Section 4 presents our main findings. Checks of the robustness of our empirical estimates and economic inferences are performed in Sections 5 and 6. Section 7 concludes the paper.

2 Endogenous investment and the substitution between internal and external financing

Our main argument is that capital market frictions affect the relation between firms' use of internal funds and demand for external finance. As discussed in the introduction, the capital structure literature documents a negative association between firm profitability and external financing. Leary and Roberts (2005), for example, find that firms that have high cash flows or high cash balances are less likely to issue (and are more likely to retire) debt and equity. Those authors, and much of the literature, interpret these findings as evidence supporting the pecking order theory (see, e.g., Myers (1993) and Fama and French (2002)). According to the pecking order argument, firms prefer to finance investments with internal funds, because asymmetric information increases external financing costs (Myers and Majluf (1984) and Myers (1984)). A preference for internal over external funds would then generate a negative relation between internal cash flows and external financing: more profitable firms require less external financing, and should thus show lower security issuance activity.

The above argument ignores the possibility that the firm's investment choice might become endogenous to external financing decisions precisely when external financing costs are high. Critically, the argument assumes that investment is determined *before* the firm decides the optimal amount of debt and equity to issue. Consistent with the assumption of exogenous investment, standard tests of the pecking order use capital expenditures as an explanatory variable in the right-hand side of regressions that explain capital structure (as part of the firm's "financing deficit"). This testing approach, which follows from Shyam-Sunder and Myers (1999), implicitly assumes that *observed* investment is equal to *desired* investment even when the firm faces capital market frictions. But what happens when one considers the interdependence of financing and investment decisions?

To develop the implications of endogenous investment for the substitution between internal and external funds, we draw on the literature that examines the impact of capital markets imperfections on investment decisions. The basic observation is that when external financing costs are high, the firm's feasible investments are not independent of the firm's external financing policy. This interdependence, in turn, creates a complementary effect between internal and external financing. Let us discuss three different mechanisms that generate this complementarity.

First, if firms' investments are lower than desired levels, that is, if firms are financially constrained, then investment should be positively related to the availability of internal funds. Essentially, firms with high internal funds will find it profitable to direct some of those funds towards incremental investment — which have high marginal product — as opposed to cutting down on external financing. Conversely, if internal funds decrease, a constrained firm might be forced to cut down investment because the alternative (i.e., leaving investment constant and raising additional external funds) might not be feasible. This investment–financing tradeoff works to mitigate any potential substitution effect between external and internal funds.

This first mechanism is behind the tests of financing constraints proposed by Fazzari et al. (1988), and motivates a large empirical literature in economics and finance (see Hubbard (1998) and Stein (2003) for comprehensive reviews). Importantly, recent research has pointed to difficulties with the strategy of looking at the empirical correlation between real and financial variables, stemming from measurement problems in the control for underlying investment opportunities (see, e.g., Erickson and Whited (2000), Gomes (2001), and Cummins et al. (2006)). Our test design avoids the explicit modelling of financial and real variables and our estimations recognize the possibility that well-known biases could underlie inferences with the sorts of empirical models we estimate (see Sections 4 and 5). Among other expedients, we adopt empirical strategies that directly address the measurement error problem (e.g., Erickson and Whited's GMM estimator).

The second mechanism is related to the effect of future investment on current financing choices.

A firm that faces costly external financing should worry not only about current investment needs, but also about future ones. One way that the firm can secure future investment spending is by increasing its holdings of cash, securities, and other liquid assets that can be used to smooth out the investment process (e.g., working capital). For constrained firms, holdings of liquid assets are an additional competing use of internal funds for credit. In other words, firms that face high costs of external financing may find it optimal to direct cash flows towards liquid assets when they observe high profitability (see Fazzari and Petersen (1993) and Almeida et al. (2004) for evidence). Conversely, if profitability is low, constrained firms may draw down their stocks of liquid assets to avoid raising costly external financing. The optimal management of liquid assets is another reason why constrained firms display a less strong propensity to employ cash flows towards the reduction of external financing, relative to unconstrained firms.

In order to test whether external financing and liquid asset holdings are simultaneously determined, we estimate a system of regressions in which both these variables are endogenous (see Section 5). This system allows us to test the hypothesis that the *same firms* that avoid using external financing to absorb changes in internal funds *also* direct internal funds towards holdings of liquid assets.[7]

The third mechanism affecting the substitution between internal and external financing is related to the firm's capacity to raise external finance. Constrained firms' ability to raise external financing is likely to covary positively with variations in internal cash flows, either because external financing costs decrease when cash flows are high (Bernanke and Gertler (1989)), or because the value of collateral increases with internal cash flows (Kiyotaki and Moore (1997)). Following a positive income shock, firms invest more, therefore increasing their holdings of tangible assets. These assets create new collateral, which in turn, allow the firm to raise more external finance ("credit multiplier"). The credit multiplier mechanism suggests that internal funds and external finance should become more complementary for firms that are financially constrained.[8] This mechanism provides yet another reason why the relation between internal funds and external finance should be *less negative* when external financing costs are high (relative to the pattern observed in unconstrained firms).

Our empirical tests explore the rationale behind the credit multiplier by identifying situations in which this mechanism is more likely to become important. In particular, prior research suggests that the credit multiplier matters more during recessions and monetary contractions, when financing constraints are more likely to bind (see, e.g., Kashyap et al. (1994), Gertler and Gilchrist (1994),

[7]Our tests on liquid asset holdings draw on Almeida et al. (2004). However, while Almeida et al. use only cash on the left-hand side of their empirical models, the tests of this paper use a broader measure of liquid asset holdings that also include working capital items (such as inventory and accounts receivables). This modification is important to consider because cash and working capital can be close substitutes (see, for example, Bates et al. (2006)).

[8]Firm-level evidence of the credit multiplier can be found in the recent work of Hennessy et al. (2006) and Almeida and Campello (2006).

and Calomiris et al. (1995)). Accordingly, we examine the extent to which the sensitivity of external financing to internal funds varies with the business cycle for different types of firms (see Section 6). Presumably, it is even more likely that internal funds and external finance become complementary during recessions and monetary contractions.

Notice that these arguments do not make any explicit predictions about the effect of profitability on the demand for external finance for firms that face low external financing costs. Presumably, in the absence of the complementarity effects discussed above this set of firms should display the standard negative association between profitability and external financing. For testing purposes, we take this as our empirical benchmark. We summarize our discussion into the following set of testable implications:

(1) Single-Equation Tests: The sensitivity of external financing (debt and equity issuance) to innovations in profitability (cash flows) should be lower (i.e., less negative) for financially constrained firms than for unconstrained firms.

(2) System-Equation Tests: Constrained firms that display a less negative sensitivity of external financing to cash flow innovations should also display a more positive sensitivity of liquid asset holdings (cash, inventory, etc.) to cash flows, compared to unconstrained firms.

(3) Differences-in-Differences Tests: The gap between the cash flow sensitivities of external financing of constrained and unconstrained firms should increase during periods in which financial constraints are more likely to bind (e.g., economic recessions).

In the remainder of the study, we examine whether these predictions are borne out in the data. In doing so, we focus on the association between firms' external financing initiatives (net issues of public debt and equity securities) and their internal cash flows across and within subsamples of firms characterized according to the degree of frictions that they face when assessing the capital markets. As we discuss in turn, much of our sampling and testing methodologies draw on the existing literature. We do this for the sake of comparability with earlier studies and to ease the replication of our findings.

3 Sample and Methodology

3.1 Sample

To test our predictions we use a sample of firms taken from COMPUSTAT's P/S/T, Full Coverage, and Research annual tapes over a three-decade window from 1971 to 2001.[9] Our sampling disregards

[9] We start collecting our sample from 1971 because the flow of funds data is not available prior to that year. The tests of this paper only consider security issuance activities that generate *actual* flows of funds from the financial

observations from financial institutions (SICs 6000–6999), utilities (SICs 4900–4999), and not-for-profit organizations and governmental enterprises (SICs greater than 8000). We require firms to provide valid information on their total assets, sales, debt, market capitalization, and operating income (cash flows). We deflate all series to 1971 dollars.

