Corporate Uses of Cash Flow in Recent Decades

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Abstract

We study time-series variation in how U.S. firms allocate their cash flow across various uses over the past three decades. Based on cash flow sensitivities of different uses of funds, our integrated regression framework depicts a complete picture of what firms do with their cash flow. Contrary to the findings of recent studies, the investment-cash flow sensitivity of U.S. firms has neither declined nor disappeared. Our analysis illustrates that the sensitivity has been stably high (i.e., around 0.3) since 1988, suggesting that investment has consistently been an important use of cash flow. Furthermore, we find that firms have been shifting their cash flow considerably away from increasing working capital towards reducing equity financing. Taken together, our findings reveal temporal variation in corporate uses of cash flow over the recent decades and illustrate how firms reallocate internal funds to shape their corporate policies.

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I. Introduction

Cash flow is the lifeblood of publicly traded firms. In 2019, the aggregate internal cash flow generated by publicly listed U.S. firms reached a staggering $2.87 trillion, amounting to about 13.4% of nominal GDP.[1] Firms use internally generated cash flow to make investments, meet working capital needs, build up cash reserves, pay dividends, retire debt, and reduce equity financing. These six uses of cash flow are interrelated and determined *jointly* and *simultaneously* by firms (Tobin, 1988), thereby shaping corporate real (investment) and financial (cash and external financing) decisions. In this paper, we study how corporate uses of internal cash flow have evolved over the past three decades.

This question deserves attention not only because of the economic magnitude of corporate cash flow but also because of its policy implications. How firms allocate cash flow across various uses can affect the speed at which an economy recovers from a recession. If firms use cash flow primarily to increase cash holdings or reduce external financing, then the effects of monetary and fiscal policies which aim to increase corporate profits and spur investment (e.g., tax and interest rate cuts) may be muted. Thus, understanding the allocation of corporate cash flow may enhance the effectiveness of economic policies in influencing corporate decisions and the real economy. Furthermore, the amount of cash flow allocated to a particular use (e.g., investment) can be empirically captured using the cash flow sensitivity of that use.

Chen and Chen (2012) find that the investment-cash flow sensitivity of U.S. firms has declined over time and disappeared in recent years − from around 0.3 in 1967 to almost zero in 2006. To wit, with an additional dollar of cash flow, an average firm allocates 30 cents to investment in 1967, but zero cent in 2006. This finding is intriguing and invites an interesting question: if firms have been cutting back on the cash flow allocated to investment, what have they been using the cash flow for

[1] U.S. nominal GDP was $21.43 trillion in 2019. To compute the aggregate amount of cash flow, we include all U.S. firms in the Compustat database for which we can compute cash flow using the flow-of-funds (i.e., the cash flow statement) data. As defined in Section II.C, cash flow is the operating cash flow that does not include spending on working capital. Throughout the study, we use the terms: cash flow, internal cash flow, internally generated cash flow, and operating cash flow interchangeably.

instead? We aim to answer this question by studying how the allocation of cash flow across various uses has changed over time.

To depict a complete picture of what firms do with their cash flow, we use an integrated regression framework that simultaneously tracks all six main uses of cash flow. Within the framework, every use of cash flow is regressed on cash flow and other control variables. The cash flow sensitivity of a particular use reveals how much of an additional dollar of cash flow is directed towards that use. Instead of estimating cash flow sensitivities of different uses in isolation,[2] we account for the interdependence among corporate decisions by using the cash flow identity that equates the sources of funds to their uses. As a result, it is almost tautological that the cash flow sensitivities of various uses of cash flow add up to unity. In other words, if internal cash flow increases by one dollar, then the changes in all uses (i.e., investment, additions to cash holdings, working capital, dividends, and equity and debt reductions) must sum to one dollar. In short, our methodology can pin down precisely how firms deploy cash flow across the major uses.

We measure the uses and sources of funds using data from the Statement of Cash Flow (SCF hereafter). Our SCF-based measures differ from the conventional measures of cash flow and its uses. For example, cash flow is conventionally defined as income before extraordinary items plus depreciation and amortization (e.g., Fazzari, Hubbard, and Petersen, 1988). We adjust the conventional measure for an extensive list of non-cash, non-operating, or non-recurring items, resulting in a broader and cleaner measure of cash flow. Moreover, unlike conventional measures of investment that primarily focus on capital expenditure (e.g., Kaplan and Zingales, 1997), our investment measure includes all investment items reported in the SCF (i.e., net capital expenditure, acquisitions, and financial investments), thereby offering a more encompassing view of a firm's investing activities. More importantly, our variables - defined using SCF data - satisfy the cash flow identity and thus provide a full account of how firms use their cash flow.

