Do Cash Flow Sensitivities Vary During Non-Crisis and Liquidity Crisis Periods and Across Countries?

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Abstract

Using the system of equations model of Gatchev, Pulvino, and Tarhan (2010), we examine two aspects of whether firms are constrained from accessing capital markets: 1. Do cash flow sensitivities vary with economic conditions? We identify four liquidity crises periods and find strong evidence that the 2007-2009 mortgage crises was especially severe compared to other crises episodes. While conditions for raising funds were relatively easy during normal times, during the three pre-2007 crises firms, especially constrained firms, faced difficulties. Raising external funds became extremely difficult during the mortgage-crisis and financially constrained firms cut their investments significantly in response to the shortage of internal cash flows. We further demonstrate that using the single-equation approach of Fazzari, Hubbard, and Petersen (1988) instead of our constrained multivariate setting fails to uncover the severity of the recent crisis. 2. We also examine whether access constraints differ between civil and common-law countries, and also between firms that operate in emerging markets compared with those that are domiciled in advanced economies. While we find no differences between civil and common-law countries, we find strong evidence that firms of emerging market economies face substantial difficulties in raising funds.

Keywords: Financial crises, investment cash flow sensitivity, financial constraints, investment spending, supply-side shock

JEL classification codes: G01, G31, G32

I. Introduction

Starting with Fazzari, Hubbard, and Petersen's (1988) seminal study, a literature that examines the extent firms' face obstacles in accessing external capital developed. The premise behind the capital market access issue is the potential wedge between the costs of internal and external financing. Following Fazzari, Hubbard and Petersen (1988), the methodology that was used to determine whether or not firms face constraints in accessing capital markets relied on single-equation estimates of the cash flow sensitivity of investments (capital expenditures). Hubbard (1998) provides a survey of the findings of earlier empirical studies. However, a recent paper by Gatchev, Pulvino, and Tarhan (GPT, 2010) shows that the approach of these earlier studies suffers from econometric problems in the form of an omitted variables bias and inefficient coefficient estimates, and also that the results obtained from the static single-equation framework may lead to misleading conclusions about whether or not firms actually face market access constraints. Moreover, the GPT methodology is based on the insight that corporate policies need to be examined in a constrained multivariate setting instead of in a single-equation platform, because financial variables are related by accounting identities that hold at all times and for all firms (such as assets being equal to liabilities and sources of cash being equal to uses of cash).

Using the GPT methodology, in this paper, we examine two important issues. First, while cash flow investment sensitivities have been examined extensively in the literature, to our knowledge, how investment and financing cash flow sensitivities vary cyclically has not been studied. This is important since during liquidity crises periods, firms are more likely to have difficulties in raising funds. Thus, such periods may represent more fertile periods for detecting the presence/absence of access constraints. For this reason, we explore whether financing constraints that firms face worsen during crisis periods, and whether or not cash flow sensitivities differ during non-crisis and liquidity crises periods.

In this respect, we also examine how cash flow sensitivities are affected during the mortgage crisis of 2007-2009. Acharya et al., (2009) and Almeida et al., (2011) argue that this was a particularly severe crisis. Anecdotes from this period support this view. For example, even companies with stellar reputation such as General Electric and Goldman Sachs were unable to raise funds during this period, and had to use Warren Buffett to satisfy part of their financ-

ing needs, and also to get his certification in order to be able to raise funds from other sources. Another unusual event during this period was that banks were reluctant to conduct routine lending activities with each other.

To see whether or not this indeed was the case, we examine this period separately. Thus, we estimate our model for non-crisis years, of the 1971-2011 period, for the three liquidity crisis episodes during 1971-2006, and finally, the crisis episode of 2007-2009. This enables us to both investigate whether or not capital market constraints are more severe during crisis versus non-crisis periods, as well as to compare the three 'garden variety liquidity crisis episodes' with the mortgage crisis.

We find that, in general, firms face more severe financing constraints during the three pre-2007 crises periods that we identify than they do during normal times. We then estimate the model for the liquidity crisis that took place between 2007 and 2009, and compare the investment and financing cash flow sensitivities during this most recent period with the estimates we obtain from the previous three liquidity crises. We find evidence that this period was indeed different. For example, while firms appear to be able to substitute long-term debt with short-term debt during the three crises periods, relative to non-crisis years, during the mortgage crisis, firms' access to both short- and long-term debt was severely curtailed.

After examining cash flow sensitivities during crisis and non-crisis years for the combined sample of constrained and unconstrained firms, we follow the common practice of the literature and repeat the analysis for the subsamples of constrained and unconstrained firms separately. Our conjecture is that as economic conditions worsen, the subsample of constrained firms are likely to have greater difficulties in financing their investments, and as a result curtail their investments more, relative to firms that we classify as being unconstrained.

Second, we examine another aspect of capital market access issue that has not been studied in the literature: to what extent financing constraints differ, on the one hand, across countries with different legal environments and, also how different are the constraints for firms that operate in emerging market countries compared with those faced by firms in advanced economies? A number of prior studies document that there is a relationship between how strong the laws that protect investors in a country are, how diligently these laws are enforced, and how well-developed a country's capital markets is. These include Demirgüc-Kunt and

Maksimovic (1998), Beck et al. (2004, and 2006), and La Porta et al. (1997).[1] Overall, they document that those countries which have legal systems that protect investors, which diligently implement laws, and which enjoy low levels of corruption have larger and deeper debt and equity markets. La Porta et al. (1998) find that common-law countries generally have the strongest, and French-civil-law countries provide the weakest legal protection to investors. However, our findings show that cash flow sensitivities of firms do not differ on the basis of whether they operate in civil or common-law countries.

It seems that there is likely to be a relationship between how developed a country's capital market is and how easy or difficult it is for firms to raise funds in that country. In the context of our study, we analyze whether or not financing constraints firms face differ across countries on the basis of whether they operate in emerging market or advanced economies. Towards this end, we compare the cash flow sensitivities of firms that operate in emerging markets, with both common and civil law countries. We find that firms that operate in emerging markets face more severe financing constraints compared to the firms of advanced economies, irrespective of whether the developed country is governed by common or civil-law legal system.

Taken together, we find strong support that firms faced relatively easy conditions for raising funds during normal times. Conditions became more challenging during the three liquidity crises episodes prior to 2007, but market access constraints became severe during the mortgage-related financial crisis of 2007-2009. Our results further confirm that financially constrained firms cut their investments substantially during the mortgage crisis, due to not being able to raise sufficient external financing. Financially less constrained firms, on the other hand, were both able to raise more external funds, especially in the form of short-term borrowings, and were also able to use their excess cash which apparently they built-up during normal times for financial flexibility considerations. As a result, while they also curtailed their investments, the cut in their investments did not come anywhere close to the magnitude

[1] Demirgüc-Kunt and Maksimovic (1998) document that in countries with efficient legal systems, a greater proportion of firms use long-term external financing. Beck, et al. (2004) find that small firms use less external finance, especially bank finance. But, they also benefit the most from better protection of property rights and financial intermediary and stock market development in the sense of being able to access to external finance. La Porta et al. (1997) find that countries with poorer investor protection have smaller and narrower debt and equity markets.

of the cut that constrained firms had to execute. Finally, we document that financing constraints are more stringent for firms that operate in emerging market economies.

We also reach a conclusion from a methodological perspective: The results obtained from examining constraints under different states of the economy, and also across countries with different legal systems, and different stages of development, suggest that the methodology used by Gatchev, Pulvino, and Tarhan (2010) is robust.

The remainder of this study is structured as follows: Section II summarizes the related literature. Section III describes our methodology and data. Section IV, V presents our empirical findings and Section VI summarizes these results. Finally, Section VII concludes.

II. Related Literature

Estimating our model for the mortgage crisis period contributes to several studies that examine the investment and financing decisions during this crisis. Most recently, Chen and Chen (2012) investigate to what extent investment cash flow sensitivities changed over time. Using the standard single-equation framework, they find that there has been a dramatic decline in the magnitude of the cash flow sensitivity of investments (capital expenditures) to an extent where it has essentially disappeared in recent years. In fact, surprisingly, they find that the sensitivity coefficient in question is zero during the period covering the mortgage crisis. They argue that if firms indeed face capital market access constraints, then it must be the case that cash flow sensitivity coefficient cannot be a good measure of these constraints. Alternatively, their finding is also consistent with the hypothesis that during recent years, capital markets developed at such an accelerated pace that firms found it increasingly easy to raise funds. However, even if it was the case that capital markets have been developing at a faster rate during the recent past, the conjecture that firms did not have any difficulties in raising funds during perhaps one of the most severe crisis during the last 70-or so years, is contrary to all the anecdotal evidence about the mortgage crisis.

Additionally, as we mentioned in the introduction section above, in this study we find a very large capital expenditures cash flow sensitivity coefficient for the constrained sample of firms when we estimate our system-of-equations model. As GPT (2010) show, the omitted variables bias of the single-equation model is in the direction of estimating a too high value for

this coefficient. Thus, in addition to being contrary to the anecdotal evidence, there is an econometric reason for estimating a high value for the coefficient in question. Thus, it is all the more surprising that Chen and Chen (2012) find this coefficient to be very small in their single-equation estimation.

Campello et al. (2010) conduct a survey of Chief Financial Officers (CFOs) in the U.S., Europe, and Asia to directly assess whether their firms are financially constrained during the global financial crisis of 2008 and to what extent their operations were affected. Their evidence shows that firms that considered themselves to be constrained planned deeper cuts in tech spending, employment, and capital expenditures compared to unconstrained firms. Furthermore, constrained firms burned through more cash, drew more heavily on lines of credit for fear banks would restrict access to these funds in the future, and sold more assets to fund their operations. In addition, the survey participants indicated that their inability to borrow caused many of them to turn-down or postpone attractive investment opportunities.[2] The survey evidence also shows that not only constrained firms reduced their investments, the majority of financially constrained firms actually engaged in negative investment activities (asset sales) in order to fund operations in 2008, while unconstrained firms did not display significant propensity to sell assets. In fact our empirical results confirm this finding about the two types of firms.

Duchin et al. (2010) investigate the negative shock to the supply of external finance for non-financial firms during the period July 2007 to June 2008 (March 2009) on corporate investment. Controlling for firm fixed effects and time-varying measures of investment opportunities, they report that corporate investments declined significantly following the onset of the crisis. In the context of their model, they argue that this result is consistent with the shock being on the supply side. Additionally, they find that the decline in investments is greatest for firms that have low cash reserves or high net short-term debt, firms that are financially constrained, and for firms that operate in industries dependent on external finance. In order to address endogeneity concerns, they measure firms' financial positions prior to the crisis, and

[2] One interpretation of the results is that credit conditions led constrained firms to cut investment in suboptimal ways. Another interpretation, however, is that the firms that are cutting investment the most during the crisis are those that were overinvesting before it. Campello et al. (2011) emphasize that they are unable to ascertain whether the projects that are cut were value-maximizing.

find that investments do not decline in response to a placebo crisis in the summers of 2003-2006, or the negative demand shock associated with the September 11, 2001 event.

Almeida et al. (2011) use the beginnings of the mortgage crisis in August 2007 to measure the causal effects of financial contracting on real firm behavior. They examine whether firms with large fractions of their long-term debt maturing at the time of the crisis had to adjust their behavior (e.g., cut capital expenditures) in ways that were more pronounced than otherwise similar firms that did not have to refinance their long-term debt during the crisis period. Firms whose long-term debt was maturing right after the third quarter of 2007 cut their investment-to-capital ratio by 2.5 percentage points more (on a quarterly basis) than otherwise similar firms whose debt was scheduled to mature after 2008. They argue that this statistically significant drop in investments was economically important as well, representing a drop of one-third of pre-crisis investment levels.

Not being able to refinance their maturing debt in external markets, firms can potentially payoff their maturing debt by adjusting other variables, such as drawing down cash reserves, reducing stocks of inventory, repurchasing fewer shares, or cutting back on dividend payments. Almeida et al. (2011) find that firms with large amounts of maturing debt in 2008 initially drew heavily on their cash holdings in order to mitigate the effects of maturing debt. However, their results suggest that in spite of many anecdotal evidence regarding dividend cuts during this period, firms in their sample were reluctant to cut their dividends. The firms they examined eventually had to cut back on real rather than financing adjustments such as reducing their investment spending.

Campello et al. (2011) analyze how firms managed liquidity during the 2008-2009 crisis period. In particular, they focus on how firms' lines of credit were affected during this time. They examine the demand for credit lines, the costs associated with credit lines, the ease with which firms are able to initiate or renew lines of credit, the consequences of violating credit line covenants, the outcomes of renegotiation after violations, and how firms manage liquidity coming (concurrently) from credit lines, cash holdings, and profits. They report that firms choose not to use credit lines when they have enough internal funds, implying a cost wedge between these two sources of liquidity. They also find that credit lines are associated with greater spending when companies are not cash strapped. Firms with limited access to credit

lines, in contrast, appear to choose between saving and investing during the crisis. Overall, the evidence indicates that credit lines acted as a buffer, enabling firms to somewhat isolate corporate spending from the effects of the crisis, even though they were not able to raise funds by using other financing alternatives.