Our data selection criteria and variable construction approach follows that of Almeida et al. (2004), who study the impact of financing constraints on the management of internal funds, and that of Frank and Goyal (2003), who look at external financing decisions. Following Almeida et al., we discard from the raw data those firm-years for which the market value of assets is less than $5 million, and those displaying asset growth exceeding 100%.[10] We further request that firm annual sales exceed $1 million in order to minimize the sampling of distressed firms. We use the flow of funds account series detailed in Frank and Goyal to construct our empirical proxies. Differently from those authors, however, we do not trim any of the variables at their extreme percentiles. Instead we place limits on variables' distributions based on economic intuition. For instance, we eliminate firm-years for which debt exceeds total assets (near-bankruptcy firms), and those whose market-to-book asset ratio (or Q, our basic proxy for investment opportunities) is either negative or greater than 10 (see Gilchrist and Himmelberg (1995)).

Our final sample consists of observations from 10,031 individual firms (72,851 firm-years). Table 1 reports summary statistics for the main variables used in our tests. Since our sampling approach and variable construction criteria follow the literature, it is not surprising that the numbers we report in Table 1 resemble those found in related studies (see, e.g., Frank and Goyal (2003) and Lemmon and Zender (2004)). In the interest of brevity, we omit the discussion of the descriptive statistics of our (standard) sample.

– insert Table 1 here –

3.2 Methodology

According to our story, we should expect to find a strong negative relation between internal funds shocks (cash flow innovations) and the demand for external financing when firms are financially unconstrained (our "benchmark" case). For financially constrained firms, in contrast, any such association should be at most weakly negative, and significantly different (less negative) than what is observed for unconstrained firms. In order to implement a test of this argument, we need to specify

markets into the firm (and vice-versa). Our results are immune to Fama and French's (2005) criticism that existing studies in the literature fail to account for events that change a firm's observed capital structure — such as mergers and granting of stocks to managers — but produce no cash flows to the firm.

[10] The first screen eliminates from the sample those firms with severely limited access to the public markets; the internal–external funding interplay of our theory implies that the firm does have active (albeit potentially constrained) access to funds from the financial markets. The second screen eliminates those firm-years registering large jumps in their business fundamentals; these are typically indicative of major corporate events.

an empirical model relating firms' issuance of external financing instruments and cash flows, and also to empirically identify financially constrained and unconstrained firms. We tackle these two issues in this section.

3.2.1 Empirical Models of External Financing

We use two alternative specifications to empirically model the cash flow sensitivity of external financing. The first specification is a parsimonious one, in addition to firm size, it only includes proxies for variables that we believe will capture information related to the primitives of our story: cash flows and investment opportunities. Define *ExternalFinancing* as the ratio of the total net equity issuances (COMPUSTAT's item #108 – item #115) plus net debt issuances (item #111 – item #114) to total book value of assets (item #6). *CashFlow* is defined as the ratio of earnings before extraordinary items plus depreciation and amortization (item #123 + item #125) to total book assets. Our proxy for investment opportunities, Q, is computed as the market value of assets divided by the book value of assets, or (item #6 + (item #199 × item #25) − item #60 − item #74) / (item #6). Our baseline empirical model can be written as:

$$ExternalFinancing_{i,t} = \alpha_1 CashFlow_{i,t} + \alpha_2 Q_{i,t} + \alpha_3 Size_{i,t} + \sum_i firm_i + \sum_t year_t + \varepsilon_{i,t}, \quad (1)$$

where *Size* is the natural log of sales (item #12), and *firm* and *year* absorb firm- and time-specific effects, respectively.

Our predictions concern the issuance of financing instruments in response to cash flows, captured by α_1 in Eq. (1). Our story also suggests that a constrained firm's financing decisions should be influenced by the attractiveness of future investment opportunities. Noting the difficulty in empirically measuring those opportunities, our baseline model uses Q to capture information about the value of long-term growth options that are available to the firm. We, however, acknowledge the limitations of empirical Q and later propose alternative specifications that sidestep those limitations. We include firm size in our baseline specification because accessing external funds may entail fixed costs; on the margin, the larger firms within a given subset of firms could be more favorably predisposed to substitute between internal and external funds due to economies of scale. Finally, we explicitly control for biases stemming from unobserved individual heterogeneity and time idiosyncrasies by expunging firm- and time-fixed effects from our sample. In fitting the data, we allow residuals to be correlated within years using the "sandwich" (or Huber-White) variance/covariance matrix estimator.

An alternative estimate of the cash flow sensitivity of external financing is obtained from a specification in which a firm's decision to issue public securities in face of cash flow innovations takes into account the firm's pre-existing *stock* of internal funding/wealth and its ex-ante financial structure. Here, we borrow insights from the literature on investment demand (e.g., Fazzari and Petersen

(1993) and Schiantarelli and Sembenelli (2000)), on liquidity demand (Almeida et al. (2004)), and on capital structure (e.g., Rajan and Zingales (1995)), and model the annual net issuances also as a function of the beginning-of-the-year stock of cash and liquid securities (*CashHoldings*), accounts receivables and inventory items (*Inventory*), gross plant, property and equipment (*PPE*), and debt/equity ratios (*Debt/Equity*):

$$\begin{aligned} ExternalFinancing_{i,t} &= \alpha_1 CashFlow_{i,t} + \alpha_2 Q_{i,t} + \alpha_3 Size_{i,t} \\ &\quad + \alpha_4 CashHoldings_{i,t-1} + \alpha_5 Inventory_{i,t-1} \\ &\quad + \alpha_6 PPE_{i,t-1} + \alpha_7 Debt/Equity_{i,t-1} \\ &\quad + \sum_i firm_i + \sum_t year_t + \varepsilon_{i,t}. \end{aligned} \tag{2}$$

We control for pre-existing stocks of cash holdings and other working capital items because a firm can use these alternative components of internal wealth to accommodate shocks to cash flows. As in previous research, a firm's stock of hard, tangible assets and its lagged capital structure enter as additional determinants of the amount of new external financing that it obtains.[11]

In estimating Eq. (2), we explicitly recognize the endogeneity of corporate policies such as the accumulation of assets (e.g., cash) that can be quickly liquidated in order to absorb cash flow shocks as well as pre-existing capital structure. We do so within a GMM framework. Identifying instruments for endogenous regressors is never an obvious task, but the combination of some economic introspection and thorough testing of the validity and relevance of the selected set of instruments will help ensure the reliability of our GMM estimates. In particular, we conjecture that past lags of the included variables will convey only negligible (if any) additional information to what is already contained in the right-hand side of (2); yet those same lags should be reasonably correlated with the included regressors. Accordingly, we use lags two and three of the included endogenous regressors (*CashHoldings*, *Inventory*, *PPE*, and *Debt/Equity*) in addition to the exogenous regressors (*CashFlow*, *Q*, and *Size*) as instruments in (2). *Instrument validity* is checked via Hansen's (1982) J-statistic, which in light of our instrument set, reduces to a $\chi^2(4)$ statistic. *Instrument relevance* can be determined from the excluded instruments' squared partial correlations, which are essentially the partial F-statistics from the first stage regressions of the endogenous regressors on the excluded instruments in the system (see Bound et al. (1995)).[12]

[11] All variables are scaled by total assets, with the exception of *Debt/Equity*. Accordingly, *CashHoldings* is computed as the COMPUSTAT's item #1 divided by item #6. *Inventory* is equal to item #2 plus item #3, divided by item #6. *PPE* is item #8 divided by item #6. *Debt/Equity* is item #9 plus item #34, divided by item #216.

[12] Eq. (2) has four variables that we take to be endogenous. In establishing instrument relevance in the regressions below, we only report the lowest of the four first-stage F-statistics — i.e., in order to ensure robustness, we gauge the quality of our instruments based on the *weakest* of their associated test statistics.