[2] Prior studies have separately estimated the investment-cash flow sensitivity (e.g., Fazzari, Hubbard, and Petersen, 1988), the cash-cash flow sensitivity (Almeida, Campello, and Weisbach, 2004), and the external finance-cash flow sensitivity (Almeida and Campello, 2010).

Using a large panel of U.S. firms for the period 1988 to 2019, we reveal how corporate uses of cash flow have changed over the past decades. We start our sample in 1988 because that is the first year in which U.S. firms are mandated to report the SCF.[3] We find that for the full sample, given a one-dollar increase in cash flow, firms on average spend 26.9 cents on investment, raise working capital by 25.1 cents, add 19 cents to cash holdings, increase dividends by 0.8 cents, reduce the use of debt by 9.2 cents, and lower the use of equity by 19 cents.

More importantly, two distinct time trends emerge when we estimate the allocation of cash flow across the six uses every year. First, there has been an increasing substitution between internal cash flow and external equity financing. Given an additional dollar of cash flow, an average firm uses almost 30 cents more to reduce its use of equity in 2019 compared to 1988. Second, cash flow channeled into working capital has reduced over time. Given an additional dollar of cash flow, firms on average spend 14 cents less on working capital in 2019 than they did in 1988. Using the augmented Dickey-Fuller (ADF) test, we further confirm that these time trends are statistically significant. On the other hand, the allocation to investment, cash holdings, dividends, and debt reductions either show little variation over time or display no clear time trend.

We conduct several additional analyses to understand the allocation of cash flow to specific uses of funds. We find that the allocation of cash flow to investment, as measured by the cash flow sensitivity of investment, has been stable throughout our sample period. This result stands in sharp contrast to the finding of Chen and Chen (2012), which states that the investment-cash flow sensitivity of U.S. firms has declined significantly since 1967 and disappeared completely by 2006. To reconcile our result with that of Chen and Chen (2012), we compare the investment-cash flow sensitivities estimated using the traditional measures of investment and cash flow, with those estimated using our SCF-based measures. We show that the estimated allocation to investment is sensitive to the definition of both investment and cash flow. However, the definition of investment is relatively more

[3] Prior to 1988, Compustat reports Flow of Funds data under three different format codes, leading to both cross-sectional and time-series inconsistencies in variable definitions. We provide details about the change in reporting standards and its impact on Compustat SCF data in Section II. B.

important in explaining the gap between the two sets of sensitivity estimates. Contrary to common belief, we find that the conventional measure of investment - net capital expenditure - only accounts for approximately one-third of the allocation of cash flow to comprehensive investment. Therefore, the disappearing investment-cash flow sensitivity documented by Chen and Chen (2012) is specific to the measures they use. The comprehensive measure of investment remains sensitive to the availability of cash flow.

To better understand what drives the time trends in the cash flow allocation to net working capital and net equity reduction, we decompose these two uses into their main components and estimate the cash flow allocation to these components. We find that the declining trend in the allocation to working capital is mainly driven by a declining allocation to accounts receivable and inventory. This evidence is consistent with the stylized fact that accounts receivable and inventory of U.S. firms have fallen significantly over the past decades (e.g., Bates, Kahle, and Stulz, 2009; Aktas, Croci, and Petmezas, 2015). One implication of our finding is that U.S. firms have become more efficient in managing their working capital over time. Consequently, they deploy less cash flow to finance their working capital needs. At the same time, firms allocate more cash flow to reduce their reliance on equity financing, and they do so more by reducing equity issuances than increasing equity repurchases.

We conjecture that the time trends in cash flow allocation could be influenced by macroeconomic conditions. Indeed, we observe a strong correlation between the estimated allocation coefficients and a number of macroeconomic variables. We find evidence of precautionary savings as firms save more cash out of cash flow and spend less to reduce equity financing during economic expansions. We also find that deteriorating bond market conditions (higher borrowing costs) are associated with higher allocation of cash flow to net debt reduction. On the other hand, firms tend to save less and spend more on net equity reduction during times of favorable equity market valuation. Lastly, as research and development (R&D) spending becomes a more significant driving force of economic output, firms direct less cash flow to (non-R&D) investment and channel more of it to net debt reduction.

Our baseline results survive a battery of robustness tests. First, to ensure that the observed time trends are not primarily driven by changes in sample composition caused by newly listed companies (e.g., Fama and French, 2004; Graham and Leary, 2018), we classify firms into incumbents and new entrants depending on whether they are listed before or after 1988. We find that both the incumbent and entrant firms exhibit similar trends in the allocation of cash flow over time. Second, our results may reflect time-series variations in the measurement error of Tobin's q, which can engender biased cash flow coefficients in regressions (e.g., Whited, 2006). To mitigate this concern, we use Beveridge and Nelson's (1981) approach to decompose cash flow into cycle and trend components. By construction, the trend component of cash flow contains information about future cash flow growth, while the cycle component includes little information about the future beyond short-term momentum. Thus, the coefficients of the cycle component can be interpreted as reliable estimates of the use of cash flow (Chang et al., 2014). Using both components of cash flow in our regression analyses, we find that the cycle component offers allocation results that are qualitatively similar to our main results.