III. Methodology and Data

A. The empirical model used in the literature

Following Fazzari, Hubbard and Petersen (1988), the methodology used to determine whether or not firms face constraints in accessing capital markets relies on single-equation estimates of the cash flow sensitivity of investments (capital expenditures). The conventional interpretation of the sensitivity coefficient in question is that relatively a large (small) coefficient means that firms are (not) forced to cut back on their capital expenditures. The underlying implication is that if firms are reducing their investments dramatically, it must be the case they are unable to raise funds when faced with adverse cash flow realizations.

GPT (2010) find various flaws with this line of reasoning: First, if the issue is whether or not firms are able to raise funds when faced with adverse cash flow realizations, even if one were to use a single-equation model, why not examine financing cash flow sensitivities directly rather than indirectly via the impact of cash flow innovations on capital expenditures? Second, there is not a one-to-one correspondence between a large capital expenditure coefficient and reduction in investments. For, example, what if the adverse cash flow realization makes a firm to change its strategy from organic growth to growth by acquisitions? This clearly would not indicate the inability of the firm to raise funds. In fact, if this is the case, the firm in question could be raising funds to finance its acquisitions. But in the single equations literature investments are measured only by capital expenditures. It is not acknowledged that conceptually there is no difference between capital expenditures and acquisitions even though in both cases the firm makes accept/reject decisions that involve projects.

Of course, this example is only the tip of the iceberg as far as the problems associated with the single-equation approach of the literature is concerned. Changes in cash flow – which is a ‘source of funds’ item – have potential ramifications for all the other sources of cash items, as well all the use variables. In other words the financial decisions of firms are necessarily inter-

dependent via *accounting* identities in the *ex-post* sense, and *economic* identities in the *ex-ante* sense which holds true for all firms at all times. It is always the case that when, e.g., cash flows increase by a dollar, either other sources of funds must decline by a dollar, use variables must increase by a dollar, or the combination of the changes in sources and uses must add-up to a dollar.

Going back to the discussion of single equation models of investment-cash flow sensitivities, with few exceptions, such as Kaplan and Zingales (2000) and Cleary (1999), the literature is dominated by the finding that firms that are financially weak have larger capital expenditure sensitivity coefficients relative to financially healthier firms – presumably indicating that financially weak firms face higher obstacles in accessing capital markets, compared to financially healthier firms. Specifically, these studies first estimate the cash flow sensitivity of investments in a single-equation framework, for sub-samples of firms that are segmented on the basis of *ex ante* measures of financial health (such as Z-scores or scores obtained from ordered logit models). The presence of capital market constraints is then examined by testing whether the cash flow sensitivity coefficient is larger (smaller) for the subsample of firms that are *ex ante* likely to be financially distressed (healthy). Almost all of the studies that use this static single-equation approach find that firms in the "constrained" subsample have significantly larger investment-cash flow sensitivities. Based on this finding, they then conclude that there are obstacles in accessing capital markets. Interestingly, these studies fail to comment about one glaringly puzzling aspect of their findings: they typically report statistically significant investment-cash flow coefficients even for the "unconstrained" subsample of firms. The implication of this finding is that even financially healthy firms face frictions in financial markets, and as a result, may forego valuable investment projects.

GPT (2010) show that the approach of earlier studies suffers from econometric problems in the form of an omitted variables bias and inefficient coefficient estimates. Additionally, as the examples given above show, results obtained from these static single-equation models may lead to misleading conclusions about whether or not firms face market access constraints. Earlier studies examine the capital market access issue by estimating cash flow sensitivity of investments without allowing for potential persistence in investments. By estimating static rather than dynamic models, prior studies ignore the intertemporal dependencies within and across financial variables. However, many financial variables (such as capital expendi-

tures and dividends) exhibit substantial persistence due to high adjustment costs. GPT (2010) argue that ignoring the intertemporal aspect of financial variables is likely to produce an omitted variables bias. For example, to the extent that contemporaneous and lagged capital expenditures are positively correlated, the estimates for the cash flow sensitivity of investments produced by models that do not include lagged investments as an explanatory variable are likely to have a positive bias. This suggests that these estimates may capture real side (adjustment costs associated with changes in investments) rather than financial market frictions.

As discussed above, GPT (2010) further argue that since financial variables are related by accounting identities that hold at all times and for all firms, financial decisions of firms need to be examined in a constrained multivariate setting instead of in a single-equation platform. When the information contained in the sources and uses constraint is not contained in the specification of models, cash flow sensitivity of investment estimates produced by single-equation models are likely to be inefficient. However, the precision of estimates are crucial in this literature since the presence or absence of capital market obstacles is based on tests that compare the cash flow sensitivity of capital expenditures obtained from subsamples which are formed on the basis of firms' perceived degree of financial health.

For all these reasons, GPT (2010) develop a dynamic system-of-equations framework where firms determine their investment and financing decisions jointly, subject to the constraint that sources of cash equal uses of cash. The system of equations they estimate incorporates nine dependent variables that capture firms' investments (capital expenditures, acquisitions, and asset sales), financing (short- and long-term debt, equity issues, and changes in cash), and distribution (dividends and share repurchases) decisions. The system is estimated subject to the restriction that changes in sources and uses add-up to a dollar.

They find that investment cash flow sensitivities are both economically small and statistically insignificant (even for the financially constrained subsample). In contrast, their estimates show that firms' financing cash flow sensitivities are both large and highly significant in all the subsamples, and they dominate the investment cash flow sensitivities. Based on these findings, they conclude that U.S. firms do not appear to face obstacles in accessing capital, and by implication, do not seem to suffer from underinvestment. This finding confirms Mo-

digliani and Miller (1958), where investment decisions are based on a project's future cash flows and, in the event of any present period cash flow shortfalls, firms finance investments by debt or equity.

The GTP model is based on the notion that uses of funds are equal to sources of funds. Therefore, the following ex post accounting identity always holds:

$$CAPX_t + ACQUIS_t - ASALES_t - EQUISS_t + RP_t + DIV_t$$
$$-\Delta LTD_t - \Delta STD_t + \Delta CASH_t \equiv CF_t, \quad (1)$$

where *CAPX* is capital expenditures, *ACQUIS* is acquisitions, *ASALE* is asset sales, *EQUISS* is equity issues, *RP* is share repurchases, *DIV* is dividends, ΔLTD and ΔSTD are long-term and short-term debt issues, respectively, and $\Delta CASH$ is changes in cash balances. Table A2 in the Appendix describes the variables that enter the model. The cash flow variable, denoted as *CF*, is defined as:

$$CF_t = EBITDA_t - INTEXP_t - TAX_t - \Delta NWC_t, \quad (2)$$

Where *EBITDA* is earnings before interest, taxes, and depreciation, *INTEXP* is interest expense, *TAX* is cash taxes, and ΔNWC is change in net working capital from year $t - 1$ to year t. These variables are jointly determined by the firm's past investments and by consumers' current behavior, and thus they, together with *CF*, are assumed to be exogenous. The variable *CF* represents internally generated funds that are available for undertaking investments and/or for making payments to shareholders and debt holders.

GPT (2010) introduce a simultaneous equations model where uses of funds are constrained ex ante to be equal to sources of funds, conditional on forecasted cash flows. They also assume that firms make their investment and financing decisions based on their investment opportunities. The proxy they use for this variable is the market-to-book value of equity (*MB*). Another independent variable they use is firm size (*SIZE*), measured by the logarithm of the book value of firms' assets. Including size in the model accounts for the possibility that larger firms may have more investment opportunities and thus have easier access to external capital.

Subject to the constraint specified in equation (1), the following system of nine equations for the planned variables is estimated:[3]

$$\begin{bmatrix} -CAPX_t \\ -ACQUIS_t \\ ASALES_t \\ EQUISS_t \\ -RP_t \\ -DIV_t \\ \Delta LTD_t \\ \Delta STD_t \\ -CASH_t \end{bmatrix} = \boldsymbol{L}[CF_t] + \boldsymbol{K} \begin{bmatrix} -CAPX_{t-1} \\ -ACQUIS_{t-1} \\ ASALES_{t-1} \\ EQUISS_{t-1} \\ -RP_{t-1} \\ -DIV_{t-1} \\ \Delta LTD_{t-1} \\ \Delta STD_{t-1} \\ -\Delta CASH_{t-1} \end{bmatrix} + \boldsymbol{M} \begin{bmatrix} MB_t \\ SIZE_t \end{bmatrix} + \begin{bmatrix} -e_{CAPX,t} \\ -e_{ACQUIS,t} \\ e_{ASALES,t} \\ e_{EQUISS,t} \\ -e_{RP,t} \\ -e_{DIV,t} \\ e_{\Delta LTD,t} \\ e_{\Delta STD,t} \\ -e_{\Delta CASH,t} \end{bmatrix} \quad (3)$$

where e_{CAPX}, …, $e_{\Delta CASH}$ are the error terms associated with the nine financing and investment decision variables and represent deviations of actual quantities from planned quantities. Also based on equation (1), the sum of these error terms equals the corresponding forecast error for cash flows. Imposing the sources-equal-uses-of-funds constraint implies a set of restrictions for the parameter matrices. First, the total response of the investment and financing variables is opposite to the sign of the shock in cash flow variable and the estimated coefficients must add up to one:

$$\boldsymbol{i}'\boldsymbol{L} = -1,\ \boldsymbol{i}'\boldsymbol{K} = \boldsymbol{0}_{1\times 9},\ \boldsymbol{i}'\boldsymbol{M} = \boldsymbol{0}_{1\times 2} \quad (4)$$

Where $\boldsymbol{i}$ is a unit vector of appropriate order. The interpretation of the first restriction in equation (4) is that when there is a one dollar shock in a source or use variable, the total response of the investment and financing variables is opposite in sign to the shock and adds up to one dollar. For example, if the source variable, *CF*, increases by one dollar, other source variables must decline by a dollar, use variables must increase by one dollar, or some combination of the response of source and use variables must sum to one dollar. In contrast, if the shock originates from a variable that represents neither a source nor a use of funds variable (i.e., the two exogenous control variables *MB* and *SIZE* and lagged dependent variables), the total response

[3] The GPT model assumes that firms attempt to minimize a penalty function that depends on deviations of planned variables from their desired levels and on the speed of adjustment from past levels. As shown in Gatchev, Pulvino, and Tarhan (2010), if the penalty function is additive and quadratic in these two penalties, then minimizing the penalty function with respect to the planned levels of the variables subject to the constraint that sources of funds must equal uses of funds produces the linear equations in equation (3) that are estimated.

across the system of equations must sum to zero. As an example, for the second and third type of restriction in equation (4), assume that the estimated coefficient on *SIZE* in the capital expenditures equation is 0.30, implying that capital expenditures increase by 30 cents when the natural logarithm of book assets increases by one. As capital expenditures is a use variable, and because sources of funds must equal uses of funds, other use variables must decrease by 30 cents, net source variables must increase by 30 cents, or some combination of these responses must sum to 30 cents. As a result, the *SIZE* coefficients across the system of nine equations will sum to zero. Similar constraints hold for *MB* and all lagged dependent variables.

B. Data

We analyze annual balance sheet and market data of industrial firms from 43 countries. Data on exchange-listed firms is obtained from the Compustat North America and Compustat Global databases. The developed countries data base includes 26 of the 30 countries that make-up the 'advanced economies' subsample of *The Fiscal Monitor* publication of the International Monetary Fund 2012, plus Taiwan. Following the classification of Djankov et al. (2007), of the 27 developed countries in our sample 19 are governed by the civil-law legal system, and the legal system framework in 8 of the developed countries (including U.S.) is common-law. Our sample of emerging market countries includes 16 of 30 'emerging markets economies' of the same IMF publication. The sample period for the United States is 1971-2011. We collect data for the other countries over the period 1990-2011. As Compustat Global does not provide complete records for all countries beginning in 1990, we add countries as data becomes available. Table A1 in the Appendix lists the 43 countries and indicates the year when a country is added to our sample. The table also provides information on whether a country is classified as a developed common law, developed civil law, or emerging market country. The longer sample period and larger number of firms for the United States allows a more in-depth analysis and we therefore study the United States data separately. Another reason for treating the United States separately is that it is thought to have the most developed

capital markets. Additionally, reporting the results for the US separately avoids the sample being dominated by the large number of observations for the United States.[4]

Our samples include firms with consolidated balance sheet data, valid entries for country code, and positive values for total book value (at) and market value of assets (prcc × csho or mkval). Financial sector firms (SIC codes 6000-6999) and regulated utilities (SIC codes 4900-4999) are excluded. All variables are denominated in US dollars. Panel A of Table A2 summarizes the definitions and Compustat codes of the source, use, and control variables of the simultaneous equations model. Following GPT (2010) we replace missing values with zero. The format of the Statement of Cash Flows differs across countries and for some countries over time and, therefore, a few variable definitions necessitate some minor adaptations. Panel B of Table A2 details these differences in the definitions of asset sales, share repurchases, dividend payments, and acquisitions by format code. Finally, we trim the market-to-book ratio (MB) at the 95% tail.

Table 1 presents means and standard deviations for all variables of our model as a proportion of total assets (except for firm size and the market-to-book ratio). Firm-years are excluded whenever any of the model variables is missing. The table shows that for all subsamples, mean cash flows as a fraction of total assets are not statistically significantly different from zero. For the United States (– 0.5%) and for the common law country group in general (– 2.2%), average cash flows per year are slightly negative. While average annual changes in short and long-term debt are close to zero for all country groups over our sample period, common law countries are much more active equity issuers (6.1% and 9.8%, respectively) than civil law (1.4%) and emerging market countries (1.6%). Capital expenditures as a ratio of total assets is highest for common law countries (7.4%), followed by the United States (6.6%), emerging market countries (5.9%), and civil-law countries (3.8%). Changes in cash holdings exhibit a relatively high dispersion within each subsample. The average firm size in our sample is somewhat larger in developed civil-law countries when compared to developed common-law and emerging market countries. On the other hand, market-to-book ratio in the developed civil law group is lower than for the other two country groups.