3.2.2 Financial Constraints Criteria

Testing the implications of our model requires separating firms according to *a priori* measures of the financing frictions that they face. There are a number of plausible approaches to sorting firms into "financially constrained" and "financially unconstrained" categories. We do not have strong priors about which approach is best and use a of variety alternative schemes to partition our sample:

- Scheme #1: In every year over the 1971 to 2001 period, we rank firms based on their payout ratio and assign to the financially constrained (unconstrained) group those firms in the bottom (top) three deciles of the annual payout distribution. We compute the payout ratio as the ratio of total distributions (dividends and repurchases) to operating income. The intuition that financially constrained firms have significantly lower payout ratios follows from Fazzari et al. (1988), among many others, in the financial constraints literature.[13] In the capital structure literature, Fama and French (2002) use payout ratios as a measure of difficulties firms may face in assessing the financial markets.

- Scheme #2: We rank firms based on their asset size over the 1971 to 2001 period, and assign to the financially constrained (unconstrained) group those firms in the bottom (top) three deciles of the size distribution. The rankings are again performed on an annual basis. This approach resembles that of Gilchrist and Himmelberg (1995), who also distinguish between groups of financially constrained and unconstrained firms on the basis of size. Fama and French (2002) and Frank and Goyal (2003) also associate firm size with the degree of external financing frictions. The argument for size as a good observable measure of financial constraints is that small firms are typically young, less well known, and thus more vulnerable to capital market imperfections.

- Scheme #3: We retrieve data on firms' bond ratings and categorize those firms that never had their public debt rated during our sample period as financially constrained. Given that unconstrained firms may choose not to use debt financing and hence not obtain a debt rating, we only assign to the constrained subsample those firm-years that *both* lack a rating and report positive debt (see Faulkender and Petersen (2006)).[14] Financially unconstrained firms are

[13] The deciles are set according to the distribution of the payout ratio reported by the firms itself (rather than according to the distribution of the reporting firms), which yields an unequal number of observations being assigned to each of our constraint groups. For example, since many firms have a zero payout ratio, we have more payout-constrained firms than unconstrained ones. Our approach ensures that we do not assign firms with low payouts to the financially unconstrained group, and that firms with similar payouts are assigned to the same group.

[14] Firms with no bond rating and no debt are considered unconstrained, but our results are not affected if we treat these firms as neither constrained nor unconstrained. We use the same criterion for firms with no commercial paper rating and no debt in scheme #4 below. In the robustness checks, we restrict the sample to the period where firms' bond ratings are observed every year (from 1986 to 2001), allowing firms to migrate across constraint categories.

those whose bonds have been rated during the sample period. Related approaches for characterizing financial constraints are used by Gilchrist and Himmelberg (1995) and Lemmon and Zender (2004). The advantage of this measure over the former two is that it gauges the *market*'s assessment of a firm's credit quality. The same rationale applies to the next measure.

- Scheme #4: We retrieve data on firms' commercial paper ratings and categorize as financially constrained those firms that never display any ratings during our sample period. Observations from those firms are only assigned to the constrained subsample in the years a positive debt is reported. Firms that issued commercial papers receiving ratings at some point during the sample period are considered unconstrained. This approach follows from the work of Calomiris et al. (1995) on the characteristics of commercial paper issuers.

Table 2 reports the number of firm-years under each of the eight financial constraint categories used in our analysis. According to the payout scheme, for example, there are 30,947 financially constrained firm-years and 22,530 financially unconstrained firm-years. The table also shows the extent to which those classification schemes are correlated. For example, out of the 30,947 firm-years considered constrained according to payout, 13,637 are also constrained according to size, while a much lower number, or 5,027 firm-years, are considered unconstrained. The remaining firm-years represent payout-constrained firms that are neither constrained nor unconstrained according to size. In general, there is a positive correlation among the four measures of financial constraints. For example, most small (large) firms lack (have) bond ratings. Also, most small (large) firms have low (high) payout policies. However, the table also makes it clear that these cross-group correlations are far from perfect. It should be difficult to find consistent results across all of these partition schemes unless they capture some dimension of a common financing constraint phenomenon.

– insert Table 2 here –

4 Baseline Empirical Findings

We start our analysis by estimating Eq. (1) over our entire sample (polling together financially constrained and unconstrained firms). We do so with the goal of verifying that well-documented patterns in the relation between firm profitability and external financing are present in our data. This first test returns the following estimates (t-statistics in parenthesis):

$$ExternalFinancing_{i,t} = \underset{(-4.79)}{-0.0269} \times CashFlow_{i,t} \underset{(4.36)}{+0.0038} \times Q_{i,t} \underset{(7.32)}{+0.0081} \times Size_{i,t}, \quad R^2 = 0.35.$$

The coefficient associated with $CashFlow$ displays the usual strong, negative association between external financing and profitability. That coefficient is very similar, for example, to the profitability coefficients reported by Leary and Roberts (2005) in their issuance/retirement regressions for debt and equity securities (see Table V in their paper). In other words, despite differences in specification, our testing framework reproduces the standard negative relation between profitability and external financing. We now turn to the cross-sectional and time-series properties of the internal–external funding relation.

Table 3 presents the results from the estimation of our baseline regression model (Eq. (1)) within each of the constrained/unconstrained partition schemes describe in the last section. A total of eight estimated equations are reported in the table (4 constraint criteria $\times$ 2 constraint categories). Under *every one* of the constraint criteria considered, the set of financially unconstrained firms display *significantly negative* sensitivities of external financing to cash flow — these sensitivities are all significant at better than 1% test level. In economic terms, the estimates in the table suggest that for each dollar of internal cash flow shortfall (normalized by assets), an unconstrained firm will seek for up to 27 cents in new external financing. In sharp contrast, the estimated external financing–cash flow sensitivities in the constrained samples are *much less negative* (around 1 or 2 cents), and always statistically *insignificant*. Wald tests for difference in sensitivities between constrained and unconstrained firms are significant at better than the 1% level for the payout and commercial paper ratings criteria, and at 3% for the size and bond ratings measures. The coefficients on the control variables also conform to our expectations. An increase in investment opportunities makes it more likely that both sets of firms will seek external funding, while bigger firms generally issue more securities. The results of Table 3 are fully consistent with the predictions of our model of the impact of financial constraints on the substitutability between internal and external funds.

– insert Table 3 here –

Table 4 reports the results we obtain by fitting Eq. (2) to the data. The model is estimated via GMM. The external financing–cash flow sensitivity estimates show the same patterns reported in Table 3 when we include controls for alternative internal funding sources and add proxies for asset tangibility and pre-existing financial structure. The cash flow sensitivity estimates are all negative and highly significant for constrained firms and small, statistically insignificant for the set of constrained firms. Differences in external financing–cash flow sensitivities across constrained and unconstrained samples are significant at better than the 1% level for *all* criteria. These findings are again consistent with the hypothesis that there are systematic differences in the way financially constrained and unconstrained firms conduct their external financing policies. The coefficients for the other regressors attract either statistically insignificant estimates (e.g., PPE) or significant estimates of the expected sign (e.g., Q).

– insert Table 4 here –

In the last two columns of Table 4 we report the diagnostic test statistics associated with our instrumental set. As it turns out, those instruments are well-suited for the equations we fit in the data. For instance, note that the *lowest* p-value associated with Hansen's (1982) test of overidentifying restrictions is as high as 20%.[15] Moreover, the *lowest* partial F-statistic from the (first-stage) regression of the endogenous regressors on the set of excluded instruments is highly significant in each of the models estimated. Simply put, these diagnostic test statistics show that our instruments are both valid and relevant.

5 Robustness and Extensions

In checking the robustness of our findings we proceed in two ways. The first approach is to perform again our basic tests using alternative model specifications, proxy construction methods, sampling procedures, and econometric techniques. This battery of checks should provide evidence that our empirical estimates are reliable. The second approach consists of demonstrating the reliability of our economic inferences through additional tests that verify the internal consistency of our results.