In addition, we account for intertemporal cash flow allocation (Dasgupta, Noe, and Wang, 2011) by adding lagged cash flow variables into the regressions. Moreover, we include the lagged dependent variables (i.e., the six uses of cash flow) to control for the intertemporal dependencies within and across various uses of cash flow (Gatchev, Pulvino, and Tarhan, 2010). We find that the inclusion of these variables into the regressions has no material impact on the estimated coefficients of cash flow. Lastly, we conduct a number of additional tests and show that: 1) the time trends in cash-flow allocation varies across industries, sometimes with opposite signs. However, the declining allocation to net working capital and the increasing allocation to net equity reduction are consistently observed in most industries; 2) The time trends are similar for financially constrained and unconstrained firms; 3) The time trends are robust to an alternative measure of cash flow, which nets out the change in net working capital; 4) The time trends are largely unaffected when we consider R&D spending as a form of investment.

Our paper contributes to the extant literature in several ways. First, our study adds to the literature on the link between internal cash flow and various corporate policies. Unlike prior studies that examine the response of a particular use of cash flow to cash flow innovations in isolation, we simultaneously track all uses of cash flow to provide a full account of how firms deploy cash flow.[4] In doing so, our research addresses Tobin's (1988) comment that "... *the firm jointly determines investment, dividend payments, and other ways of allocating its cash flow. Therefore, ...the authors (should) model investment and dividends as depending on the same set of explanatory variables.*" Moreover, our empirical framework accounts for the interdependence in corporate policies by virtue of the cash flow identity. As such, our analyses explicitly recognizes the endogeneity of corporate policies (Almeida and Campello, 2010). While several studies (e.g., Gatchev, Pulvino, and Tarhan, 2010; Lewellen and Lewellen 2016; Chang et al., 2014) have investigated what firms do with their cash flow using an integrated regression framework, none of them examines the time-series variation in the allocation of cash flow to its various uses.

Our study is also closely related to the extensive literature on the link between investment and cash flow. Although empirically, prior studies (e.g., Fazzari, Hubbard, and Petersen, 1988) have long documented a positive relation between investment and cash flow, both the cause and strength of the relation remain controversial. Lewellen and Lewellen (2016) put together three reasons for a positive investment-cash flow sensitivity: financial constraints (i.e., external funds are more costly than internal funds), agency problems (i.e., managers overinvest with any additional internal cash flow), and the correlation between cash flow and Tobin's q. We approach this issue from a different but straightforward perspective: Corporate investment should be sensitive to cash-flow fluctuations because it is an essential use of cash flow. If, however, the investment-cash flow sensitivity reduces

[4] e.g., Fazzari, Hubbard, and Petersen (1988) on the cash flow sensitivity of investment; Almeida, Campello, and Weisbach (2004) on the cash flow sensitivity of cash; and Almeida and Campello (2010) on the cash flow sensitivity of external financing.

to zero, then all the other uses of cash flow must work together to absorb cash-flow fluctuations completely.

Regarding the strength of the investment-cash flow sensitivity, previous studies have obtained a variety of estimates, ranging from -0.11 (Erickson and Whited, 2012) to 0.7 (Kaplan and Zingales, 1997).[5] In particular, Chen and Chen (2012) show that the investment-cash flow sensitivity has declined over time since 1967 and completely disappeared by 2006.[6] This finding implies that internal cash flow is no longer important for corporate investment. We contribute to this strand of literature by showing that the estimation of the investment-cash flow sensitivity is highly sensitive to the definitions of investment and cash flow. Chen and Chen's (2012) finding primarily results from narrow definitions of investment (i.e., net capital expenditure) and cash flow. Using more comprehensive measures of investment and cash flow based on SCF data, we show that the investment-cash flow sensitivity remains largely stable at around 0.3 over the past three decades, suggesting that investment has always been a major use of cash flow. Moreover, acquisitions and other investments collectively account for more than 60% of the investment-cash flow sensitivity. As such, using conventional investment measures to estimate the investment-cash flow sensitivity seems to miss the big picture and underestimate the impact of cash flow on total investment.