[4] The 119,892 observations for the United States over the period 1990-2011 would otherwise represent 33.9% of the overall sample.

[Table 1 about here]

IV. Empirical Results

A. Symmetry tests

Since the issue is the presence of financial market constraints, we prefer to interpret the estimated coefficients in the context of "$1 *decline* in cash flows" rather than the typical interpretation based on an increase in an independent variable. The presence of capital market constraints is more about being able to raise funds when a firm experiences a negative cash flow change than it is about retiring capital when faced with positive cash flow changes. This assumes that a firm's reaction to positive cash flow innovations is equal in magnitude but opposite in direction to its reaction to negative cash flow innovations.[5] For this reason, we examine to what extent firms' reaction is symmetric. We do so by estimating equation (3) subject to the constraints in equation (4), including interaction variables equal to cash flow multiplied by a dummy variable that takes the value of one when the change in cash flow is positive and zero otherwise. Table 2 displays the results we obtain when we test for symmetry for the full sample period.

[Table 2 about here]

The first column of Table 2 shows how firms react when they experience a one dollar increase in cash flows. Column 2, on the other hand, displays the reaction to a one dollar shortfall in cash flows. Column 3 tests for differences between positive and negative cash flow shocks. Column 2 coefficients need to be multiplied by -1 in interpreting the results. Table 2 results show that with the exception of equity issues, firms' react to positive and negative shocks in cash flows symmetrically. For example the coefficients for short-term debt indicate that the amount of short-term funds firms borrow when they face a one dollar shortfall in cash flow ($0.44) is similar to the amount of short term debt they retire when they experience a one dollar increase in cash flow (-$0.37), and the difference is not statistically different from zero.

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[5] GPT (2010) show in their Table X that the responses are asymmetric only in the cases of dividends (probably due to their well-known stickiness), and equity issues.

While the differences between positive and negative cash flow shocks in the equations for capital expenditures, equity issues, long-term debt and cash balances, relative to the cash flow sensitivities of these variables appear to be large in absolute value, apparently, they do not reach the level of statistical significance.

B. Investment and Financing Cash Flow Sensitivities: Crisis and Non-Crisis Periods

In this section we present results using a combined sample that includes both financially constrained and unconstrained firms. We discuss our definition of 'constrained' below. The estimates obtained from equation (3), subject to (4) are displayed in Table 3. Column 1 of the table covers the full sample period (1971-2011). The sample period for column 2 covers the non-crisis years of 1971-2007 and also the 2010-2011 period. Columns 3 and 4 show our results for the crises periods. We identify four liquidity crises periods: The oil crisis of 1973-1975, the financially turbulent stagflation period of 1979-1982, and the savings and loan crisis period that lasted from 1986 to 1991. Finally, we treat the recent mortgage crisis period that covers 2007-2009 separately. Thus, we combine the first 3 liquidity crises episodes and report the results of the model for these crises in column 3. Finally, in column 4 the estimates for the mortgage crisis period are reported.

Comparing columns 2 and 3 shows whether investment and financing cash flow sensitivities during what we consider to be 'garden variety' liquidity-crunch periods are more severe than during times where economic conditions can be thought of as 'normal'. Comparison of columns 3 and 4 (and 2 and 4) is likely to shed light on whether the recent mortgage crisis – as it is generally believed – was indeed much severe than the previous three liquidity crises episodes.

We determine the crises dates using the NBER recession-definition definitions. Arguably, the most difficult one is the last crisis. Technically, the economy started to show signs of severe problems beginning in the third quarter of 2007. Judging by the Dow-Jones index, which was at around 14,000 in September and during first part of October of 2007, it lost more than half of its value and dropped to 6,625 on March 9, 2009. However, we decided that the crisis period covered 2007-2009 for two reasons: First, at this stage, we use annual data. Second, the severe conditions for raising funds in financial markets started in 2007, and probably some of the effects were reflected in the end of year data for 2007. Also, while the stock market

reached its lowest point in March 2009, the markets have not recovered immediately after this date. In fact, in June 2009, the Dow-Jones was still around 8,800. Thus, we believe that 2009 data continued to at least partially incorporate the adverse effects of the mortgage crisis.

Given the stagnant, and for some countries essentially recessionary conditions that prevailed during 2010 and 2011 there is clearly no indication of a liquidity crisis during these years. To the contrary, because central banks in developed economies reacted to the mortgage crisis by expanding their balance sheets dramatically, interest rates have declined steadily. In fact, nominal rates on 10 year government bonds at year end of 2011 in developed countries such as U.S., Germany, Switzerland, France, and Japan were 2.01%, 1.94%, 0.70%, %1.91%, and 0.97% respectively (they declined further in 2012). During this time, short-term rates were even lower; in fact, they were close to zero percent. If one assumes inflation expectations of around 2%, this means that real rates, even for longer maturities, were negative.

Despite very low interest rates and the fact that firms in U.S. had record profits and record levels of excess cash, firms during this period (and even now) refused to make meaningful investments in fixed assets. Additionally, partially due to lack of investments, the unemployment rates continued to be very-high. In fact, in the E.U. countries, the jobless rate hit a record high of 11.8 percent in November 2012. For individual countries such as Spain and Greece, the rate was and continues to be much higher. Thus, the reason behind lack of investments by firms is not interest rates being high as is typically the case during episodes of liquidity crises, or banks' unwillingness to lend funds. The lack of investments is caused by the perception on the part of firms that due to global uncertainties the economic environment suffers from lack of "visibility".[6] Firms in essence are saying "how can you expect us to invest in fixed assets such as building plants with a 15 year expected life, when within a year or two, there could be global eruptions, e.g., in the form of a crisis in Euro-zone economies?"

[6] In a survey released by Graham and Harvey that covered 887 U.S. firm CFOs (conducted by Duke University / CFO Magazine Business Outlook Survey in September 2012), 97% of the 667 respondents indicated that a 50 basis point reduction in borrowing costs would not initiate, accelerate, or increase their investments. Even if the reduction was 1% (given the low level of interest rates, a substantial reduction), over 91% of the respondents stated that they would behave the same way with respect to their investments. In fact, when the question was repeated for 2%, 84% of the participants continued to give the same response. (See, Harvey's blog *Garden of Econ.* CFO magazine Business Outlook.)

The multi-equation system in equation (3) is estimated both for all variables being measured in levels, and also where variables are measured in "first differences" using Cleary's (1999) sample selection methodology. While we present both sets of results, since the results seem to be robust, at this stage, our discussion will be based on the tests that use variables that are measured in levels. These results are displayed in Panel A1 of the Table 3. Results obtained when variables are measured in first differences are shown in Panel B1 of the same table. Panels A2 and B2 report significance tests for the differences between the columns of A1 and B1. To account for year fixed effects, we subtract annual means from each variable. For subsample estimations, weights and annual means are based on the subsample. Significance tests presented in this paper control for firm-level clustering using Rogers's (1983, 1993) method. When comparing coefficients across the different models, standard errors of differences are bootstrapped using stratified sampling. Firms are divided into three strata (constrained, neutral, unconstrained) of equal size using the SA-index from Hadlock and Pierce (2010), which we describe below, as a measure of financial constraints. [7]

[Table 3 about here]

The results of Table 3, Panel A1, indicate that in terms of the signs of the coefficients regarding how investment, distribution, and financing variables react to a one dollar decline in cash flows the results are robust whether the period examined is non-crisis years, or during liquidity crises episodes. 31 of the 36 coefficients in Panel A1 of Table 3 have the "correct" sign. Furthermore, 20 of the 31 coefficients are statistically significant, and none of the 5 coefficients that have the incorrect sign (the 4 equity issue coefficients, and the coefficient for asset sales during the crises episodes of the pre-2007 period) are statistically significant. When firms experience a dollar decline in cash flows, as expected, they reduce their investments, increase asset sales, reduce shareholder payouts both in the form of dividends and share repurchases, increase both their short and long-term borrowings and draw down on their cash holdings. However, while the cash flow sensitivity coefficients have the same sign whether it is non-crisis years, pre-2007 crisis episodes, and the mortgage crisis sample, the size, and thus the composition of responses differ substantially.

[7] We use the same test design and table setup for the Tables 4 and 5, respectively.

It is interesting that independent of whether it is non-crisis or crisis periods, once the inter-temporal nature of financial decisions, and the interdependence between investment and financing decisions are accounted for, investment-cash flow sensitivities (capital expenditures, acquisitions and asset sales) appear to be relatively small in magnitude. On the other hand, both short and long-term debt, and cash balances, in other words, leverage related cash flow sensitivities dominate both investment and distribution responses. However, while the reduction in capital expenditures continues to be economically small in all three states of the economy considered, the cutbacks in this variable increases monotonically as one moves from examining the non-crisis sample, to the pre-2007 crises years, and to the mortgage crisis sample: $0.015 in non-crisis years, $0.025 during the pre-2007 crisis episodes, and $0.041 during the mortgage crisis. The corresponding response of the investment block variables (capital expenditures + acquisitions – asset sales) are $0.045, $0.044, and $0.089. Furthermore, the cash flow sensitivity of shareholder distributions also appears to be relatively small. When firms experience a $1 reduction in cash flows, they cut-back on their payouts to shareholders by $0.075, $0.017 and $0.094 respectively, during the non-crisis, the first three crises and the mortgage crisis periods.

The most dramatic response to a decline in cash flows is observed in the borrowing equations (both short and long-term borrowings), and the sum of the leverage variables (borrowings plus the draw-down of cash balances): While the $0.93 of borrowings ($0.94 increase in leverage) during the three pre-2007 crises is higher than the $0.80 of borrowings that takes place in normal times (leverage increases by $0.88), the composition of the leverage response is significantly different. During normal times, firms borrow $0.45 of long-term and $0.35 of short-term funds (and draw down their cash balances by $0.08), during the first three crises episodes, apparently it becomes more difficult to borrow long-term funds ($0.20), and firms more than double their borrowings of short-term funds to $0.73 perhaps, by making use of their lines of credit.

The decline in long-term borrowings (from $0.45 to $0.20) is consistent with the view that the effects of financing constraints are felt more in the long-term end of the debt market than in shorter maturities. In fact, Gatchev, Spindt, and Tarhan (GST, 2009) argue that the concept of financial constraints is more binding in long-term debt markets, and that the presence or absence of capital market constraints is more likely to be observed in this market. They argue

that this stems from the fact that while in crisis periods both long and short-term debt issue costs increase, long-term debt issue costs increase more relative to issue costs related to short-term borrowings (and adverse selection costs of equity). In fact, as we will see below, unlike the first three crises episodes, during the mortgage crisis, we do not observe significant amount of substitution of short-term debt for long-term debt. Later on, we will see results suggesting that during this dramatic crisis it was mostly the unconstrained firms that were able to borrow short-term funds, probably by being able to access their lines of credit.

The financing sensitivity coefficients during the mortgage crisis indicate that this crisis was indeed different than the other liquidity crises. While the increase in leverage during the mortgage crisis is somewhat close to what it was during the pre-2007 crises episodes ($0.82 vs. $0.94), borrowings differ significantly ($0.48 vs. $0.93). It appears that, relative to the previous liquidity crisis periods, during the mortgage crisis firms dramatically cut both their long-term borrowings ($0.09 vs. $0.20), and short-term debt ($0.38 vs. $0.73). During this severe crisis, it seems that firms borrow essentially the same amount of short-term funds as they do in normal times. This situation is in contrast with the earlier crises when the firms were able to increase their short-term borrowings substantially relative to their levels of borrowing during normal times (from $0.35 to $0.73). This suggests that maybe banks were able to use the 'escape clauses' in their line of credit contracts. Later on when we estimate our model for constrained and unconstrained firms separately, we will be able to see whether it is the financially weak or healthy firms that had difficulty in accessing short-term borrowings. It may turn out to be the case that pooling constrained and unconstrained firms together may hide differences in having access to short-term debt during the mortgage crisis.

For the combined sample of firms, it appears that cash balances picked up the slack from the shortfall in borrowings during this crisis. When firms experience a dollar decline in cash flows in non-crisis years, they use $0.08 cash balances, and $0.02 in the previous three liquidity crises episodes. However, during the mortgage crisis this source of internal funds increases to $0.35.

The relative importance of cash flow sensitivities of variables that make-up investments, distributions, and the leverage decision blocks are consistent with the findings of GPT (2010). The whole literature (other than GPT (2010) and this study) is devoted to investigating the

presence or absence of capital market constraints in investment cash flow sensitivities. However, the findings of GPT (2010) and this study suggest that, the presence or absence of such constraints is more likely to be detected by focusing on financing cash flow sensitivities rather than investment related sensitivities. Additionally, even then, examining financing cash flow sensitivities in a single-equation framework would still not be the correct methodological approach. What the approach of this study and GPT (2010) show is that the issue can only be addressed by a model that explicitly takes into account both the intertemporal nature of financial decisions and acknowledges the interdependence between such decisions.

While equity issues do not play a significant role in samples where financially healthy and weak firms are combined together, if GST (2009) findings hold, equity issues may prove to be an important financing source in the case of constrained firms.