5.1 Reliability of Empirical Estimates

Our baseline model uses Q to capture otherwise unobservable information about firm investment opportunities. One issue we have to consider is whether including Q in our regressions will bias the inferences that we can make about cash flow sensitivities. Such concerns have become a topic of debate in previous papers on financial constraints — namely, those focusing on investment–cash flow sensitivities — as evidence of higher cash flow sensitivities of constrained firms has been ascribed to measurement problems with Q (see, e.g., Erickson and Whited (2000)). In turn, we propose three alternative ways of checking whether our inferences are robust to measurement issues in our proxy for investment opportunities.

The first row of Table 5 displays the results we obtain from implementing Erickson and Whited's (2000) errors-in-variables-consistent GMM5 estimator.[16] For ease of exposition, the table only reports the estimates associated with *CashFlow* in Eq. (1). One difficulty we find in applying the estimator proposed by Erickson and Whited is isolating observations that are suitable for their procedure. We can only isolate windows of three consecutive years after subjecting our data to those authors' sample "pre-tests," and these windows cover different stretches of our sample period.[17]

[15] One can safely accept the null that the instrument set satisfies the required orthogonality conditions if the p-values associated with the J-statistics exceed the 10% cut-off.

[16] We implement the GAUSS codes made available by Toni Whited in her Webpage.

[17] Erickson and Whited, too, report these sampling difficulties in their paper; their sample is constrained to a four-year window (see also Polk and Sapienza (2003) and Almeida and Campello (2006)). To save space, we omit from the output the p-values associated with the pre-sample tests, and those for the tests associated with the null

Using more restricted data and a very different estimator, we find that our previous results continue to hold for each for each one of the constraint criteria we examine. The results from the Erickson-Whited estimator suggest that potential mismeasurement in empirical Q does not translate into biased inferences about the impact of financing constraints on firm issuance decisions. If anything, our results become stronger and our inferences more clear cut under this robust estimator.

The second approach we take to address the concern that Q is poorly measured follows from the original work by Cummins et al. (2006) on this issue: we use financial analysts' forecasts of earnings as an instrument for Q in an IV estimation of our baseline model. As in Polk and Sapienza (2003), we employ the median forecast of the two-year ahead earnings scaled by lagged total assets to construct the earnings forecast measure. The earnings data are taken from IBES, where extensive coverage only starts in 1986. The results from these IV regressions are shown in row 2 of Table 5. Again, our main results are strengthened when we use yet another approach designed to address the potential for attenuation biases associated with poorly-measured Qs.

Another way of tackling the issue of mismeasurement in Q is to use an alternative proxy for investment opportunities. We have followed the financial constraints literature and used Q to proxy for investment opportunities, but research in corporate finance often uses yet another proxy for those same opportunities: R&D expenditures (see, among others, Graham (2000) and Fama and French (2002)).[18] In row 3 of Table 5 we report results from the estimation of our baseline model after we replace Q with the ratio of R&D expenditures (COMPUSTAT's item #46) to total assets. This seems to produce very few changes in our baseline estimates, with our previous inferences continuing to hold for all of the sample splits.

In the fourth row of Table 5 we report the estimates for external financing–cash flow sensitivities that are returned when we eliminate IPO-years from the sample. As discussed in Frank and Goyal (2003) and Lemmon and Zender (2004), the year in which a firm becomes public is characterized by unusual equity issuance activity. It has also been noted that many of the IPOs of the 1990s were particularly unprofitable. These observed regularities could "hard-wire" an empirical association between cash flows and issuance activity, which we want to expunge from our estimates. As in Lemmon and Zender, we identify IPO-years by determining the first year in which a firm appears in our sample (other than the first year of the sampling period). Results in row 4 of Table 5 make it clear that our conclusions are unaffected by concerns with IPO observations.

of orthogonality conditions. These p-values are very similar to those in Hennessy (2004), who also uses the Erickson and Whited's (2000) GMM5 estimator.

[18] Unfortunately, R&D expenditures, too, are arguably measured with some degree of error. However, it is not the case that those errors should necessarily vary along the lines of financial constraints, systematically biasing our estimates in a way that favors our previous inferences. Noteworthy, our results are the same whether we eliminate from the estimations those observations reporting missing data for R&D expenditures or replace those missing data with zero and add an indicator variable for these observations to the specification (as we report below).

As a crude attempt to address the issue of heteroskedasticity, researchers often 'scale' the variables included in models such as that of Eq. (1). We chose to scale all of our variables by the book value of assets both because this is the most popular choice of scaler and because it coincides with the denominator of our basic proxy for investment opportunities (Q). However, note that the choice of scaler may have undesirable consequences for the estimations whenever the scaler is economically linked to the variables in the model (Frank and Goyal (2003) also note this issue). It is not obvious how to circumvent this problem, but we can demonstrate that our results do not hinge on our particular choice of scaler. Following Fama and French (2002), the fifth row of Table 5 reports results from the estimation of Eq. (1) when all variables (except Q and *Size*) are scaled by the *market value* of assets. Our cash flow sensitivity estimates hold steady for all criteria. Alternatively, as in Frank and Goyal, we also used *net* assets (i.e., item #6 – item #5) as a scaling factor and obtain qualitatively similar results (unreported).

Finally, we revisit the constraint characterizations that are based on the existence of ratings (bond and commercial paper). Following Faulkender and Petersen (2006) and Lemmon and Zender (2004), we focus on data that start from 1986 — when COMPUSTAT provides extensive coverage on ratings — and define as financially unconstrained firm-years those firms for which COMPUSTAT reports the existence of a rating during the very year under examination (i.e., we do not input ratings information from the later part of the sample into the early sample years). Differently from our previous strategy, this approach allows firms to migrate across constraint categories over the years. Studying only the second half of our sample period also serves the purpose of verifying whether our results are stable through time. The sixth row of Table 5 reports the results we obtain when we fit Eq. (1) over the 43,350 data points contained in the 1986–2001 period, under the newly proposed constrained/unconstrained partitions. The estimates from this experiment show that the patterns we have uncovered are nearly insensitive to qualitative changes to our constraint characterizations and that our previous results seem to emerge consistently across different windows of our sample period.

– insert Table 5 here –

5.2 Reliability of Economic Inferences

5.2.1 External and Internal Financing

We have shown evidence that financially unconstrained firms can more easily compensate for a drop in cash flows with the issuance of new securities than constrained firms facing the same income shortfall. While consistent with our theory, the results above may not yet provide a complete characterization of the impact of financial constraints on firms' internal–external funding management. A way of more fully illustrating the extent to which firms' financing choices differ cross-sectionally along the lines of financing constraints is to examine *directly* how different sources of funds — internal or external to the firm — absorb contemporaneous shocks to a firm's cash flow process. This simultaneous (within-firm) policy analysis can be done for each firm in the sample by estimating the following SUR system separately across sets of constrained and unconstrained firms:

$$ExternalFinancing_{i,t} = \alpha_1 CashFlow_{i,t} + \alpha_2 Q_{i,t} + \alpha_3 Size_{i,t} + \sum_i firm_i + \sum_t year_t + \varepsilon^{EF}_{i,t,} \quad (3)$$

$$InternalFinancing_{i,t} = \beta_1 CashFlow_{i,t} + \beta_2 Q_{i,t} + \beta_3 Size_{i,t} + \sum_i firm_i + \sum_t year_t + \varepsilon^{IF}_{i,t}. \quad (4)$$

ExternalFinancing is defined as above, i.e., net security issuance over total assets. In contrast, *InternalFinancing* captures changes in a set of proxies for internal funding sources ("savings") that, according to previous research, can be used to smooth the investment process: changes in cash stocks (COMPUSTAT's item #236), changes in inventories (item #203), and changes in accounts receivables (item #202) (see, e.g., Fazzari and Petersen (1993), Calomiris et al. (1995), and Almeida et al. (2004)).[19]

We expect the estimates from Eq. (3) to be close to those of Eq. (1) in that we are estimating a similar model, but now conditioning on the sample of firms for which we have full information on the components of internal savings policy (from Table 1 one can see that only 63% of the sample firms provide complete information on *InternalFinancing*). More importantly, our story yields clear-cut priors for the estimates in Eq. (4). If firms are financially constrained and thus unable to absorb cash flow shocks by tapping the external markets (this is the evidence we have provided thus far), they should be systematically more inclined to absorb those shocks by using internal (buffer) wealth instead. Accordingly, constrained firms should seek to save internally a greater proportion of any cash flow surpluses in order to be able to smooth future investment spending. By the same principle, a fall in these firms' cash flow should be accompanied by a fall in the accumulated stock of items such as cash and inventories. When firms are unconstrained, on the other hand, they do not need to rely on the accumulation of internal funds to smooth investment. Since these firms do not save internally, we should hence observe a cash flow shortfall being accompanied by an increase in external funding, but not necessarily observe any systematic response in their accumulation of cash, inventory, and other easily redeployable assets.