Finally, we also add to the literature on time trends of corporate policies. As corporate uses of cash flow shape corporate real and financial decisions, time-series variation in cash flow allocation gives rise to time-series variation in corporate policies. In recent decades, U.S. firms have reduced their holdings of working capital (e.g., Bates, Kahle, and Stulz, 2009) and significantly increased their payout in the form of equity repurchases (e.g., Kahle and Stulz, 2021). Our findings not only help to

[5] Specifically, the estimated investment-cash flow sensitivities are 0.2-0.7 for manufacturing firms between 1970 and 1984 (Fazzari, Hubbard, and Petersen,1988; Kaplan and Zingales, 1997), around 0.06-0.15 for firms beteween 1988 and 1994 (Cleary, 1999), 0.11-0.15 for firms from 1980 to1999 (Baker, Stein, and Wurgler, 2003), 0.11 for firms between 1990 and 1998 (Rauh, 2006), 0.04-0.08 for firms from 1968 to 2003 (Hennessy, Levy, and Whited, 2007), -0.11-0.16 for firms from 1985 to 2000 (Almeida and Campello, 2007), 0.04-0.38 for firms between 1970 and 2005 (Almeida, Campello, and Galvao, 2010), 0.01-0.15 for firms between 1976 and 2008 (Erickson and Whited, 2012), and 0-0.3 for firms from 1967 to 2006 (Chen and Chen, 2012).

[6] Agca and Mozumdar (2008) and Brown and Petersen (2009) also find that investment-cash flow sensitivity has declined over time. Larkin, Ng and Zhu (2018) show that the investment-cash flow sensitivity has declined in wealthy nations around the world. Lewellen and Lewellen (2016) claim the decline in sensitivity is due to conventional cash flow being an increasingly poor measure of cash flow over time.

explain the trends in working capital and payout policies, but also reveal the interconnected nature of these trends through substantial internal funds reallocation from increasing working capital to reducing equity capital.

The remainder of the paper proceeds as follows. Section II describes our empirical methods, sample selection procedures, variable constructions, and summary statistics. Section III presents the baseline results on how firms allocate cash flow to various uses over time. Section IV describes detailed analyses on the allocation of cash flow to investment, net working capital, and net equity reduction. Section V presents several additional analyses and Section VI concludes.

II. Empirical methodology, data, variables, and summary statistics

A. Empirical methodology

Our empirical analysis fully accounts for what firms do with their cash flow. Specifically, we require that firms' investment and financial decisions be interrelated according to the following accounting identity:

$$INV + \Delta WC + \Delta CASH + DIV + DR + ER = CF + DI + EI, \tag{1}$$

where the uses of funds include investment (*INV*), the change in working capital (ΔWC), the change in cash holdings ($\Delta CASH$), cash dividends (DIV), debt retirement (*DR*), and equity repurchases (*ER*). The sources of funds comprise of internally generated cash flow (*CF*) and external financing, which includes both debt and equity issuances (*DI* and *EI*, respectively). Equation (1) is high dimensional in the sense that investment, working capital, dividends, cash holdings, debt, and equity are all commonly regarded as important corporate decisions. To allow for the substitution between internal and external financing (e.g., Almeida and Campello, 2010), we move *DI* and *EI* to the left-hand side of the equation. After defining two net terms, $\Delta D = DR - DI$ and $\Delta E = ER - EI$, the cash flow identity can be reduced to:

$$INV + \Delta WC + \Delta CASH + DIV + \Delta D + \Delta E = CF, \tag{2}$$

where we refer to ΔD and ΔE as net debt and equity reductions respectively. For example, a net equity reduction occurs when cash outflows for repurchases exceed cash inflows from issuances. Equation (2) stipulates that internal cash flow is fully allocated across six major uses of cash flow on the left-hand side of the equation. We define all these variables using the SCF data to ensure that the cash flow identity holds in our analyses. All variables in equation (2) are deflated by the beginning-of-period total assets.

Consistent with the decision-making process of firms in practice, our framework assumes that firms make investment, working capital, cash holdings, dividend, and external financing decisions jointly. Specifically, our baseline model involves regressing each use of cash flow (i.e., *INV*, ΔWC, $\Delta CASH$, *DIV,* ΔD, and ΔE) on internal cash flow (*CF*), control variables (*Y*), firm fixed effects (f_i) that control for the impact of unobservable time-invariant firm characteristics, and year fixed effects (y_t) that account for the aggregate time variation in the uses of cash flow. The multi-equation regression model takes the following form:

$$INV_{it} = \alpha^{INV} CF_{it} + \beta^{INV} Y_{it-1} + f_i + y_t + \varepsilon_{it}^{INV}, \tag{3}$$

$$\Delta WC_{it} = \alpha^{\Delta WC} CF_{it} + \beta^{\Delta WC} Y_{it-1} + f_i + y_t + \varepsilon_{it}^{\Delta WC}, \tag{4}$$