The estimated distribution-cash flow sensitivities (of dividends and share repurchases) during non-crisis years and during the pre-2007 crises episodes is counter intuitive, in that, in response to a dollar decline in cash flows, firms appear to cut shareholder distributions in non-crisis periods by larger amounts than during the pre-2007 crises episodes ($0.043 vs. $0.006). However, during 2007-2009, distributions are reduced by a higher amount than the other two sample periods (by $0.08). In fact, results not shown here indicate that the cut in distributions was even larger during 2007-2008 ($0.13) and in 2008 ($0.18).

C. Stratified Bootstrap Difference Tests: Crisis and Non-crisis Periods

Panel A2 of table 3 shows whether cash flow sensitivity coefficients differ during normal times and pre-2007 crises (Column 1), during normal times and during the mortgage crisis (Column 2). Finally, column 3 shows to what extent the mortgage crisis episode was different from the three pre-2007 crises periods. While a high proportion of the signs of these differences tests are in the expected direction, only a third of the differences coefficients reach the level of statistical significance.

In examining the issue of how dramatic the mortgage crisis was compared with what we call the ‘garden variety’ liquidity crises prior to 2007, we compare the differences in the behavior of firms that are reflected in columns 4 and 3 of Table 3, Panel A1. The stratified bootstrap difference tests for these two columns are shown in column 3 of Panel A2. Out of 9 coeffi-

cients 8 of them have signs that correspond to the latest crisis being more severe (the only ambiguous sign is observed in the equity issues equation). Results of column 3 confirms the findings of Section IV.B that during the mortgage crisis, compared with the previous liquidity crises, firms reduced their capital expenditures and acquisitions more. The results also show that during the mortgage crisis, again compared to the earlier crises, firms cut their payouts more, borrowed less (both short and long-term funds), and used more of their cash balances as a financing source. Amongst these, the ones that show statistical significance are share repurchases, short-term debt and cash balances. Obviously, it would have been desirable to have more coefficients with statistical significance. Nevertheless, when the statistically significant coefficients are combined with the fact that 5 of the coefficient-differences have 'correct' signs, it appears that the evidence provided by the behavior of pooled sample of constrained and unconstrained firms support the anecdotal evidence that the mortgage crisis was unusually severe.

We will next examine the behavior of firms conditional on their financial health. Our expectation is that constrained firms are likely to be affected more severely than the firms that make-up the unconstrained sample of firms even in normal times. It goes without saying that during liquidity crisis periods when more difficult conditions prevail, we expect the differences in the behavior of constrained and unconstrained firms to be even more dramatic. In fact, we expect the differences in how the two types of firms behave to be more pronounced especially during the mortgage crisis when the economic environment under which firms operated was very severe.

D. Empirical Results: Cash Flow Sensitivities and Firms' Financial Health

We classify firms as constrained or unconstrained based on Hadlock and Pierce (2010). Their measure considers size and age of firms to be important predictors of the extent a firm faces financial constraints. They obtain the index loadings by using ordered logit regressions, where the dependent variable ranges from 1 (least constrained) to 5 (most constrained). These values are assigned on the basis of inspections of the firms' annual reports and 10-K filings. Hadlock and Pierce (2010) suggest that the SA-index provides a better measure of financial constraints than other indices, such as the Kaplan and Zingales (2000) index or the Whited and Wu (2006) index. The SA-index is calculated as:

$$\text{SA-index} = -0.737 \times Size + 0.043 \times Size^2 - 0.040 \times Age$$

Where *Size* is the natural logarithm of total assets, and *Age* denotes the number of years a firm has a non-missing stock price in Compustat Global. A higher (lower) SA-index value is consistent with greater (smaller) financial constraints. In order to divide the U.S. sample into constrained and unconstrained firms, we estimate the SA-index by inserting the coefficients from Hadlock and Pierce (2010). We classify firm year observations with a high value of the SA-index (above the 60% percentile) to be constrained, and firms below the 40% percentile to be unconstrained.

The results displayed in Table 4 show the results obtained from estimating the model for constrained and unconstrained firms for the three periods in question. In general, these results suggest that estimating the model for the pooled sample of constrained and unconstrained firms hide significant differences between the two types of firms both in terms of their investment and financing decisions.

[Table 4 about here]

As before, essentially all the coefficients for all the sample periods considered have the expected signs. Additionally, 33 of the 54 coefficients are statistically significant. Also, as was the case for the pooled samples of firms, investment and distribution cash flow sensitivities are small in magnitude for both samples of firms, and also both during non-crisis years and the crises years of the pre-2007 period. However, what stands out is the estimate for the capital expenditures sensitivity coefficient for constrained firms during the mortgage crisis period. Apparently, when faced with a dollar decline in cash flows, constrained firms cut back on their capital expenditures by $0.55. In no other sample we observe such a dramatic cut. In fact, this is the only sample where investment cash flow sensitivity dominates the combined cash flow sensitivities of financing and distributions. Having such a huge impact on the real-side decisions of firms is one of the indications of severe the mortgage crisis was compared to other liquidity crises.

In the next three sub-sections we will compare the cash flow sensitivities of constrained and unconstrained firms during normal times, during the pre-2007 crises years, and during the mortgage crisis. We will then compare the behavior of constrained firms across the three

states of the economy. Finally, we will repeat this exercise for the unconstrained sample. Panel A2 of Table 4 displays the stratified bootstrap difference tests of all the combinations for unconstrained vs. unconstrained firms and the three states of the economy.

i. Constrained vs. Unconstrained Firms: Non-crisis Years

Again, interpreting the results in the context of a dollar decline in cash flows, we find that constrained firms reduce their capital expenditures more that unconstrained firms. They also issue more equity. Both constrained and unconstrained firms borrow an equal amount of long-term funds (around $0.45). Relative to unconstrained firms, constrained firms borrow more short-term funds ($0.47 vs. $0.36), and rely on cash balances less. Using less cash balances by constrained firms may be due their desire to save this internal financing source for harder times. Both types of firms reduce their dividend payments. Unconstrained firms also cut back on their share repurchases (RPs), while the RPs' of constrained firms are not affected (perhaps because they do not use this form of distribution that much).

ii. Constrained vs. Unconstrained Firms: Pre-2007 Crises Periods

During the three pre-2007 crises episodes, as expected, constrained firms reduce their capital expenditures more than unconstrained firms ($0.07 vs. $0.03). Also, as expected they issue more equity supporting the findings of GST (2009) and Fama and French (2005), and are engaged in more asset sales. Apparently constrained firms cut back on their share repurchases, while the cut in dividends is similar to unconstrained firms. Interestingly, these firms also are able to borrow more long-term funds than the unconstrained sample ($0.34 vs. $0.20). Apparently, healthier firms have more access to short-term borrowing (probably via lines of credits), and this may explain why constrained firms rely on long-term debt more so than unconstrained firms. Constrained firms' make-up for using less short-term debt by increasing their equity and bond issues and by using their cash balances more than unconstrained firms.

When both types of firms are pooled together, we had seen that during these three crises episodes, firms were able to borrow substantial amount of short-term funds. It appears that, pooling constrained and unconstrained firms together hides the fact that the substantial increase in short-term borrowings are executed by unconstrained firms. We have seen above that in normal times, constrained firms use less cash balances than the unconstrained. Our

conjecture was that they may save this source of internal financing for harder economic times. This appears to be the case during the three crises in question, constrained firms use $0.19 of excess cash, while constrained firms use only $0.02 of this internal financing source.

When the behavior of the two types of firms during the three crises periods with respect to short-term debt and cash balances are compared with their behavior during normal economic times, it appears that constrained and unconstrained firms pursue financial flexibility differently. The results are consistent with constrained firms' pursuing financial flexibility by building-up their cash balances, while unconstrained firms may accomplish the same goal by building-up unused debt capacity in their lines of credit. This may explain why, during the three earlier liquidity crises, constrained firms rely on their stock of cash balances more than the unconstrained sample ($0.19 vs. $0.02), while unconstrained firms use more short-term debt ($0.72 vs. $0.27). Thus, pooling together both types of firms may hide this subtle difference in the behavior of constrained and unconstrained firms regarding how they pursue financial flexibility.

One objective of this study in investigating how firms behave during crisis versus non-crisis periods was the premise that the presence of capital market access constraints are more likely to be detected during harder economic times than when the sample period does not make a distinction with respect to the economic environment. Based on the comparison of how firms behave in non-crisis periods with their behavior during the three liquidity crises episodes, it appears that this indeed is the case. Our estimates show that there are differences, in the expected direction, between the behavior of constrained and unconstrained firms when normal economic conditions prevail. However, when the behavior of the two types of firms are examined during the three pre-2007 liquidity crises we examined so far, we find that the effects of capital market constraints is more pronounced for constrained firms (vs. the unconstrained sample) than what we observed during the non-crisis years.

Our conjecture is that during the mortgage crisis, which, based on anecdotal evidence, is considered to be more severe than the crises we have examined so far, the effects of capital market constraints will be even more pronounced especially for constrained firms. Thus, even if we find that the effects are felt by unconstrained firms as well, we suspect that the differences

between the two samples will be even sharper during the mortgage crisis relative to the differences observed during the previous crisis episodes.

iii. Constrained vs. Unconstrained Firms during the Mortgage-crisis

Column 3.2, in Panel A1 of Table 4 shows that of all the subsample combinations of economic conditions and types of firm subsamples we examine, by far, the largest cash flow sensitivity of capital expenditure coefficient is observed in the case of constrained firms during the mortgage crisis. The finding, that when constrained firms experienced a dollar of decline in their cash flows during this crisis, they cut back their capital expenditures by $0.55 means that this is the only case where the sensitivity of capital expenditures dominates even the financing response. Another perspective on this response is provided by the estimate that during this severe crisis, unconstrained firms cut-back on their capital expenditures by only $0.04 (their total investment block response was $0.08). Given the substantial decline in capital expenditures, the counter intuitive finding of Chen and Chen (2012) that cash flow sensitivity of capital expenditures was essentially zero in magnitude and statistically insignificant, becomes even more surprising.

The severity of this crisis and the crisis' very adverse impact on constrained firms can also be seen in their financing activities: $0.26 increase in short and long-term borrowings, and $0.44 increase in leverage. During the previous three liquidity crises, the corresponding financing response for the constrained sample is $0.61 increase in total borrowings, and $0.80 increase in leverage. While both short and long-term borrowings of firms during this crisis declines relative to the earlier crises, their use of cash balances remains unchanged ($0.18). This suggest that these firms cushion of cash balances must be around this amount since even though this crisis is more severe than the others, they are unable to draw-down on their cash balances any more than they do during the previous crises.

The financing sensitivities of unconstrained firms show that these firms also felt the effect of this severe crisis. In fact, even though the unconstrained firms raise significantly greater amount of funds via short-term borrowings ($0.39) than constrained firms ($0.12), it does not come close to the $0.72 of short-term borrowing they are able to borrow during the three previous crises. Ivashina and Scharfstein (2010) argue that during this crisis there was a some sort of "a bank run on lines of credit", driven by the desire to satisfy their financing needs,

and also by the fear of firms that banks may go bankrupt before they are able to access funds that banks committed themselves to. If this story is correct, it seems that such "a bank-run" was available only to the unconstrained firms which used $0.39 of short-term debt during this period, while constrained firms borrowed only $0.12. This result is also consistent with banks being able to use the "escape clauses" of the lines of credit contracts that they had with constrained firms but not to the same extent in the case of unconstrained firms. This scenario seems reasonable given that constrained firms are financially weak to begin with, and given the harsh economic conditions they faced during such a severe crisis, they were likely to be in violation of some of their lines of credit covenants. While firms may be willing to renegotiate these contracts in a way that eliminates the violations in normal times, they are unlikely to behave in this manner during this extra-ordinary period when banks were not conducting routine transactions amongst themselves. In the case of healthy firms, first they are less likely to be in violation of their covenants. They also are likely to have good long-term relationships with banks.

However, the fact that even unconstrained firms were not able to borrow much long-term funds either (only $0.10 vs. $0.20 during the earlier crises), is another evidence supporting the view that during this crisis the access constraints became binding even for healthier firms. However, these firms were able to protect their planned investments to a much greater extent than the constrained firms due to the ability to borrow short-term ($0.39), and by drawing-down their cash balance ($0.34).

We can summarize the findings we have so far on this particular crisis: **1.** It indeed was a very severe crisis. **2.** Constrained firms felt the effects of capital market constraints on their investments much more than the real-side effects felt by unconstrained firms. **3.** Constrained firms also felt the effects of capital market access constraints in their financing activities relative to the financing effects felt by unconstrained firms during this crisis, and also relative to the financing activities they had during the earlier crises. **4.** Even unconstrained firms were not immune from the effects of this severe crisis: While their investments did not suffer as much as the investments of constrained firms, they had to reduce their long-term borrowings dramatically, and they did not have the access they had to short-term loans as they did during the previous crises.

iv. Constrained Firms: Non-crisis Years, Pre-2007 Crises Years, and the Mortgage-Crisis Period

We will first examine the cash flow sensitivities of constrained firms during non-crisis years, then move on to examining their behavior during pre-2007 crises episodes, and finally investigate how they behaved during the mortgage crisis. The interpretations again will be based on their reactions to a dollar decline in cash flows. Cash flow sensitivity of capital expenditures as expected, are reduced monotonically more: $0.03, $0.08, and $0.55 during non-crisis, 'garden variety' crises, and the mortgage crisis episodes, respectively. Acquisitions decline during normal times, but the coefficient is not statistically significant during the other two periods.