Table 6 reports the results from the above SUR system separately for constrained and unconstrained firm samples. For ease of exposition, we only present the results for the estimates associated

[19] In defining *InternalFinancing*, we also experimented with changes in dividend policies as a way firms might deal with cash flow shortages. Our results are virtually unchanged. That strategy, however, raises additional issues. First, it is not clear that firms fine tune their dividend policy according to their cash flow process (dividends are relatively sticky, whereas cash flows are not). Second, recall that our first financial constraint sampling criterion is based on firms' dividend policies. Sample selection biases will likely arise if we use dividend policy both as a criterion for subsample assignment as well as in the construction of the dependent variable.

with the cash flow innovations in the system (i.e., α_1 and $\beta_1$in Eqs. (3) and (4)). As in previous estimations, unconstrained firms display a strong, negative cash flow sensitivity of external financing, while constrained firms show estimates that are neither economically nor statistically significant (see results in row 1). In accordance with our prior that *external* financing constraints must also influence the *internal* financing choices of constrained firms, we find that these firms display a strong, positive cash flow sensitivity of internal financing. Unconstrained firms, on the other hand, do not accumulate internal resources out of their cash flows (see row 2). Altogether, the results from Table 6 are consistent with the intuition of our model and provide a more complete characterization of the dynamics of the substitutability between internal and external funds under financial constraints.

– insert Table 6 here –

5.2.2 Is it Debt or Equity?

Our analysis focuses on the total amount of funds that firms raise in the capital markets, both debt and equity. Our main argument is that financing constraints should affect the substitutability between firms' internal funds and their use of external financing. In principle, the differential investment–financing mechanisms that we emphasize should hold irrespective of firms' preferred type of external financing instrument. Yet, one may wonder whether the data patterns that we have uncovered indeed hold for both debt and equity issues separately, or if they are driven primarily by one of those two securities. One might conjecture, for example, that the firms that we deem as financially constrained are primarily constrained in their ability to contract *debt* when cash flows fall short of investment needs.[20] This argument would suggest that the cross-sectional patterns that we have uncovered could be largely driven by debt financing alone. Conversely, most optimal contracting models suggest that debt — not equity — should be the preferred form of external financing when firms face the types of frictions (e.g., agency- and imperfect information-type problems) that make them financially constrained (see Tirole (2006)). This would suggest that the differences in financing patterns between constrained and unconstrained firms that we have uncovered could be largely driven by cross-sectional differences in the dynamics of outside equity financing alone.

In order to evaluate these different possibilities, we re-estimate our baseline empirical model separately for debt and equity issues (as opposed to *total* issues) across samples of constrained and unconstrained firms. The first row of Table 7 displays the results we obtain for constrained firms when we replace *ExternalFinancing* in Eq. (1) with either *DebtFinancing* (the ratio of net debt issuances (COMPUSTAT's item #111 – item #114) to total book value of assets (item #6)) or *EquityFinancing* (the ratio of total net equity issuances (item #108 – item #115) to total book value of assets).

[20] Lemmon and Zender (2004) suggest that this consideration might help reconcile the findings that small firms "too often" issue equity (see, among others, Frank and Goyal (2003)) with the pecking order theory.

Row 2 presents the results from similar models estimated over samples of financially unconstrained firms. Row 3 reports p-values for a Wald test of cross-group differences in cash flow sensitivities.

The cash flow sensitivity estimates in Table 7 suggest that our previous results cannot be attributed to either debt or equity financing alone. The cash flow sensitivity of *both* debt and equity financing is negative and significant in all of the eight different unconstrained regressions; with debt– and equity–cash flow sensitivities attracting remarkably similar estimates within sample partitions. In sharp contrast, the cash flow sensitivities of constrained firms are uniformly less negative than in the unconstrained sample, again for both debt and equity financing. The case for differences in the substitutability between internal and external (debt *and* equity) funds is further highlighted by the results from the tests of cross-group differences in cash flow sensitivities (see row 3): for every possible constrained–unconstrained comparison pair, the cash flow sensitivity of external finance (again, debt and equity) is significantly more negative for unconstrained firms at the 5% test level or better. The results suggest that, comparatively to the unconstrained firms, constrained firms *use less of both debt and equity* financing to absorb variations in internal cash flows, a pattern that is consistent with our baseline story.

– insert Table 7 here –

6 Macroeconomic Dynamics

Research on the impact of financing constrains on corporate behavior commonly draws inferences from macroeconomic dynamics. This follows naturally from the idea that financing constraints are linked with the real economy in that it is generally believed that those constraints bind more during recessions and monetary contractions — when corporate net worth falls, collateral values collapse, and higher interests increase the cost of servicing debt. Empirical analyses using such testing expedients are found in papers dealing with corporate financing (e.g., Gertler and Gilchrist (1994), Calomiris et al. (1995), and Korajczyk and Levy (2003)), liquidity (Kashyap et al. (1994)), and inventory investment (Fazzari et al. (1994)), to name a few.

Showing that cross-sectional differences in firm behavior, on *average*, conform with expectations regarding the impact of financing constraints on corporate behavior is an important step in testing our story, but empirical limitations may still permeate those findings. For example, it is impossible to completely rule out the importance of concerns with simultaneity biases in our cross-sectional estimates.[21] Exploring the dynamics of macroeconomic movements, on the other hand, can provide for evidence that the impact of constraints on firm behavior *covaries* with exogenous tightenings

[21] In particular, one could raise an involved argument suggesting that estimation biases might affect one set of subsample regressions more severely than another, possibly yielding misleading inferences.

and relaxations of those constraints. In this testing set up, when comparing differential external financing behavior across groups of firms categorized as either constrained or unconstrained, one does not need to focus on differences in the *levels* of external financing–cash flow sensitivities across those two groups of firms (as we have done thus far), but instead on the *responses* of those sensitivities to macroeconomic innovations. In this way, the "macroeconomic-dynamics" testing approach can help shed light on the impact of financing constraints on external financing behavior even in the presence of biases in our estimate of the first-order substitution effect between internal cash flows and the external contracting of funds.

Our basic proposition is that differences in the external financing behavior of constrained and unconstrained firms — specifically, cross-sectional differences in the sensitivity of external financing to cash flow — will become *more pronounced* following negative innovations to macroeconomic conditions; that is, in periods when financial constraints are likely to bind more. To implement a test of this proposition, we use a two-step approach similar to that used by Kashyap and Stein (2000). The idea is to relate external financing–cash flow sensitivities and aggregate demand conditions by combining cross-sectional and times series regressions.

The first step of this procedure consists of estimating our baseline regression model (Eq. (1)) every year separately for groups of financially constrained and unconstrained firms. From each yearly sequence of cross-sectional regressions, we collect the coefficients returned for cash flow (i.e., α_1) and "stack" them into the vector Ψ_t, which is then used as the dependent variable in the following (second-stage) time series regression:

$$\Psi_t = \eta + \phi \Delta Activity_t + \rho Trend_t + u_t, \tag{5}$$

where the term $\Delta Activity$ represents shocks to aggregate activity. These shocks are computed from the residual of an autoregression of log real GDP on four lags of itself, with the error structure following a moving average process.[22] The impact of unforecasted shocks to aggregate activity on the sensitivity of external financing to cash flow can be gauged from ϕ. A time trend ($Trend$) is included to capture secular changes in external financing activities. Finally, because movements in aggregate demand and other macroeconomic variables often coincide, in "multivariate" versions of Eq. (5) we also include changes in inflation (log CPI) and changes in basic interest rates (Fed funds rate) to ensure that our findings are indeed driven by shocks to demand. These macroeconomic series are gathered from the Bureau of Labor Statistics and the Federal Reserve websites.