$$\Delta CASH_{it} = \alpha^{\Delta CASH} CF_{it} + \beta^{\Delta CASH} Y_{it-1} + f_i + y_t + \varepsilon_{it}^{\Delta CASH}, \tag{5}$$

$$DIV_{it} = \alpha^{DIV} CF_{it} + \beta^{DIV} Y_{it-1} + f_i + y_t + \varepsilon_{it}^{DIV}, \tag{6}$$

$$\Delta D_{it} = \alpha^{\Delta D} CF_{it} + \beta^{\Delta D} Y_{it-1} + f_i + y_t + \varepsilon_{it}^{\Delta D}, \tag{7}$$

$$\Delta E_{it} = \alpha^{\Delta E} CF_{it} + \beta^{\Delta E} Y_{it-1} + f_i + y_t + \varepsilon_{it}^{\Delta E}, \tag{8}$$

where the subscripts *i* and *t* index firms and years, respectively, and the superscripts of the coefficients (α, and β) denote the different uses of cash flow in various regression equations.

We capture the allocation of cash flow to its various uses by the coefficients on *CF* in equations (3)-(8). These α coefficients are also interpreted as cash flow sensitivities in prior studies (e.g., Fazzari, Hubbard, and Petersen, 1988; Almeida, Campello, and Weisbach, 2004). Given that we model the various uses of cash flow as being jointly determined, subject to equation (2) that internal cash flow must equal to the sum of all uses of cash flow, the cash flow sensitivities of various uses of cash flow must add up to unity. Mathematically, the coefficient estimates in equations (3)–(8) must satisfy the following add-up constraints.

$$\alpha^{INV} + \alpha^{\Delta WC} + \alpha^{\Delta CASH} + \alpha^{DIV} + \alpha^{\Delta D} + \alpha^{\Delta E} = 1, \tag{9}$$

$$\beta^{INV} + \beta^{\Delta WC} + \beta^{\Delta CASH} + \beta^{DIV} + \beta^{\Delta D} + \beta^{\Delta E} = 0, \tag{10}$$

Constraint (9) is implied by equation (2) and reflects a complete view of how firms allocate internal cash flow. That is, a one-dollar increase in internal cash flow must be fully used to increase investment, increase working capital, increase cash holdings, pay cash dividends, or reduce external financing. Moreover, if the cash flow allocated to a particular use (e.g., investment) changes, the cash flow allocated to all other uses must adjust accordingly to ensure that constraint (9) still holds. Constraint (10) stipulates that the total response across different sources and uses of funds must sum to zero if the shock stems from an exogenous or predetermined variable that represents neither a source nor a use of funds in the current period.[7]

Chang et al. (2014) illustrate that if the variables in equation (2) are consistently and accurately measured so that the cash flow identity holds in the data, constraints (9) and (10) should hold automatically and need not be imposed explicitly in the estimation. Furthermore, since all the explanatory variables in equations (3)-(8) are either exogenous or predetermined, these multiple equations can be estimated simultaneously using the seemingly unrelated regressions (SUR) method, which offers consistent and efficient estimates. Greene (2012) suggests that the SUR estimates are equivalent to equation-by-equation OLS estimates if the same set of explanatory variables is included in all regression equations, which is precisely the case in equations (3)-(8). Thus, we estimate these equations individually using OLS regressions without explicitly imposing constraints (9) and (10).[8]

[7] For instance, suppose that the coefficient of *MB* is 0.1 in equation (3), indicating that investment increases by 10% of total assets if *MB* increases by one. Since investment is a use of funds and total uses of funds must be equal to the total sources of funds, the net effect of the increase of MB on other use variables must sum to -10% of total assets.

[8] In an unreported robustness check, we confirm that our unconstrained single-equation estimation generates the same results as those obtained by estimating equations (3)-(8) simultaneously using the SUR method with constraints (9) and (10) imposed. Gatchev, Pulvino, and Tarhan (2010) argue that estimating all the cash flow sensitivities simultaneously

To estimate regressions with firm fixed effects, we demean all the dependent and independent variables in equations (3)-(8) over the entire sample period. This also allows us to run annual cross-sectional regressions with the demeaned variables, thereby tracking the changes in cash-flow allocations over time. We include as control variables (*Y*) the market-to-book ratio (*MB*) as a proxy for investment opportunities, the log of the book value of assets (*Ln*(*Assets*)) as a proxy for firm size, the annual sales growth rate (*SalesG*) as an additional control for firm growth prospects, the net PPE-to-assets ratio (*PPE/Assets*) as a measure of asset tangibility and the leverage ratio (*Leverage*), defined as total debt (the sum of short-term and long-term debt) divided by total assets.