It seems that, as expected, these firms use the equity market actively. While they issue $0.04 of equity in non-crisis years, and this increases to $0.10 during the earlier crises, during the mortgage crisis it falls back to $0.04. The reduction during the last crisis may be due to the fact that funds available in the equity markets dried-up dramatically during this severe crisis. In fact long-term debt also falls dramatically. While they are able raise $0.35 in the bond market during the earlier crises, this drops to $0.14 during the mortgage crisis. These firms reduce their dividends during normal times, reduce both dividends and RPs during the pre-2007 crises years, but for some reason, distributions are not affected during the mortgage crisis period.

Both the long-term and short term borrowings of constrained firms increase when they experience a dollar decline in cash flows, but, as expected, by monotonically smaller amounts as we move from non-crisis, to pre-2007 crises, and to the mortgage crisis periods. The long-term debt issues are as follows: $0.46, $0.35, and $0.14. The estimated short-term debt coefficients are as follows: $0.48, $0.26, and $0.12. These firms do not appear to use cash balances as a financing source during normal times, but during crisis years they use about $0.18 of cash balances to fund their operations.

v. Unconstrained Firms: Non-crisis years, Pre-2007 Crises Years, and the Mortgage-Crisis Period

Unconstrained sample of firms also behave similar to constrained firms regarding capital expenditures, but, as expected the size of the coefficients, in all cases is smaller than the estimates for the constrained firms. Additionally, they engage in asset sales in regular times and during the mortgage crisis but not during the other crises. They also cut back their dividends during crisis periods and both their RPs and dividends during non-crisis years.

In terms of financing response, they seem to be able to borrow both long and short-term funds more than the constrained firms. In normal times their total borrowings is $0.81, during the earlier crises periods it increases to $0.92, but during the mortgage crisis it falls to $0.49, most of which is short-term borrowings, probably made possible by their lines of credit. They also rely on more cash balances as a financing source during this period than any other period. Thus, the financing difficulties faced by even unconstrained firms are another piece of evidence indicating that this crisis was much more severe than the earlier crises.

V. Empirical Results: Legal Characteristics of Countries and Cash Flow Sensitivities

As mentioned in Section II, a number of studies find that those countries where laws provide strong protection to investors, and implement these laws diligently, have larger and deeper capital markets. Studies also find that common law countries provide the strongest protection to investors, and french-civil-law countries provide weak protection to investors, and as a result, have capital markets that are thought to be not as well-developed as the markets in common law countries. The survey conducted by Beck et al. (2006) finds that countries that have well-developed capital markets have lower financing constraints.

It is a well-known fact that emerging market economies have much less-developed capital markets than both developed common-law and civil-law countries (as well as having weaker banking system than advanced economies). The capital markets in emerging economies suffer from lack of depth, and from having limited menu of financing instruments that firms can use to raise funds.[8] Additionally, because of the substantial financing needs of the public sector of these economies, the private sector is typically is ‘crowded-out’ from the bond markets.

[8] For example, in many emerging markets even governments cannot issue intermediate or long-term bonds. In some emerging markets, even if governments are able to issue intermediate-term bonds, their substantial financing needs mean that the private sector is crowded out from the bond markets. In such countries, firms are forced to finance even their fixed assets by short-term bank loans.

For this reason, depending on their credit ratings, some of the large firms in these countries can issue intermediate term bonds only in developed country capital markets. Another problem of emerging country bond markets is that, typically, even government bonds have relatively short maturities, sometimes as short as 1 -2 years

To test whether or not there is a connection between the extents of financing constraints firms face in advanced countries that have different legal systems, and also to test whether firms that operate in advanced versus emerging market countries face different degrees of capital market access constraints, we formed four groups: 1. Common law countries. 2. United States - even though U.S. is a common law country, because there is a consensus that it has the most developed capital markets, we decided to examine this country separately. 3. Civil law countries. 4. Emerging market economies. These country groups are listed in Table A3.

For each group we estimate the GPT model and compare both investment and financing cash flow sensitivities across the four groups. As some countries, especially the emerging countries, do not have data on cash flows prior to 1990, we run all regressions for the 1990-2011 period. Column 1 of Table 5 shows the estimates obtained for the U.S. columns 2 and 3 are the results for common and civil law countries, respectively. In column 4 we pool together all the advanced economies, and, column 5 shows the results for emerging market economies sample. Results in Table 5 indicate that 44 of the 45 coefficients have the expected sign (the only exception is the equity issues coefficient in the U.S.), and a remarkable 39 of the 44 coefficients are statistically significant, in fact, 23 of them are significant at the 1% level.

[Insert Table 5 about here]

The table shows that all the developed countries have very low capital expenditure cash flow sensitivities. The estimated coefficient for U.S. is lowest ($0.029), while by far the highest coefficient is found for the emerging market economies sample ($0.137). While civil law countries have slightly higher investment sensitivity coefficient than common law countries (excluding the U.S.), the difference is inconsequential ($0.0357 vs. $0.0350). When we examine the total cash flow sensitivities for the sum of the investment-block variables, we find that civil-law countries have the lowest investment-cash flow sensitivity (0.056 vs. 0.083 for the common-law countries, and $0.067 for U.S.). However, this result is driven by the low

cash flow sensitivity of acquisitions in civil-law countries. Civil-law countries are significantly more hostile to acquisitions, and the low level of acquisitions activity may account for their low cash flow sensitivity of acquisitions. By far, the highest cash flow sensitivity of the investment-block variables are in the emerging market economies sample ($0.16).

Distributions have the highest sensitivity coefficient in the US ($0.08), followed by common law countries ($0.03). It seems that even emerging market countries have a higher distribution sensitivity than civil-law countries.

Long-term borrowing sensitivities are as expected: highest in the U.S. (0.327), very closely followed by other common-law countries (0.324), and civil-law countries (0.283). Finally, again as expected, emerging markets have the lowest long-term debt sensitivity coefficient (0.206). In response to a $1 decline in cash flows, U.S. firms borrow $0.36 of short-term funds, while both civil and common-law countries borrow around $0.49. When we combine short- and long-term debt cash flow sensitivities, we find that the coefficient for U.S. is $0.69, for other common-law countries it is $0.81, in civil-law countries, it is $0.78, while it is only $0.49 in the emerging market economies sample.

Thus, when faced with a dollar shortfall in cash flows firms in emerging market countries not only borrow the least amount in the bond markets, they also borrow by far the lowest funds in the short-term markets as well. This suggests that these countries suffer from both lack of well-developed capital markets and also a well-developed banking system. Combined with having the highest investment cash flow sensitivities with at the same time having the lowest financing (other than equity) cash flow sensitivities means that firms that operate in these countries face by far the most formidable capital market access constraints.

Firms in the emerging market economies seem to be more active in equity markets than firms in other countries. This is consistent with the findings of GST (2009) and Fama and French (2005) who report that small and high-growth firms are more likely to use equity financing than large and mature firms. Needless to say, firms in emerging market economies fit this description.

When firms that operate in emerging market economies experience adverse cash flow innovations, they appear to make-up for inadequate external sources of funds by relying on a combination of internal sources of funds, equity offerings, and cutting their investments dramati-

cally. The groups that use internal funds the most are the groups at the two extremes: emerging markets ($0.21), and the U.S. ($0.17). However, it is likely that the factors that account for relatively heavy reliance on internal funds for the two groups in question differ. It seems that emerging market firms make relatively heavy use of cash balances due to having underdeveloped capital markets. The U.S. firms, on the other hand, may build up cash balances for financial flexibility considerations.

In sum, there does not seem to be much of a difference amongst U.S., other common-law countries, and civil- law countries samples in terms of market access constraints. The difference emerges when developed countries are compared with emerging market economies. Panel A2 of Table 5 displays the results of stratified bootstrap tests. As before, the coefficients are not highly significant for reasons we have stated above. However, it is interesting that whether firms in emerging markets are compared with U.S., other common-law countries civil-law countries, or the pooled sample of advanced economies (column 4), firms in emerging market countries face capital market access constraints relative to firms that operate in advanced economies. For example, comparing the pool of advanced economies firms (column 4), with emerging markets firms (column 5), we see that 6 of the 9 bootstrap tests are statistically significant: Relative to firms in advanced economies, firms that operate in emerging market countries have higher capital expenditure, and equity issues sensitivities, and lower share repurchase, asset sales, short and long-term borrowing cash flow sensitivities.

In sum, both in terms of investment and non-equity financing cash flow sensitivities, not surprisingly, firms in emerging markets seem to face more severe constraints in accessing external funds compared with firms that operate in advanced economies. Firms that operate in advanced economies do not appear to suffer from capital market constraints. However, contrary to the findings of Beck et al (2006), we do not find many significant differences between civil and common-law countries in terms of raising external funds.

VI. Summary of the Empirical Findings

A. Pooled Sample of Constrained and Unconstrained Firms

The following conclusions emerge regarding cash flow sensitivities during non-crisis and crisis years when constrained and unconstrained firms are pooled together: **1.** When firms

experience a decline in cash flow, in terms of the direction of the responses, 31 of the 36 of the sample coefficients considered have the correct sign. Moreover, 20 of these coefficients are statistically significant, and none of the coefficients that have the "wrong" sign has statistical significance. **2.** Independent of whether the samples cover crisis or non-crisis years, financing cash flow sensitivities dominate investment cash flow sensitivities. This result, which confirms the findings of GPT (2010), also suggests that the presence or absence of financial constraints is likely to be observed in financing variables rather than in investment variables. Additionally, capital market constraints need to be investigated by estimating models that acknowledge the intertemporal and interdependent nature of financial decisions. This means that the presence of constraints cannot be examined by estimating single-equation models of capital expenditure cash flow sensitivities. **3.** There are significant differences in how firms react to cash flow innovations in pre-2007 crises episodes compared with non-crisis years of the total sample, especially in terms of financing cash flow sensitivities. **4.** On the issue of whether the recent crisis was more severe than the pre-2007 crisis episodes, the indications are that it was. The severe nature of the mortgage crisis is observed both in financing and investment cash flow sensitivities. **5.** However, using samples where constrained and unconstrained firms are pooled together hides some significant differences amongst the two categories of firms, and thus, does not show whether the pooled sample results are driven by the behavior of constrained versus unconstrained firms. **6.** When we examine the cash flow sensitivities of firms that operate in civil vs. common-law countries, contrary to the findings of Beck et al (2006), we find no evidence that firms' cash flow sensitivities differ between these two country groups. **7.** However, when firms that operate in advanced economies are compared with firms in emerging market economies, we find that firms in emerging market economies face formidable capital market access constraints. This is observed both in investment and in financing cash flow sensitivities. This conclusion appears to be robust whether advanced economies are represented by common-law countries, civil-law countries, the U.S., or the pooled sample of all these advanced economies.

B. Constrained vs. Unconstrained Firms

The following conclusions emerge about how constrained and unconstrained firms react to a shock in the form of $1 decline in cash flows during crisis and non-crisis periods: **1.** Invest-

ment-cash flow sensitivities continue to be much smaller than financing cash flow sensitivities in all but one sample. This suggests that unlike previous studies approach of examining investment cash flow sensitivities to detect the presence/absence of capital market access constraints, the focus needs to be on financing cash flow sensitivities. Additionally, in general, investment-cash flow sensitivities are relatively higher for the constrained firms, while financing-cash flow sensitivities are relatively higher for unconstrained firms. **2.** However, even switching the focus from investment to financing cash flow sensitivities is not sufficient. Examining the financing cash flow sensitivities in a single equation framework has the same methodological and interpretation related flaws as the single equation investment cash flow sensitivities approach. The issue need to be examined in a framework where both the intertemporal and interdependent nature of financial decisions are explicitly taken into account. This means that a system of equations model needs to be estimated subject to the constraint that sources and uses of funds equal each other. **3.** Constrained firms' investment-cash flow sensitivity is larger in magnitude than that of unconstrained firms in all states of the economy. While the difference between the two sets of firms increases during the pre-2007 crises episodes, compared to normal times (from $0.012 to $0.04), it becomes substantial ($0.51), as the constrained firms experience a very severe cut in their capital expenditures during the mortgage-related financing crisis of 2007-2009. This, along with evidence on the financing cash flow sensitivities front clearly indicates that the mortgage crisis was indeed very severe. **4.** This finding has ramifications that go beyond the mortgage crisis period. Since constrained (financially weak) firms cut back on their investments in a very dramatic fashion, it seems reasonable to argue that these firms which were relatively unhealthy prior to the mortgage-crisis, must have become even more weak following the crisis since they were not able to invest in their future during the crisis. **5.** Another finding is that, as expected, while both the increase in leverage (increase in borrowings and the decrease in cash balances) and total borrowings is higher for unconstrained firms relative to the constrained firms' sample, the difference is most pronounced during the mortgage crisis, followed by the pre-2007 crises, and during normal times. **6.** This validates one of the major premises of this study; that crisis periods present a more fertile ground for detecting the absence/presence of capital market constraints than sample periods that pool crisis and normal periods together. **7.** Constrained firms rely more on equity financing than unconstrained firms, supporting GST (2009), and Fama

and French (2005). As expected, similar behavior is observed in emerging market firms. **8.** While financing-cash flow sensitivities of both constrained and unconstrained firms dominate investment-cash flow sensitivities by a wide margin, investment-cash flow sensitivities increase substantially for constrained firms during the recent crisis. **9.** While, unconstrained firms were able to substitute substantial amount of short-term debt for long-term debt during the pre-2007 liquidity crises episodes - perhaps by tapping into their lines of credit - they are less able to do this during the mortgage crisis. There is also some results that is consistent with banks being able to get out of their line of credit contracts with the constrained sample of firms.