The results from the two-stage estimator are summarized in Table 8. The table reports the coefficients returned for ϕ from Eq. (5), along with the associated p-values (calculated via Newey and

[22] Even though the macro innovation proxy is a generated regressor the coefficient estimates of Eq. (5) are consistent (see Pagan (1984)).

West's (1987) covariance estimator). Row 1 collects the results for financially constrained firms while row 2 reports results for unconstrained firms. Additional tests for cross-group coefficient differences are reported at the bottom of the table (row 3). Standard errors for the "difference" coefficients are estimated via a SUR system that combines the two constraint categories (p-values reported).

– insert Table 8 here –

The GDP-response coefficients for the constrained firms in row 1 are all negative and highly statistically significant, indicating that the cash flow sensitivity of external financing of these firms increases (i.e., becomes even less negative) during recessions. This finding suggests that constrained firms are less able to assess the external markets to make up for cash flow shortfalls *precisely* at times when financial constraints are tightened. In contrast, the response coefficients for the unconstrained firms (row 2) are typically indistinguishable from zero. The differences between those sets of coefficients (row 3) suggest that the external financing–cash flow sensitivities of financially constrained and unconstrained firms follow markedly different paths in the aftermath of negative shocks to the macroeconomy: constrained firms are *significantly less able* to use external financing as a way of smoothing out the effect of internal income shortfalls on investment following negative innovations to aggregate demand. These exact patterns should be expected in the context of the internal–external financing substitution argument that we propose.

7 Concluding Remarks

We consider the implications of investment–financing interactions for external financing decisions. In doing so, we focus on a particular mechanism, which we believe is directly related to the notion of financial flexibility: the impact of financing constraints on firms' demand for external financing.

Our main argument is that financing constraints should mitigate/eliminate the substitutability between internal and external funds. This effect is a result of three different but related mechanisms: (1) constrained firms might find it profitable to direct internal funds to current investments, rather than to reduce the demand for external financing; (2) the need to fund future investments increases the firm's demand for liquid assets such as cash and working capital, and (3) high costs of external finance create a direct complementarity between internal funds and the firm's capacity to raise external finance. Using data from US corporations over the 1971–2001 period we verify empirically that the sensitivity of external financing to cash flow innovations is negative and economically, statistically significant for firms deemed as financially unconstrained (those that payout large amounts of cash to investors, are large in size, and whose bonds and commercial papers are rated). In contrast, external financing–cash flow sensitivities are always insignificant for financially constrained firms.

Besides performing standard checks that ensure the robustness of our empirical estimations, we show additional results that further confirm the logic behind our main hypotheses. For example, we show that those same firms that are less able to substitute between internal and external sources of funding tend to allocate/save excess cash inflows into liquid assets (these can be used to smooth the capital investment process). We also report evidence that, comparatively to the unconstrained firms, constrained firms use less of *both* debt and equity financing as a means to absorb variations in internal cash flows. Finally, we show that differences in external financing–cash flow sensitivities across constrained and unconstrained samples are magnified during macroeconomic recessions, which arguably contribute to the tightening of financing constraints.

Our study shows that the negative effect of profitability on the demand for external finance is concentrated in firms that *do not* face strong financing frictions, implying that the negative relation between profits and external financing should not be used as evidence for external financing costs arising from information frictions. More generally, our study suggests that the sorts of financing constraints that firms face in the real world should be more carefully considered in future attempts at characterizing corporate policies in the empirical literature.

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Table 1. Sample Descriptive Statistics

This table displays summary statistics for the main variables used in the paper's empirical estimations. All firm data are collected from COMPUSTAT's annual industrial tapes over the 1971–2001 period. The sampled firms exclude financial institutions (SICs 6000–6999), utilities (SICs 4900–4999), and not-for-profit organizations and governmental agencies (SICs greater than 8000). *ExternalFinancing* is the ratio of the total net equity issuances (COMPUSTAT's item #108 – item #115) plus net debt issuances (item #111 – item #114) to the total book value of assets (item #6). *CashFlow* is the ratio of earnings before extraordinary items and depreciation (item #123 + item #125) to total assets. Q is computed as the market value of assets divided by the book value of assets, or (item #6 + (item #199 × item #25) – item #60 – item #74) / (item #6). *Size* is the natural log of sales (item #12). *Cash* is item #1 divided by item #6. *Inventory* is equal to item #2 plus item #3, divided by item #6. *PPE* is item #8 divided by item # 6. *Debt/Equity* is item #9 plus item #34, divided by item #216. *InternalFinancing* is item #236, plus item #203, plus item #202, all divided by item #6.

Variables	Statistics					
	Mean	Median	Std. Dev.	25^{th} Pct.	75^{th} Pct.	Obs.
ExternalFinancing (Total)	0.0325	0.0022	0.1153	–0.0129	0.0589	72,851
DebtFinancing	0.0132	0.0000	0.1032	–0.0138	0.0272	72,851
EquityFinancing	0.0194	0.0003	0.0632	–0.0000	0.0057	72,851
CashFlow	0.0628	0.0948	0.2145	0.0519	0.1359	72,851
Q	1.9098	1.3013	2.6311	0.9814	2.0154	72,851
Size	2.1837	1.9277	1.5084	1.0188	3.0601	72,851
CashHoldings	0.1764	0.0979	0.1973	0.0401	0.2374	72,851
Inventory	0.1682	0.1431	0.1503	0.0341	0.2604	72,483
PPE	0.3238	0.2795	0.2167	0.1547	0.4567	72,738
Debt/Equity	0.7482	0.3620	15.7943	0.0636	0.8206	72,830
InternalFinancing	–0.0033	–0.0085	0.1761	–0.0658	0.0489	46,264

Table 2. Cross-Classification of Financial Constraint Types

This table displays firm-year cross-classifications for the various criteria used to categorize firm-years as either financially constrained or unconstrained (see text for definitions). To ease visualization, we assign the letter (C) for constrained firms and (U) for unconstrained firms in each row/column. All firm data are collected from COMPUSTAT's annual industrial tapes. The sampled firms exclude financial institutions (SICs 6000–6999), utilities (SICs 4900–4999), and not-for-profit organizations and governmental agencies (SICs greater than 8000).

Financial Constraints Criteria		Div. Payout		Firm Size		Bond Ratings		CP Ratings	
		(C)	(U)	(C)	(U)	(C)	(U)	(C)	(U)
1. Payout Policy									
Constrained Firms	(C)	30,947							
Unconstrained Firms	(U)		22,530						
2. Firm Size									
Constrained Firms	(C)	13,637	3,380	21,873					
Unconstrained Firms	(U)	5,027	11,453		22,569				
3. Bond Ratings									
Constrained Firms	(C)	22,290	11,362	20,245	5,547	45,392			
Unconstrained Firms	(U)	8,657	11,168	1,628	17,022		27,459		
4. Comm. Paper Ratings									
Constrained Firms	(C)	29,319	15,378	21,746	11,925	44,891	15,720	60,611	
Unconstrained Firms	(U)	1,628	7,152	127	10,644	501	11,739		12,240

Table 3. The Cash Flow Sensitivity of External Financing: Baseline Regression Model

This table displays results for OLS (with year- and firm-fixed effects) estimations of the baseline regression model (Eq. (5) in the text). All firm data are collected from COMPUSTAT's annual industrial tapes. The sampled firms exclude financial institutions (SICs 6000–6999), utilities (SICs 4900–4999), and not-for-profit organizations and governmental agencies (SICs greater than 8000). The estimations correct the error structure for heteroskedasticity and within-period error correlation using the White-Huber estimator. t-statistics (in parentheses).