B. Data

Our sample consists of firms listed in the Compustat Industrial Annual files between 1988 and 2019. Our analysis hinges critically upon the cash flow identity defined using the flow-of-funds data, which are available electronically for all firms starting from 1971. However, prior to 1988, companies may report one of the following three flow-of-funds statements: Working Capital Statement (format code = 1), Cash Statement by Source and Use of Funds (format code = 2), and Cash Statement by Activity (format code = 3). Effective for fiscal years ending after July 15, 1988, Statement of Financial Accounting Standards (SFAS) #95 requires all U.S. companies to report the Statement of Cash Flows (SCF; format code = 7).[9] As we focus on the time-series variation in cash-flow allocation, we start the sample in 1988 to ensure that our results are not affected by the changes or inconsistency in reporting formats of the cash flow statements. For firms with missing *SCF* data, we manually collect, whenever possible, the data from 10-K statements that firms file with the Securities and Exchange Commission.

without explicitly imposing the add-up constraints leads to erroneous coefficient estimates. However, Chang et al. (2014) show that Gatchev, Pulvino, and Tarhan's (2010) claim is false because their variable definitions are inconsistent and the cash flow identity is violated for a substantially large percentage of the observations in their sample.

[9] The reported items can be quite different across different reporting formats. For instance, Increase in Investments (*ivch*), Sales of Investments (*siv*), Short-Term Investments-Change (*ivstch*), and Cash and Cash Equivalents – Increase (Decrease) (*chech*) are reported in the Statement of Cash Flows (format code = 7), but unavailable or incomplete under other format codes (1, 2, or 3) prior to 1988. The variable names in parentheses are the Compustat XPF variable names.

Data on stock prices are retrieved from the Center for Research on Security Prices (CRSP) files. Dollar values are converted into 2019 constant U.S. dollars using the GDP deflator. Following common practice (e.g., Almeida, Campello, and Weisbach, 2004), we exclude financial institutions (SIC codes 6000–6999) and utilities (SIC codes 4900–4999).[10] We also require firms to have non-missing information on total assets, sales growth, and market capitalization. In addition, we follow Almeida and Campello (2010) and exclude firm-years for which: (1) the market value of assets (GDP-deflator adjusted) is less than $1 million, (2) the asset growth rate exceeds 100%, or (3) the annual amount of sales (GDP-deflator adjusted) is less than $1 million.[11] To ensure that the cash flow identity holds well in our data, we exclude observations for which the absolute value of the difference between the left- and right-hand sides of equation (2) exceeds 1% of the beginning-of-period total book assets.[12] These filtering rules leave us with an unbalanced panel that consists of 103,246 firm-year observations (11,531 unique firms).

C. Variables in the cash flow identity

We measure the variables in equation (2) using the SCF, which summarizes the amount of cash and cash equivalents entering and leaving a company. In this section, we discuss the main advantages of our SCF-based measures over those used in prior studies (e.g., Fazzari, Hubbard, and Petersen, 1988; Chen and Chen, 2012). We include details of the variable construction in Exhibit 1.

[Insert Exhibit 1 here]

For cash flow, the conventional measure (*CCF*) is income before extraordinary items plus depreciation and amortization (e.g., Fazzari, Hubbard, and Petersen, 1988; Erickson and Whited,

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[10] These firms are excluded from our sample because they are heavily regulated. In particular, financial firms are subject to additional regulations, such as capital adequacy requirements, which are not relevant for nonfinancial firms.

[11] Very small firms are removed because they have severely limited access to public capital markets. Extremely high growth firms are eliminated because they are normally involved in major corporate restructuring, such as mergers and acquisitions. Firms with very low sales are excluded to minimize the sampling of financially distressed firms.

[12] 9,386 observations are deleted due to this screen. The difference between the left- and right-hand sides of equation (2) is mainly due to rounding errors, misrecorded data, or winsorization. In particular, winsorization leads to a mild violation of the cash flow identity for a small number of firms because not all scaled variables in the cash flow identity take extreme values simultaneously in a given firm-year. Robustness checks (untabulated) show that our main results are unaffected if we do not remove these observations.

2012). To uphold the cash flow identity in the SCF, we expand this definition by including more corrections for non-cash items (*NCF*; e.g., provision for doubtful debt, assets and inventory write-offs, impairment of assets and goodwill, adjustments for currency exchange rate changes, and stock-based compensation), and more adjustments for non-recurring or non-operating activities (*OCF*; e.g., extraordinary items, discontinued operations, and gains/losses from assets sales and unconsolidated subsidiaries). As such, our definition of cash flow (*CF*) is almost the same as cash flow from operations in the SCF except that *CF* does not include spending on working capital (ΔWC), which is viewed as a use of cash flow in our analysis.