VII. Conclusion

This study examines whether or not firms are constrained in accessing capital markets. While the impact of financial constraints on investment behavior of firms has been examined extensively in the literature, earlier studies other than GPT (2010) and this study, focus on investment-cash flow sensitivities within a single equation capital budgeting framework. This approach is unlikely to provide a satisfactory answer for two general reasons: First, investment cash flow sensitivities are very small and finding evidence is unlikely to be reliable. Second, as discussed by GPT (2010), the approach in question suffers from a number of econometric problems, as well as problems in being able to interpret the estimated coefficients in a meaningful manner. The system-of-equations approach that GPT (2010) develop, which we use in this study does not suffer from these problems.

Using the GPT (2010) model, this study extends the literature in three important directions: **1.** Whether or not cash flow sensitivities vary over the business cycle has not been studied before. This is important not just for its own sake, but also because of the fact that firms worry more about being able to undertake positive NPV projects during crisis periods rather than when economic conditions are favorable. To put it differently, this means, that the presence of capital market access constraints are more likely to be present when economic conditions are not favorable, and, especially the unfavorable conditions are represented by liquidity crises.

2. The mortgage crisis was thought to be extremely severe. In fact, it can be argued that even six years after the "end" of the crisis, the global economies have not yet fully recovered from its effects. In this study, by comparing other liquidity crises episodes with the mortgage crisis, we find evidence that confirms investors' suspicion that the bursting of the mortgage-bubble represented indeed a particularly severe crisis.

3. Another topic that has not been addressed involves two dimensions: First, is it the case that, as widely suspected, that firms in civil-law countries are at a disadvantage in terms of their investment and financing decisions, since investor protection under the civil-law legal framework is weak compared to the common-law legal system? Contrary to Beck et al. (2006), we find no evidence that firms that operate in civil-law countries face more severe capital-market access constraints than firms that operate in common-law countries. In fact, in the case of advanced economies, neither civil-law nor common-law country firms seem to suffer from the presence of capital market access constraints. Second, do emerging market countries firms face capital market constraints relative to firms that operate in advanced economies? The evidence we find answers this question with an unequivocal "yes". Irrespective of whether advanced economies are represented by U.S., by the other common-law countries, or by the civil-law countries, firms that operate in emerging markets suffer from operating under capital market access constraint conditions.

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Figure 1: Comparison of single-equation and multi-equation estimates

This figure plots the regression coefficients on capital expenditures estimated with two different models. The single equation model uses cash flow as explanatory variable and controls for firm size and market-to-book. The multi-equation model is specified in equation (3) and subject to the constraints specified by equation (4). The models are estimated for different sample periods in the United States and the p-values of the estimated coefficients control for firm-level clustering using Rogers's (1983, 1993) method. All variables are defined in Table A2. Following Chen and Chen (2012) the regression models are estimated on eight five-year panels (1972–1977, …, 2007–2009). We further differentiate between running the models on all industrial firms in Panel A and all manufacturing firms (the first digit of the Standard Industry Classification (SIC) code equals two or three) in Panel B.

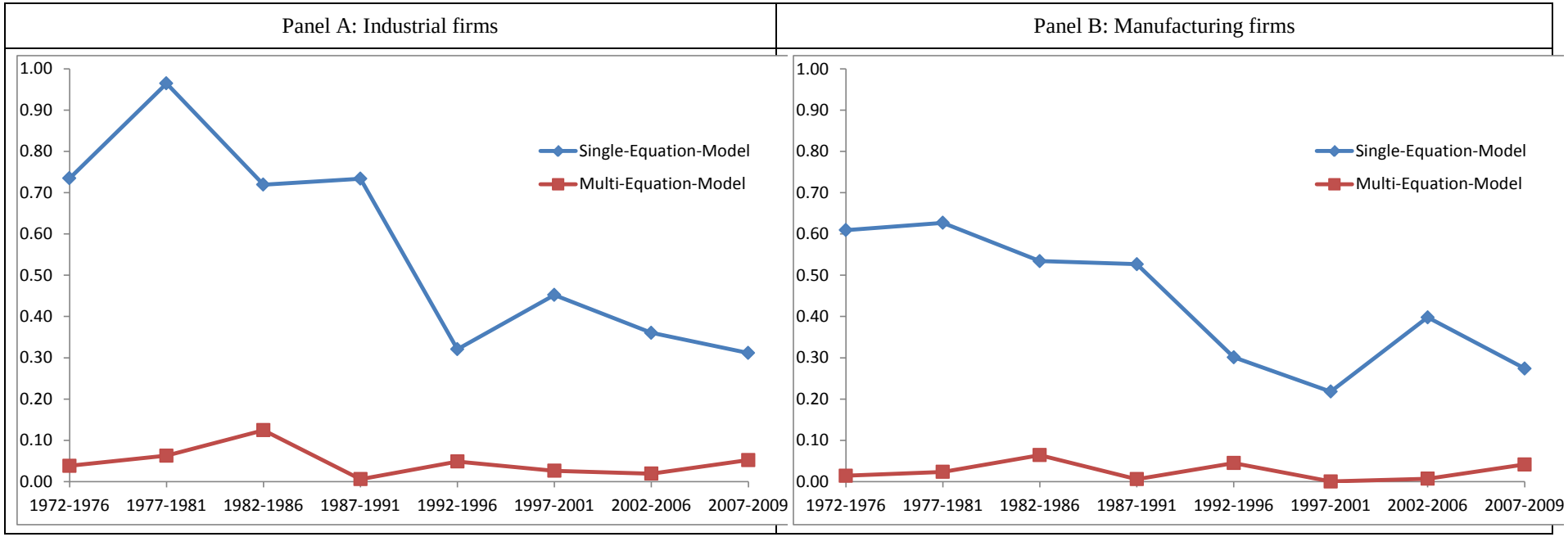

Table 1: Descriptive Statistics

The table shows the number of firm-year observations (N), the mean, and the standard deviation (S.D.) of all the source, use, and control variables of the simultaneous equations model (3) All numbers, except for Market-to-book and Firm size, are expressed as fractions of firm total assets. The 43 countries are grouped into 19 developed civil law countries, 7 developed common law countries, and 16 emerging countries. US data is excluded from the common law group and reported separately. Table A1 lists the countries in each group. All variables are defined in Table A2. Following GPT (2010), we trim the variable market-to-book assets at the 95% level.

	United States (1971-2011)			Civil law countries (1990-2011)			Common law countries (1990-2011)			Emerging markets (1990-2011)		
	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.
Cash Flow	221,334	-0.0045	1.1537	111,278	0.0446	0.8424	65,041	-0.0216	0.7821	57,574	0.0550	1.3948
Capital expenditures	221,334	0.0653	0.0859	111,278	0.0380	0.2122	65,041	0.0743	0.2015	57,574	0.0589	0.0718
Acquisitions	221,334	0.0159	0.0621	111,278	0.0055	0.0415	65,041	0.0183	0.0762	57,574	0.0042	0.0275
Asset sales	221,334	0.0096	0.0916	111,278	0.0077	0.1133	65,041	0.0114	0.1825	57,574	0.0066	0.0435
Equity issues	221,334	0.0601	0.2323	111,278	0.0140	0.0823	65,041	0.0981	0.2471	57,574	0.0163	0.0730
Share repurchases	221,334	0.0096	0.0550	111,278	0.0023	0.0300	65,041	0.0062	0.1170	57,574	0.0015	0.0782
Dividends	221,334	0.0112	0.0967	111,278	0.0127	0.5694	65,041	0.0175	0.0932	57,574	0.0188	0.0620
ΔLong-term debt	221,334	0.0080	0.9136	111,278	0.0007	0.1753	65,041	-0.0007	0.7799	57,574	0.0028	0.5153
ΔShort-term debt	221,334	-0.0004	0.4693	111,278	-0.0003	0.1538	65,041	-0.0074	0.8766	57,574	0.0045	0.3031
ΔCash balances	221,334	0.0036	0.5066	111,278	-0.0020	1.2837	65,041	0.0014	0.3476	57,574	0.0028	1.7117
Market-to-book	221,334	1.4408	0.8839	111,278	1.2672	0.6419	65,041	1.5442	0.9097	57,574	1.4086	0.8571
Firm size	221,334	4.4425	2.3316	111,278	5.7982	1.7875	65,041	4.4881	2.0916	57,574	5.0205	1.6698

Table 2: Testing for Symmetry of Positive and Negative Cash Flow Shocks

The table reports the coefficients for the cash flow variable from estimating the system of equations specified by equation (3) and subject to the constraints specified by equation (4). All variables are defined in Table A2. The full sample consists of 221,335 firm-years from Compustat North America between 1971 and 2011. The regressions in Panel A are estimated using levels while Panel B is using Cleary's (1999) "first differences". The system in (3) is estimated with the right-hand side including interaction variables equal to the change in cash flow multiplied by a dummy variable that takes the value of one when the change in cash flow is positive and zero otherwise. The p-values of the estimated coefficients control for firm-level clustering using Rogers's (1983, 1993) method. The p-values of the difference tests are bootstrapped using stratified sampling and 1,000 iterations. Firms are divided into three strata (constrained, neutral, unconstrained) of equal size using the SA-index from Hadlock and Pierce (2010) as a measure of financial constraints. The index is computed as $(-0.737 \times Size) + (0.043 \times Size^2) - (0.040 \times Age)$, where *Size* is the log of total assets, and *Age* is the number of years the firm is contained in Compustat North America with a non-missing stock price. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Panel A: Levels

	Positive Cash Flow Shock$_t$ [1]		Negative Cash Flow Shock$_t$ [2]		Difference in Cash Flow$_t$ [1] -[2]	
Capital expenditures$_t$	0.0435		0.0032		0.0403	
Acquisitions$_t$	0.0376		0.0236		0.0141	
Asset sales$_t$	-0.0024		-0.0103		0.0079	
Equity issues$_t$	0.0074		-0.0088	**	0.0162	**
Share repurchases$_t$	0.0447		0.0408	**	0.0039	
Dividends$_t$	0.0419		0.0052		0.0367	
ΔLong-term debt$_t$	-0.2676	*	-0.3997	***	0.1321	
ΔShort-term debt$_t$	-0.3743	***	-0.4372	***	0.0629	
ΔCash balances$_t$	0.1955	**	0.0713	*	0.1242	
ΔUses$_t$ + ΔSources$_t$	1.0000		1.0000			
Number of Observations	221,334		221,334			

Panel B: Cleary's "First Differences"

	Positive Cash Flow Shock$_t$ [1]		Negative Cash Flow Shock$_t$ [2]		Difference in Cash Flow$_t$ [1] -[2]	
Capital expenditures$_t$	0.0451		0.0025		0.0426	
Acquisitions$_t$	0.0420		0.0221		0.0199	
Asset sales$_t$	-0.0026		-0.0102		0.0076	
Equity issues$_t$	0.0343		-0.0213		0.0556	*
Share repurchases$_t$	0.0099		0.0062		0.0037	
Dividends$_t$	0.0430		0.0045		0.0384	
ΔLong-term debt$_t$	-0.3028	*	-0.4297	***	0.1269	
ΔShort-term debt$_t$	-0.3876	***	-0.4341	***	0.0466	
ΔCash balances$_t$	0.2014	**	0.0694	*	0.1320	
ΔUses$_t$ + ΔSources$_t$	1.0000		1.0000			
Number of Observations	221,334		221,334			

Table 3: Investment and Financing Cash Flow Sensitivities: Crisis and Non-Crisis periods

The table reports the coefficients for the cash flow variable from estimating the system of equations specified by equation (3) and subject to the constraints specified by equation (4) for different sample periods in the United States. All variables are defined in Table A2. The regressions in Panel A1 are estimated using levels while Panel B1 is using Cleary's (1999) "first differences". The full sample consists of 221,335 firm-years from Compustat North America between 1971 and 2011. Panels A1 and B1 show estimates for the full sample in column [1], the non-crisis years of 1971-2007 and also the 2010-2011 period in column [2], the liquidity crisis periods prior 2007 in column [3], and the mortgage crisis from 2007-2009 in column [4]. For more detailed explanations of the crisis and non-crisis periods see Section IV.B. Panels A2 and B2 report difference tests for the coefficients from A1 and B1, respectively. The p-values of the estimated coefficients control for firm-level clustering using Rogers's (1983, 1993) method. The p-values of the difference test are bootstrapped using stratified sampling and 1,000 iterations. Firms are divided into three strata (constrained, neutral, unconstrained) of equal size using the SA-index from Hadlock and Pierce (2010) as a measure of financial constraints. The index is computed as $(-0.737 \times Size) + (0.043 \times Size^2) - (0.040 \times Age)$, where *Size* is the log of total assets, and *Age* is the number of years the firm is contained in Compustat North America with a non-missing stock price. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Panel A1: Levels