Dependent Variable		Independent Variables			R^2	Obs.
ExternalFinancing		*CashFlow*	*Q*	*Size*		
Financial Constraints Criteria						
1. Payout Policy						
Constrained Firms	(C)	–0.0134	0.0039**	0.0204**	0.42	30,947
		(–1.09)	(4.22)	(9.05)		
Unconstrained Firms	(U)	–0.2725**	0.0051**	0.0112	0.39	22,530
		(–11.23)	(5.91)	(0.99)		
P-Value of Difference	(C) – (U)	[0.00]	[0.34]	[0.43]		
2. Firm Size						
Constrained Firms	(C)	–0.0208	0.0045**	0.0234**	0.50	21,873
		(–1.21)	(4.52)	(6.88)		
Unconstrained Firms	(U)	–0.0727**	0.0046**	0.0116	0.29	22,569
		(–4.24)	(5.45)	(1.56)		
P-Value of Difference	(C) – (U)	[0.03]	[0.94]	[0.15]		
3. Bond Ratings						
Constrained Firms	(C)	–0.0202	0.0035**	0.0106**	0.39	45,392
		(–1.57)	(4.14)	(8.34)		
Unconstrained Firms	(U)	–0.0701**	0.0052**	0.0093**	0.21	27,459
		(–3.63)	(4.52)	(4.91)		
P-Value of Difference	(C) – (U)	[0.03]	[0.23]	[0.57]		
4. Comm. Paper Ratings						
Constrained Firms	(C)	–0.0262	0.0037**	0.0116**	0.33	60,611
		(–1.74)	(4.30)	(8.26)		
Unconstrained Firms	(U)	–0.1866**	0.0032*	–0.0014	0.22	12,240
		(–4.64)	(2.05)	(–1.41)		
P-Value of Difference	(C) – (U)	[0.00]	[0.78]	[0.00]		

Note: ** and * indicate statistical significance at the 1-percent and 5-percent (two-tail) test levels, respectively.

Table 4. The Cash Flow Sensitivity of External Finance: Augmented Regression Model

This table displays results for GMM estimations (with year- and firm-fixed effects) of the augmented baseline regression model (Eq. (6) in the text). All firm data are collected from COMPUSTAT's annual industrial tapes. The sampled firms exclude financial institutions (SICs 6000–6999), utilities (SICs 4900–4999), and not-for-profit organizations and governmental agencies (SICs greater than 8000). The estimations correct the error structure for heteroskedasticity and within-period error correlation using the White-Huber estimator. t-statistics (in parentheses). The table also reports diagnostic statistics for instrument overidentification restrictions (p-values for Hansen's J-statistics reported) and instruments' first-stage partial F-statistics (only lowest F-statistics reported).

Dependent Variable	Independent Variables							Hansen's J-statistic	First-stage F-test
ExternalFinancing	*CashFlow*	*Q*	*Size*	*CashHoldings*	*Inventory*	*PPE*	*Debt/Equity*	(p-value)	(lowest p-value)
Financial Constraints Criteria									
1. Payout Policy									
Constrained Firms (C)	–0.0109	0.0045**	0.0092**	0.0828*	0.0832*	0.0193	–0.0033	0.55	0.01
	(–1.17)	(5.19)	(5.38)	(2.54)	(2.46)	(0.66)	(–1.19)		
Unconstrained Firms (U)	–0.2710**	0.0066**	–0.0003	0.0134	0.0390*	0.0287*	0.0004*	0.20	0.00
	(–10.21)	(6.72)	(–0.29)	(0.76)	(2.33)	(2.27)	(2.32)		
P-Value of Diff. (C) – (U)	[0.00]	[0.10]	[0.00]	[0.06]	[0.24]	[0.77]	[0.18]		
2. Firm Size									
Constrained Firms (C)	–0.0186	0.0042**	0.0118**	–0.0141	–0.0007	–0.0268	–0.0024	0.22	0.00
	(–1.08)	(4.24)	(3.96)	(–0.35)	(–0.02)	(–0.50)	(–0.86)		
Unconstrained Firms (U)	–0.0958**	0.0047**	–0.0005	0.0666*	0.0582**	0.0200	0.0005	0.51	0.01
	(–5.02)	(3.75)	(–0.44)	(2.55)	(3.37)	(1.56)	(1.17)		
P-Value of Diff. (C) – (U)	[0.00]	[0.75]	[0.00]	[0.09]	[0.13]	[0.40]	[0.30]		
3. Bond Ratings									
Constrained Firms (C)	–0.0234	0.0038**	0.0052**	–0.0054	0.0369	–0.0226	–0.0213*	0.28	0.00
	(–1.84)	(5.74)	(4.09)	(–0.23)	(1.59)	(–1.06)	(–2.00)		
Unconstrained Firms (U)	–0.1100**	0.0046**	0.0022*	0.0833**	0.0646**	0.0307*	0.0008	0.79	0.00
	(–3.71)	(3.03)	(2.02)	(3.17)	(3.71)	(2.10)	(1.36)		
P-Value of Diff. (C) – (U)	[0.01]	[0.63]	[0.07]	[0.01]	[0.34]	[0.04]	[0.04]		
4. Comm. Paper Ratings									
Constrained Firms (C)	–0.0246	0.0041**	0.0064**	0.0520**	0.0644**	0.0034	0.0001	0.26	0.01
	(–1.51)	(6.02)	(6.13)	(2.90)	(3.48)	(0.21)	(0.24)		
Unconstrained Firms (U)	–0.1640**	0.0048**	–0.0023	0.0607*	0.0563**	0.0251	0.0011	0.23	0.00
	(–5.34)	(3.14)	(–1.89)	(2.05)	(3.06)	(1.70)	(1.21)		
P-Value of Diff. (C) – (U)	[0.00]	[0.68]	[0.00]	[0.80]	[0.76]	[0.32]	[0.32]		

Note: ** and * indicate statistical significance at the 1-percent and 5-percent (two-tail) test levels, respectively.

Table 5. Robustness Checks: Alternative Specifications and Sample Restrictions

This table displays results for OLS and IV (with year- and firm-fixed effects) estimations using alternative versions of the baseline regression model (Eq. (5) in the text) as well as different variable construction and sampling criteria. The reported estimates are the coefficients returned for $CashFlow$. All firm data are collected from COMPUSTAT's annual industrial tapes. The sampled firms exclude financial institutions (SICs 6000–6999), utilities (SICs 4900–4999), and not-for-profit organizations and governmental agencies (SICs greater than 8000). The estimations correct the error structure for heteroskedasticity and within-period error correlation using the White-Huber estimator. t-statistics (in parentheses).

Dependent Variable		Financial Constraints Criteria			
ExternalFinancing		Div. Payout	Firm Size	Bond Ratings	CP Ratings
Proposed Changes to Baseline Model Estimation:					
1. Erickson–Whited Estimator					
Constrained Firms	(C)	0.0175	–0.0237	–0.0241	–0.0411
		(0.55)	(–1.50)	(–1.41)	(–1.49)
Unconstrained Firms	(U)	–0.5181**	–0.2674**	–0.2517**	–0.2894**
		(–3.67)	(–4.61)	(–3.55)	(–3.03)
P-Value of Difference	(C) – (U)	[0.00]	[0.00]	[0.00]	[0.01]
2. Cummins et al. Estimaor					
Constrained Firms	(C)	–0.0141	–0.0165	–0.0221	–0.0264
		(–1.18)	(–1.27)	(–1.84)	(–1.61)
Unconstrained Firms	(U)	–0.6640**	–0.1660**	–0.3433**	–0.4474**
		(–17.06)	(–10.77)	(–13.31)	(–13.44)
P-Value of Difference	(C) – (U)	[0.00]	[0.00]	[0.00]	[0.00]
3. Q replaced by R&D expenditures					
Constrained Firms	(C)	–0.0235	–0.0255*	–0.0289*	–0.0222
		(–1.77)	(–2.12)	(–2.17)	(–1.49)
Unconstrained Firms	(U)	–0.3230**	–0.0805**	–0.0830**	–0.1701**
		(–10.47)	(–3.60)	(–3.84)	(–4.59)
P-Value of Difference	(C) – (U)	[0.00]	[0.03]	[0.03]	[0.00]
4. IPO-years eliminated from sample					
Constrained Firms	(C)	–0.0286	–0.0268	–0.0278*	–0.0287*
		(–1.28)	(–1.68)	(–2.06)	(–2.01)
Unconstrained Firms	(U)	–0.3858**	–0.0969**	–0.0863**	–0.1900**
		(–12.22)	(–4.09)	(–3.24)	(–4.46)
P-Value of Difference	(C) – (U)	[0.00]	[0.01]	[0.05]	[0.00]

Note: ** and * indicate statistical significance at the 1-percent and 5-percent (two-tail) test levels, respectively.