Chart A of Figure 1 shows that from 1988 to 2019, the firms in our sample have collectively generated cash flow amounting to \$35.97 trillion of 2019 constant U.S. dollars. *CCF* accounts for about 87% of *CF* generated by all firms. The corrections for non-cash items and the adjustments for non-recurring/non-operating activities amount to 12.7% and 0.3% of *CF*, respectively. Chart B depicts how the aggregate amount (unadjusted for inflation) of *CF* and its components have evolved over time. *CF* and *CCF* closely resemble each other before 2000 but diverge significantly thereafter, mainly due to the correction for non-cash items (*NCF*). Although *CCF* and *CF* are highly correlated (the correlation coefficient is 0.88) for the entire sample, *CF* is a broader and cleaner measure of cash flow than *CCF*, because *CF* includes more non-recurring items and excludes more noncash and non-operating items.

[Insert Figure 1 here]

For investment, the conventional measure is capital expenditure (*CE*) or net capital expenditure (*NCE*), which captures firms' internal investment in fixed assets (e.g., Kaplan and Zingales, 1997; Lewellen and Lewellen, 2016).[13] In contrast, our measure of investment (*INV*) captures all investing activities reported in the SCF, including net capital expenditure, acquisitions, and other investments.[14]

[13] Net capital expenditure = capital expenditure - sale of property, plant, and equipment. In our sample, sale of property, plant, and equipment is roughly 6.6% of capital expenditure, on average.
[14] Our measure of investment does not include R&D as it is not included in the SCF. Instead, it is reported as an operating expense in the income statement. We discuss this exclusion in greater details in Section V.E.

Acquisitions (*ACQ*) reflect external investment paid by cash and exclude stock-for-stock transactions. Other investments (*OINV*) include long-term financial investments (e.g. debt and equity securities, operating leases, and investment in other firms) and short-term investments in marketable securities.

Chart C of Figure 1 shows that, over our sample period 1988-2019, net capital expenditure accounts for 71% of the aggregate amount of *INV* in 2019 constant U.S. dollars, whereas acquisitions and other investments constitute 26.9% and 2.1%, respectively. Chart D illustrates that the gap between the aggregate amounts of *NCE* and *INV* widens over time. This result suggests that while capital expenditure has been a major component of total investment since 1988, its relative importance in total investment has decreased gradually, and U.S. firms have become increasingly oriented towards external investments (acquisitions) and financial investments. The correlation between *NCE* and *INV* is 0.53 for the whole sample. Taken together, compared to *NCE*, *INV* encompasses a broader range of assets and thus offers a more comprehensive view of a firm's investing activities.

Working capital is an important part of a firm's stock of capital, complementing fixed capital in providing factors of production such as inventory and accounts receivable. Given its liquidity and reversibility, working capital is often adjusted by firms to smooth their investment in fixed capital in response to cash flow shocks (e.g., Fazzari and Petersen, 1993). For example, a firm can absorb a negative shock to its internal cash flow by reducing working capital (e.g., reducing inventory, intensifying efforts to collect accounts receivable, tightening credit policies on new sales, or taking longer to pay its bills). We define ΔWC as the net investment in non-cash non-debt working capital items, which equals the change in inventory (ΔIV) + the change in accounts receivable (ΔAR) – the change in accounts payable and accrued liabilities (ΔAP) - the change in other net payable (ΔOP).[15] A purchase of additional inventory with cash is a cash outflow. A firm can sell its goods and services for cash or on credit, both of which raise our measure of cash flow (*CF*) through elevating net income. However, cash sales increase cash holdings while credit sales increase accounts receivable. Thus, an

[15] Other net payable includes accrued income taxes, other net liabilities, and other financing activities.

increase in accounts receivable can be viewed as a competing use of *CF*, relative to an increase in cash holdings. A cash payment to reduce accounts payable implies that there is a cash outflow. Fazzari and Petersen (1993) also point out that working capital competes with fixed investment for a limited pool of finance.

Finally, *ΔCASH* is the change in cash and cash equivalents. Dividends (*DIV*) refers to cash dividends paid to common and preferred shareholders. For security (i.e., debt and equity) issuance and repurchase activities, we only consider those activities that generate actual cash inflows or outflows. We exclude from our analysis issuance activities that generate no cash flow for the firm, such as granting shares to employees or financing acquisitions with stock (e.g., Fama and French, 2005).

D. Summary Statistics

Table 1 and Figure 2 report descriptive statistics of our sample. All variables in equation (2) are deflated by the beginning-of-period total assets and winsorized at the top and bottom 1% of their distributions.[16] This approach reduces the impact of extreme observations by assigning the cutoff values to those observations whose values are beyond the cutoff points. Untabulated results from robustness tests show that our results are qualitatively the same when we truncate instead of winsorize the distributions.