	1971-2011 Full sample [1]		1971-2011 No crisis [2]		1971-2006 Prior 2007 crises [3]		2007-2009 Mortgage crisis [4]	
Capital expenditures$_t$	0.0311		0.0148		0.0254	*	0.0413	*
Acquisitions$_t$	0.0329		0.0222		0.0185		0.0389	
Asset sales$_t$	-0.0049		-0.0080	*	0.0003		-0.0089	
Equity issues$_t$	0.0020		0.0000		0.0023		0.0052	
Share repurchases$_t$	0.0437	*	0.0431	**	0.0038		0.0698	
Dividends$_t$	0.0303	*	0.0323	*	0.0132	**	0.0241	**
ΔLong-term debt$_t$	-0.3065	***	-0.4506	***	-0.2008	***	-0.0927	
ΔShort-term debt$_t$	-0.3949	***	-0.3521	***	-0.7247	***	-0.3819	***
ΔCash balances$_t$	0.1577	***	0.0769	*	0.0162	*	0.3477	***
ΔUses$_t$ + ΔSources$_t$	1.0000		1.0000		1.0000		1.0000	
Number of Observations	221,334		139,407		69,614		12,313	

Panel A2: Bootstrap Difference Tests

	Difference in Cash Flow$_t$ [2] -[3]		Difference in Cash Flow$_t$ [2] - [4]		Difference in Cash Flow$_t$ [3] - [4]	
Capital expenditures$_t$	-0.0107		-0.0265		-0.0158	
Acquisitions$_t$	0.0037		-0.0167		-0.0204	
Asset sales$_t$	-0.0083	*	0.0009		0.0092	
Equity issues$_t$	-0.0023		-0.0052		-0.0029	
Share repurchases$_t$	0.0393		-0.0267		-0.0660	*
Dividends$_t$	0.0191		0.0082		-0.0109	
ΔLong-term debt$_t$	-0.2498	**	-0.3579	***	-0.1081	***
ΔShort-term debt$_t$	0.3726	**	0.0297		-0.3429	*
ΔCash balances$_t$	0.0607		-0.2708	***	-0.3315	***

Panel B1: Cleary's "First Differences"

	1971-2011 Full sample [1]		1971-2011 No crisis [2]		1971-2006 Prior 2007 crises [3]		2007-2009 Mortgage crisis [4]	
Capital expenditures$_t$	0.0318		0.0153		0.0254		0.0413	*
Acquisitions$_t$	0.0361		0.0243		0.0181		0.0439	
Asset sales$_t$	-0.0050		-0.0081		0.0003		-0.0089	
Equity issues$_t$	0.0168		0.0188		0.0004		0.0022	
Share repurchases$_t$	0.0086		0.0059		0.0059		0.0213	
Dividends$_t$	0.0308		0.0329		0.0132		0.0241	**
ΔLong-term debt$_t$	-0.3423	***	-0.4944	***	-0.1995	*	-0.1305	*
ΔShort-term debt$_t$	-0.4019	***	-0.3585	***	-0.7228	***	-0.3828	***
ΔCash balances$_t$	0.1604	***	0.0793		0.0161		0.3492	***
ΔUses$_t$ + ΔSources$_t$	1.0000		1.0000		1.0000		1.0000	
Number of Observations	221,334		139,407		69,614		12,313	

Panel B2: Bootstrap Difference Tests

	Difference in Cash Flow$_t$ [2] -[3]		Difference in Cash Flow$_t$ [2] - [4]		Difference in Cash Flow$_t$ [3] - [4]	
Capital expenditures$_t$	-0.0100		-0.0260		-0.0160	
Acquisitions$_t$	0.0062		-0.0196		-0.0258	
Asset sales$_t$	-0.0085	*	0.0008		0.0093	
Equity issues$_t$	0.0184		0.0167		-0.0017	
Share repurchases$_t$	0.0000		-0.0154		-0.0154	
Dividends$_t$	0.0198	**	0.0089		-0.0109	
ΔLong-term debt$_t$	-0.2950	***	-0.3639	***	-0.0689	***

Table 4: Effects of Capital Constraints

The table reports the coefficients for the cash flow variable from estimating the system of equations specified by equation (3) and subject to the constraints specified by equation (4) for different sample periods in the United States. All variables are defined in table A2. The regressions in Panel A1 are estimated using levels while Panel B1 is using Cleary's (1999) "first differences". The full sample consists of 221,335 firm-years from Compustat North America between 1971 and 2011. Panels A1 and B1 show estimates for the full sample in column [1], the non-crisis years of 1971-2007 and also the 2010-2011 period in column [2], the liquidity crisis periods prior 2007 in column [3], and the mortgage crisis from 2007-2009 in column [4]. For a more detailed explanation of the crisis and non-crisis periods see Section IV.B. Each column in Panels A1 and B1 is further subdivided into constrained and unconstrained firms using the SA-index from Hadlock and Pierce (2010). The index is computed as (−0.737 × Size) + (0.043 × Size 2) – (0.040 × Age), where *Size* is the log of total assets, and *Age* is the number of years the firm is contained in Compustat North America with a non-missing stock price. Firm-years with a computed value of the SA-index above the 60th percentile are considered to be financial constrained, whereas firms with a computed value below the 40th percentile are considered to be financial unconstrained. Firms in between are omitted for this analysis. The Panels A2 and B2 report difference tests for the coefficients from A1 and B1, respectively. The p-values of the estimated coefficients control for firm-level clustering using Rogers's (1983, 1993) method. The p-values of the difference test are bootstrapped using 1,000 iterations.. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Panel A1: Levels

	No crisis		Prior 2007 crises		2007-2009 Mortgage crisis	
	constrained	unconstrained	constrained	unconstrained	constrained	unconstrained
	[1.1]	[1.2]	[2.1]	[2.2]	[3.1]	[3.2]
Capital expenditures$_t$	0.0281	0.0173	0.0750 ***	0.0270	0.5538 ***	0.0412 *
Acquisitions$_t$	0.0169 ***	0.0175	-0.0024	0.0182	0.0074	0.0245
Asset sales$_t$	0.0115 *	-0.0088 **	-0.0084	0.0004	0.0417 ***	-0.0105 *
Equity issues$_t$	-0.0432	0.0006	-0.1003 ***	0.0024	-0.0378 *	0.0054
Share repurchases$_t$	-0.0074	0.0400 **	0.0082 ***	0.0036	0.0036	0.0756
Dividends$_t$	0.0256 ***	0.0322 *	0.0127	0.0137 *	0.0018	0.0179 *
ΔLong-term debt$_t$	-0.4595 ***	-0.4494 ***	-0.3471 ***	-0.2007 *	-0.1381	-0.1005
ΔShort-term debt$_t$	-0.4768 ***	-0.3630 ***	-0.2631 ***	-0.7203 ***	-0.1180	-0.3934 ***
ΔCash balances$_t$	-0.0311	0.0724	0.1876 ***	0.0193	0.1813 ***	0.3418 ***
ΔUses$_t$ + ΔSources$_t$	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Number of Observations	55,760	55,763	27,845	27,845	4,924	4,924

Panel A2: Bootstrap Difference Tests

	Difference in Cash Flow$_t$ [1.1] - [1.2]	Difference in Cash Flow$_t$ [2.1] - [2.2]	Difference in Cash Flow$_t$ [3.1] - [3.2]	Difference in Cash Flow$_t$ [1.1] - [2.1]	Difference in Cash Flow$_t$ [1.1] - [3.1]	Difference in Cash Flow$_t$ [2.1] - [3.1]	Difference in Cash Flow$_t$ [1.2] - [2.2]	Difference in Cash Flow$_t$ [1.2] - [3.2]	Difference in Cash Flow$_t$ [2.2] - [3.2]
Capital expenditures$_t$	0.0108	0.0480 *	0.5126 **	-0.0469	-0.5257 **	-0.4787 **	-0.0097	-0.0239	-0.0142
Acquisitions$_t$	-0.0007	-0.0206	-0.0171	0.0193 **	0.0095	-0.0098	-0.0007	-0.0070	-0.0063
Asset sales$_t$	0.0203 **	-0.0088 *	0.0521 **	0.0199 **	-0.0301	-0.0501 **	-0.0092 *	0.0017	0.0109
Equity issues$_t$	-0.0438	-0.1027 ***	-0.0432	0.0571	-0.0054	-0.0626	-0.0018	-0.0048	-0.0031
Share repurchases$_t$	-0.0474 *	0.0046	-0.0720	-0.0156 **	-0.0110	0.0046	0.0364	-0.0357	-0.0721
Dividends$_t$	-0.0065	-0.0009	-0.0161	0.0129	0.0238 **	0.0109	0.0185	0.0143	-0.0043
ΔLong-term debt$_t$	-0.0100	-0.1463 *	-0.0376	-0.1124 **	-0.3214 ***	-0.2090 ***	-0.2487 **	-0.3490 ***	-0.1003
ΔShort-term debt$_t$	-0.1138	0.4572 ***	0.2754	-0.2137 ***	-0.3588 *	-0.1451	0.3573 **	0.0304	-0.3269 **
ΔCash balances$_t$	-0.1035	0.1683 ***	-0.1605 **	-0.2187 ***	-0.2124 ***	0.0063	0.0531	-0.2694 ***	-0.3225 ***

Panel B1: Cleary's "First Differences"

	1971-2011 no crisis				1971-2006 crisis				2007-2009 financial crisis			
	constrained		unconstrained		constrained		unconstrained		constrained		unconstrained	
	[1.1]		[1.2]		[2.1]		[2.2]		[3.1]		[3.2]	
Capital expenditures$_t$	0.0114		0.0207		0.0789	***	0.0265		0.5531	***	0.0409	
Acquisitions$_t$	0.0204	***	0.0192		0.0018		0.0182		0.0078		0.0334	
Asset sales$_t$	0.0035		-0.0086		-0.0146	*	0.0004		0.0416	***	-0.0106	*
Equity issues$_t$	-0.0052		0.0168		0.0015		0.0001		-0.0010	*	0.0061	
Share repurchases$_t$	-0.0912	***	0.0063		0.0299		0.0060		0.0088		0.0214	
Dividends$_t$	0.0213	***	0.0338		0.0128	***	0.0136		0.0018		0.0177	
ΔLong-term debt$_t$	-0.5344	***	-0.4875	***	-0.3706	***	-0.1985	*	-0.1693		-0.1403	*
ΔShort-term debt$_t$	-0.4839	***	-0.3667	***	-0.2818	***	-0.7183	***	-0.1176		-0.3960	***
ΔCash balances$_t$	0.0181		0.0742		0.2111	***	0.0193		0.1822	***	0.3457	***
ΔUses$_t$ + ΔSources$_t$	1.0000		1.0000		1.0000		1.0000		1.0000		1.0000	
Number of Observations	55,760		55,763		27,845		27,845		4,924		4,924	

Panel B2: Bootstrap Difference Tests

	Difference in Cash Flow$_t$ [1.1] - [1.2]		Difference in Cash Flow$_t$ [2.1] - [2.2]		Difference in Cash Flow$_t$ [3.1] - [3.2]		Difference in Cash Flow$_t$ [1.1] - [2.1]		Difference in Cash Flow$_t$ [1.1] - [3.1]		Difference in Cash Flow$_t$ [2.1] - [3.1]		Difference in Cash Flow$_t$ [1.2] - [2.2]		Difference in Cash Flow$_t$ [1.2] - [3.2]		Difference in Cash Flow$_t$ [2.2] - [3.2]	
Capital expenditures$_t$	-0.0094		0.0524	**	0.5123	**	-0.0676		-0.5418	**	-0.4742	**	-0.0058		-0.0201		-0.0143	
Acquisitions$_t$	0.0012		-0.0165		-0.0256		0.0187	**	0.0126		-0.0060		0.0009		-0.0143		-0.0152	
Asset sales$_t$	0.0121	*	-0.0150	***	0.0522	*	0.0181	**	-0.0381		-0.0562	**	-0.0091	*	0.0020		0.0110	
Equity issues$_t$	-0.0221		0.0015		-0.0071		-0.0068		-0.0043		0.0025		0.0168		0.0108		-0.0060	
Share repurchases$_t$	-0.0974	***	0.0239		-0.0126		-0.1210	***	-0.1000	**	0.0211		0.0003		-0.0151		-0.0154	
Dividends$_t$	-0.0125		-0.0008		-0.0160		0.0084		0.0195	**	0.0110	*	0.0202		0.0160		-0.0041	
ΔLong-term debt$_t$	-0.0469		-0.1722	*	-0.0290		-0.1638	***	-0.3651	***	-0.2013	**	-0.2890	***	-0.3471	***	-0.0582	
ΔShort-term debt$_t$	-0.1172		0.4365	***	0.2784		-0.2021	***	-0.3662	*	-0.1642		0.3516	**	0.0293		-0.3223	**
ΔCash balances$_t$	-0.0561		0.1918	***	-0.1636	*	-0.1930	***	-0.1640	*	0.0290		0.0548		-0.2716	***	-0.3264	***