Table 5. Robustness Checks — Continued

Dependent Variable		Financial Constraints Criteria			
ExternalFinancing		Div. Payout	Firm Size	Bond Ratings	CP Ratings
Proposed Changes to Baseline Model Estimation:					
5. Market values of asset used as scaling factor					
Constrained Firms	(C)	–0.0049	–0.0202	–0.0424	–0.0378
		(–0.29)	(–1.18)	(–1.40)	(–1.34)
Unconstrained Firms	(U)	–0.4099**	–0.0728**	–0.1227**	–0.1643**
		(–9.60)	(–3.86)	(–3.69)	(–4.30)
P-Value of Difference	(C) – (U)	[0.00]	[0.04]	[0.07]	[0.01]
6. Sample restricted to the 1986–2001 period					
Constrained Firms	(C)	–0.0094	–0.0082	–0.0143	–0.0156
		(–0.78)	(–0.57)	(–1.17)	(–1.22)
Unconstrained Firms	(U)	–0.3928**	–0.0704**	–0.0763**	–0.2097**
		(–7.84)	(–3.29)	(–2.72)	(–4.08)
P-Value of Difference	(C) – (U)	[0.00]	[0.02]	[0.04]	[0.00]

Note: ** and * indicate statistical significance at the 1-percent and 5-percent (two-tail) test levels, respectively.

Table 6. Internal Financing and External Financing

This table displays results for the SUR system in Eqs. (7) and (8) in the text, estimated separately for constrained and unconstrained firms. The reported estimates are the coefficients returned for $CashFlow$. All firm data are collected from COMPUSTAT's annual industrial tapes. The sampled firms exclude financial institutions (SICs 6000–6999), utilities (SICs 4900–4999), and not-for-profit organizations and governmental agencies (SICs greater than 8000). The estimations correct the error structure for heteroskedasticity and within-period error correlation using the White-Huber estimator. t-statistics (in parentheses).

		Financial Constraints Criteria			
		Div. Payout	Firm Size	Bond Ratings	CP Ratings
1. Dep. Variable: $ExternalFinancing$					
Constrained Firms	(C)	–0.0090 (–1.01)	–0.0189 (–1.27)	–0.0106 (–1.16)	–0.0125 (–1.52)
Unconstrained Firms	(U)	–0.3392** (–11.47)	–0.0550** (–4.28)	–0.0628** (–4.56)	–0.1611** (–6.87)
P-Value of Difference	(C) – (U)	[0.00]	[0.07]	[0.00]	[0.00]
2. Dep. Variable: $InternalFinancing$					
Constrained Firms	(C)	0.0479** (8.08)	0.0654** (8.18)	0.0556** (9.87)	0.0499** (10.08)
Unconstrained Firms	(U)	0.0148 (1.50)	–0.0037 (–0.55)	–0.0479** (–2.92)	–0.0133 (–1.44)
P-Value of Difference	(C) – (U)	[0.00]	[0.00]	[0.00]	[0.00]

Note: ** and * indicate statistical significance at the 1-percent and 5-percent (two-tail) test levels, respectively.

Table 7. Debt or Equity?

This table displays results for OLS (with year- and firm-fixed effects) estimations of the baseline regression model (Eq. (5) in the text), but estimated separately for net issues of debt (*DebtFinancing*) and equity (*EquityFinancing*) on the left-hand side of the specification. The reported estimates are the coefficients returned for *CashFlow*. All firm data are collected from COMPUSTAT's annual industrial tapes. The sampled firms exclude financial institutions (SICs 6000–6999), utilities (SICs 4900–4999), and not-for-profit organizations and governmental agencies (SICs greater than 8000). The estimations correct the error structure for heteroskedasticity and within-period error correlation using the White-Huber estimator. *t*-statistics (in parentheses).

		Financial Constraints Criteria			
		Div. Payout	Firm Size	Bond Ratings	CP Ratings
1. Constrained Firms	(C)				
DebtFinancing		–0.0081	–0.0166	–0.0115	–0.0193
		(–0.79)	(–1.52)	(–1.24)	(–1.55)
EquityFinancing		–0.0053	–0.0142*	–0.0127*	–0.0069
		(–1.63)	(–2.11)	(–2.15)	(–1.65)
2. Unconstrained Firms	(U)				
DebtFinancing		–0.2504**	–0.0592**	–0.0485**	–0.0975*
		(–7.61)	(–4.31)	(–2.90)	(–2.55)
EquityFinancing		–0.1821**	–0.0435**	–0.0416**	–0.0891**
		(–10.08)	(–3.52)	(–3.58)	(–5.58)
3. *P*-Value of Difference	(C) – (U)				
DebtFinancing		[0.00]	[0.02]	[0.05]	[0.05]
EquityFinancing		[0.00]	[0.04]	[0.03]	[0.00]

Note: ** and * indicate statistical significance at the 1-percent and 5-percent (two-tail) test levels, respectively.

Table 8. Macroeconomic Dynamics: The Impact of Shocks to Aggregate Activity on the Cash Flow Sensitivity of External Financing (Two-Step Estimator)

The dependent variable is the annual series of estimated sensitivities of external financing to cash flow (from Eq. (5)). In each estimation, the dependent variable is regressed on the residual of an autoregression of the log real GDP on three of its own lags ($\Delta Activity$) as specified in Eq. (9) in the text. All regressions include a constant and a time trend. Only the coefficients returned for $\Delta Activity$ are reported in the table. In the multivariate regressions, changes in inflation (log CPI) and changes in basic interest rates (Fed funds rate) are also added. The sampled firms exclude financial institutions (SICs 6000–6999), utilities (SICs 4900–4999), and not-for-profit organizations and governmental agencies (SICs greater than 8000). The sample period is 1971 through 2001. Heteroskedasticity- and autocorrelation-consistent errors are computed with a Newey-West lag window of size four. The standard errors for cross-equation differences in the GDP-innovation coefficients are computed via a SUR system that estimates the group regressions jointly. Consistent p-values [in square brackets].

		Financial Constraints Criteria			
		Div. Payout	Firm Size	Bond Ratings	CP Ratings
1. Constrained Firms	(C)				
Univariate Regressions		–1.2119 [0.00]	–1.9765 [0.01]	–1.2219 [0.00]	–0.8511 [0.00]
Multivariate Regressions		–1.2779 [0.04]	–2.3659 [0.03]	–1.2724 [0.02]	–0.9388 [0.04]
2. Unconstrained Firms	(U)				
Univariate Regressions		0.1274 [0.21]	0.1195 [0.75]	0.0504 [0.92]	0.1993 [0.80]
Multivariate Regressions		0.1163 [0.25]	0.2084 [0.49]	0.0445 [0.73]	0.2736 [0.49]
3. Diffs. Estimates and P-Values	(C) – (U)				
Univariate Regressions		–1.3393 [0.00]	–2.0960 [0.01]	–1.2723 [0.00]	–1.0504 [0.01]
Multivariate Regressions		–1.3942 [0.02]	–2.5743 [0.02]	–1.3169 [0.02]	–1.2124 [0.05]