Table 5: Cross-country Differences

The table reports the coefficients for the cash flow variable from estimating the system of equations specified by equation (3) and subject to constraints specified by equation (4) for four different country groups. Table A1 provides a detailed description of all countries in each of the four country groups. The 43 countries are grouped into 19 developed civil law countries, 7 developed common law countries, and 16 emerging countries. US data is excluded from the common law group and reported separately. The regressions in Panel A1 are estimated using levels while Panel B1 is using Cleary's (1999) "first differences". The full sample consists of 353,796 firm-years from Compustat North America and Compustat Global between 1990 and 2011. Panel A1 and B1 show estimates for the United States in column [1], common law countries in column [2], civil law countries in column [3], all developed countries in column [4] and countries from emerging markets in column [5]. Panels A2 and B2 report difference tests for the coefficients from A1 and B1, respectively. The p-values of the estimated coefficients control for firm-level clustering using Rogers's (1983, 1993) method. The p-values of the difference test are bootstrapped using stratified sampling and 1,000 iterations. Firms are divided into three strata (constrained, neutral, unconstrained) of equal size using the SA-index from Hadlock and Pierce (2010) as a measure of financial constraints. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Panel A1: Levels

	United States 1990-2011 [1]		Common law 1990-2011 [2]		Civil law 1990-2011 [3]		[1] + [2] + [3] 1990-2011 [4]		Emerging Markets 1990-2011 [5]	
Capital expenditures$_t$	0.0285		0.0350	**	0.0357	***	0.0290	*	0.1373	***
Acquisitions$_t$	0.0328		0.0464	*	0.0155	*	0.0317	**	0.0290	**
Asset sales$_t$	-0.0057		-0.0013		-0.0048		-0.0101	**	-0.0045	***
Equity issues$_t$	0.0031		-0.0121	*	-0.0047		-0.0030		-0.1031	**
Share repurchases$_t$	0.0454	*	0.0172	*	0.0058	**	0.0281	***	0.0131	**
Dividends$_t$	0.0320	*	0.0119	**	0.0085	**	0.0211	*	0.0110	***
ΔLong-term debt$_t$	-0.3272	***	-0.3242	**	-0.2833	***	-0.2757	***	-0.2064	***
ΔShort-term debt$_t$	-0.3604	***	-0.4886	***	-0.4987	***	-0.4555	***	-0.2822	***
ΔCash balances$_t$	0.1712	***	0.0633	**	0.1431	*	0.1458	**	0.2135	***
ΔUses$_t$ + ΔSources$_t$	1.0000		1.0000		1.0000		1.0000		1.0000	
Number of Observations	119,892		65,041		111,279		296,212		57,584	

Panel A2: Bootstrap Difference Tests

	Difference in Cash Flow$_t$ [1] - [2]		Difference in Cash Flow$_t$ [1] - [3]		Difference in Cash Flow$_t$ [2] - [3]		Difference in Cash Flow$_t$ [1] - [5]		Difference in Cash Flow$_t$ [2] - [5]		Difference in Cash Flow$_t$ [3] - [5]		Difference in Cash Flow$_t$ [4] - [5]	
Capital expenditures$_t$	-0.0065		-0.0072		-0.0007		-0.1088	***	-0.1023	***	-0.1016	***	-0.1082	***
Acquisitions$_t$	-0.0136		0.0173		0.0309	**	0.0038		0.0174		-0.0136		0.0027	
Asset sales$_t$	-0.0044		-0.0009		0.0035		-0.0012		0.0032		-0.0003		-0.0056	*
Equity issues$_t$	0.0153	**	0.0079	*	-0.0074		0.1062	**	0.0909	**	0.0983	**	0.1001	**
Share repurchases$_t$	0.0282		0.0397		0.0114		0.0323		0.0041		-0.0073		0.0150	*
Dividends$_t$	0.0201		0.0234		0.0034		0.0210		0.0010		-0.0024		0.0101	
ΔLong-term debt$_t$	-0.0029		-0.0439		-0.0409		-0.1208	**	-0.1179		-0.0769		-0.0693	**
ΔShort-term debt$_t$	0.1282		0.1383	*	0.0101		-0.0782	*	-0.2064	*	-0.2164	*	-0.1733	*
ΔCash balances$_t$	0.1079	**	0.0281	*	-0.0798	*	-0.0423	*	-0.1502	***	-0.0704		-0.0677	**

Panel B1: Cleary's "First Differences"

	United States 1990-2011 [1]		Common law 1990-2011 [2]		Civil law 1990-2011 [3]		[1] + [2] + [3] 1990-2011 [4]		Emerging Markets 1990-2011 [5]	
Capital expenditures$_t$	0.0285		0.0350	**	0.0357	***	0.0290	*	0.1373	***
Acquisitions$_t$	0.0328		0.0464	*	0.0155	*	0.0317	**	0.0290	**
Asset sales$_t$	-0.0057		-0.0013		-0.0048		-0.0101	**	-0.0045	***
Equity issues$_t$	0.0031		-0.0121	*	-0.0047		-0.0030		-0.1031	**
Share repurchases$_t$	0.0454	*	0.0172	*	0.0058	**	0.0281	***	0.0131	**
Dividends$_t$	0.0320	*	0.0119	**	0.0085	**	0.0211	*	0.0110	***
ΔLong-term debt$_t$	-0.3272	***	-0.3242	**	-0.2833	***	-0.2757	***	-0.2064	***
ΔShort-term debt$_t$	-0.3604	***	-0.4886	***	-0.4987	***	-0.4555	***	-0.2822	***
ΔCash balances$_t$	0.1712	***	0.0633	**	0.1431	*	0.1458	**	0.2135	***
ΔUses$_t$ + ΔSources$_t$	1.0000		1.0000		1.0000		1.0000		1.0000	
Number of Observations	119,892		65,041		111,279		296,212		57,584	

Panel B2: Bootstrap Difference Tests

	Difference in Cash Flow$_t$ [1] - [2]		Difference in Cash Flow$_t$ [1] - [3]		Difference in Cash Flow$_t$ [2] - [3]		Difference in Cash Flow$_t$ [1] - [5]		Difference in Cash Flow$_t$ [2] - [5]		Difference in Cash Flow$_t$ [3] - [5]		Difference in Cash Flow$_t$ [4] - [5]	
Capital expenditures$_t$	-0.0063		-0.0074		-0.0012		-0.0938	***	-0.0875	***	-0.0863	***	-0.0932	***
Acquisitions$_t$	-0.0116		0.0207		0.0324	*	0.0079		0.0195		-0.0128		0.0051	
Asset sales$_t$	-0.0043		-0.0008		0.0035		-0.0012		0.0031		-0.0004		-0.0056	
Equity issues$_t$	0.0110		0.0135		0.0024		0.0264		0.0153	*	0.0129	**	0.0199	**
Share repurchases$_t$	0.0005		0.0058		0.0053		-0.0853	**	-0.0858	**	-0.0911	**	-0.0868	**
Dividends$_t$	0.0207		0.0238		0.0031		0.0231		0.0024		-0.0007		0.0118	
ΔLong-term debt$_t$	-0.0216		-0.0711		-0.0495		-0.1436	*	-0.1220		-0.0724		-0.0772	*
ΔShort-term debt$_t$	0.1281		0.1323	*	0.0042		-0.0745		-0.2026	*	-0.2068	*	-0.1708	*
ΔCash balances$_t$	0.1099	**	0.0308		-0.0790		-0.0449		-0.1547	***	-0.0757		-0.0706	**

Table 6: Robustness Check – Quarterly Results

Panel A1: Levels

	1971-2011 [1]		1971-2011 no crisis [2]		1971-2006 crisis [3]		2007-2009 fin. crisis [4]	
Capital expenditures$_t$	0.0054		0.0061		0.0022		0.0061	*
Acquisitions$_t$	0.0123		0.0145		0.0001		0.0111	
Asset sales$_t$	0.0012		0.0011		0.0007		0.0065	
Equity issues$_t$	-0.0018		-0.0011		-0.0005		-0.0025	
Share repurchases$_t$	0.0068	*	0.0074		0.0006		0.0018	
Dividends$_t$	-0.0016		-0.0016		-0.0012		0.0017	
ΔLong-term debt$_t$	-0.4641	***	-0.4859	***	-0.2680	*	-0.1036	
ΔShort-term debt$_t$	-0.3654	***	-0.3554	***	-0.6963	***	-0.5468	***
ΔCash balances$_t$	0.1471	***	0.1323	**	0.0343	*	0.3329	***
ΔUses$_t$ + ΔSources$_t$	1.0000		1.0000		1.0000		1.0000	
Number of Observations	619,339		523,251		71,178		24,910	

Panel A2: Bootstrap Difference Tests

	Difference in Cash Flow$_t$ [2] - [3]		Difference in Cash Flow$_t$ [2] - [4]		Difference in Cash Flow$_t$ [3] - [4]	
Capital expenditures$_t$	0.0040		0.0000		-0.0039	
Acquisitions$_t$	0.0143	***	0.0034	*	-0.0204	*
Asset sales$_t$	0.0004		-0.0054		0.0092	
Equity issues$_t$	-0.0007		0.0014		-0.0029	
Share repurchases$_t$	0.0068	***	0.0056		-0.0660	
Dividends$_t$	-0.0004	*	-0.0033		-0.0109	
ΔLong-term debt$_t$	0.2104	***	-0.3823	**	-0.1081	**
ΔShort-term debt$_t$	-0.0874	***	0.1914		-0.3429	
ΔCash balances$_t$	0.0980		-0.2006	**	-0.3315	**

Table A1: Composition of country groups

Our international sample comprises 43 countries. We include 26 of the 30 countries from the 'advanced economies' sample of the *Fiscal Monitor* publication (International Monetary Fund, 2012). We add Taiwan to this group, which is not included in the IMF publication in question, for a total of 27 countries in the 'developed country' sample. The 16 countries in the 'emerging countries' sample come from the 30 countries that make-up the 'emerging market economies' sample of the IMF publication in question. We further subdivide developed countries into common and civil law countries following Djankov et al. (2007).

Country	Abbreviation	Start year	N	Country Group	N per group
Austria	AUT	1990	1,177		
Belgium	BEL	1990	1,466		
Switzerland	CHE	1990	2,947		
Germany	DEU	1990	9,102		
Denmark	DNK	1990	1,825		
Spain	ESP	1990	1,757		
Finland	FIN	1990	1,702		
France	FRA	1990	8,868		
Greece	GRC	1995	1,829		
Israel	ISR	1990	2,552	Civil law countries	111,278
Italy	ITA	1990	2,859		
Japan	JPN	1990	47,887		
Korea	KOR	1993	6,699		
Luxemburg	LUX	1990	371		
Netherlands	NLD	1990	2606		
Norway	NOR	1990	2,237		
Portugal	PRT	1990	683		
Sweden	SWE	1990	3,870		
Taiwan	TWN	1993	10,841		
Australia	AUS	1990	13,918		
Canada	CAN	1990	17,828		
Great Britain	GBR	1990	22,018		
Hong Kong	HKG	1990	2,569	Common law countries	65,041
Ireland	IRL	1990	1,138		
New Zealand	NZL	1990	1,119		
Singapore	SGP	1990	6,451		
Argentina	ARG	1992	628		
Brazil	BRA	1992	1,682		
Chile	CHL	1990	1316		
China	CHN	1993	13,041		
Indonesia	IDN	1992	3,145		
India	IND	1990	10,346		
Mexico	MEX	1990	1,296		
Malaysia	MYS	1990	10,251	Emerging markets	57574
Pakistan	PAK	1995	1,526		
Peru	PER	1996	560		
Philippines	PHL	1990	1,556		
Poland	POL	1996	2,172		
Russia	RUS	1996	761		
Thailand	THA	1990	4862		
Turkey	TUR	1992	1,238		
South Africa	ZAF	1990	3,194		
USA	USA	1971	221,334	United States	221,334

Table A2: Definition of variables

The table summarizes the variable definitions of the simultaneous equations model specified by equations (3) and (4), and provides the corresponding Compustat items.

Panel A: Compustat variable definitions of the source, use, and control variables

	Variable name	Abbreviation	Description	Construction from Compustat item
Source	Cash flow	CF	Internally available cash flow for investment and financing	oibdp – (xint – idit) – (txt – txdc) – ΔNWC
	ΔLong-term debt	Δ LTD	Change in long-term debt	Δ dltt
	ΔShort-term debt	Δ STD	Change in short-term debt	Δ dlc
	Equity issues	EQUISS	Equity issues	sstk
	Asset sales	ASALES	Sales of assets and investments	See Panel B
Use	Share repurchases	RP	Purchase of common and preferred stocks	See Panel B
	Dividends	DIV	Cash dividend	See Panel B
	Capital expenditures	CAPX	Net capital expenditures	capx
	Acquisitions	ACQUIS	Acquisitions	See Panel B
	ΔCash balances	Δ CASH	Change in cash balance	Δ che
Other	Market-to-book	MB	Ratio of market value of equity to book value of equity	(at – ceq* + prcc × csho) / at
	Firm size	SIZE	Logarithm of total book assets	ln(at)

*If ceq is missing, we use either seq, or otherwise at – lt.

Panel B: Variable definitions that depend on the format code of the Statements of Cash Flows

Variable name	Compustat item name (scf =1, 3, 5, 7)	Compustat item name (scf = 10)	Compustat item name (scf =11)	Compustat item name (scf = 12)
Asset sales	sppe	psfix	prosai	stfixa
Share repurchases	prstkc	prstkc + purtshr	prstkc	prstkc
Dividends	dv	dv	dv	eqdivp
Acquisitions	aqc	aqc	aqc	aqcdisn

scf = Variable in Compustat which contains the format code of the Statement of Cash Flows. U.S. firms report their Statement of Cash Flows in format codes 1, 3, 5, and 7, U.K. firms in format codes 7, 10, and 11, and firms from the rest of the world in format codes 10 and 11.