Panel A of Table 1 shows that, on average, our sample firms every year invest (*INV*) an amount equals to 8.3% of their beginning-of-period assets, increase cash holdings (Δ*CASH*) by 0.5%, increase net working capital (Δ*WC*) by 1.3%, and pay out 0.8% as dividends (*DIV*). To finance these uses of funds, firms make net debt and equity issuances amounting to 1.6% and 2.3% of their beginning-of-period assets (i.e., the net debt and equity reductions are -1.6% and -2.3%), respectively. The gap between the uses of funds and external financing is met by internally generated cash flow (*CF*), which

[16] Our main results are unaffected by the use of the beginning-of-period total capital (i.e., gross PPE) as the scaler. These results are available upon request.

accounts for 7% of the firms' beginning-of-period assets. *DIF* – the difference between the left- and right-hand sides of equation (2) – has mean, median, and standard deviation all lower than 0.001, indicating that the cash flow identity holds well in our sample, albeit not perfectly.

[Insert Table 1 Here]

Panel B presents summary statistics of the three components of *CF*. The mean value of *CF* exceeds that of the convention measure of cash flow (*CCF*) by 0.026. The corrections for non-cash items (*NCF*) account for the vast majority of the difference between *CF* and *CCF*. At the same time, the average value of the adjustments for non-recurring and non-operating activities (*OCF*) is close to zero. Panel C summarizes the components of *INV*. On average, the conventional measures of investment, *CE* and *NCE*, are about 73.5% and 68.7% of *INV*, respectively. The mean value of acquisitions (*ACQ*) accounts for 30.1% of *INV*. Although the mean value of other investment (*OINV*) is approximately zero across firms, the analysis in Section III.B shows that it contributes significantly to the cash-flow sensitivity of investment (i.e., the allocation of cash flow to investment). Panel D presents descriptive statistics of the four components of the change in net working capital (ΔWC). The average value of the change in accounts receivable (ΔAR) is larger than those of other components of ΔWC. The average change in other net payable (ΔOP) is close to zero. Panel E describes the control variables used in our regressions. The statistics of these variables are generally consistent with those of prior studies (e.g., Chang et al., 2014).

Chart A of Figure 2 reports the number of sample firms by year. Following an initial increase in the first decade, the number of firms has declined steadily in the subsequent two decades, mirroring the change in the number of Compustat firms. Charts B-H report the yearly mean and median values of the seven key SCF variables we use in our analyses. Based on both the mean and median values, *CF* and *INV* display the greatest degree of volatility over time, followed by ΔWC and $\Delta Cash$. There are visible dips in *CF*, *INV*, and ΔWC around the dot com crisis in the early 2000s and the great financial crisis in 2008. The mean values of ΔD and ΔE also vary significantly over time, but the median values center around zero. This evidence is consistent with the finding by Frank and Goyal

(2003) that most firms access the debt and equity markets occasionally, resulting in large mean values and close-to-zero median values of ΔD and ΔE. Lastly, *DIV* remains stable over time with a median value of zero.

III. Main results

In this section, we first present our baseline findings on time-series variations in corporate uses of cash flow. We then reconcile our result on investment-cashflow sensitivity with the finding of the disappearing investment-cash flow sensitivity by Chen and Chen (2012). Lastly, we provide a breakdown of the cash flow allocation to the components of investment, the change in net working capital, and the reduction of external finance.

A. Time trends of the allocation of cash flow across various uses

We first show in Table 2 the results obtained by estimating equations (3)-(8), which reveal how firms allocate internal cash flow across six uses over the entire sample period. The estimated coefficients of *CF* reveal that a one-dollar increase in cash flow increases investment by 26.9 cents, raises working capital by 25.1 cents, elevates cash holdings by 19 cents, increases dividends by less than 1 cent, reduces the use of debt by 9.2 cents, and lowers the use of equity by 19 cents. Put differently, in response to a one-dollar increase in cash flow, firms in our sample on average increase the uses of cash by roughly 71.8 cents and reduce reliance on external finance by approximately 28.2 cents. Thus, the coefficients of *CF* add up to unity across the six equations, thereby satisfying the add-up constraint (9). The coefficients of control variables indicate that constraint (10) holds as well. These findings confirm that although we estimate equations (3)-(8) separately, constraints (9) and (10) hold automatically because the dependent variables are linked implicitly through the cash flow identity (equation (2)) which holds well in our data.

[Insert Table 2 here]

More importantly, using equal-height histograms, Figure 3 reports the baseline results on how the cash-flow allocation changes from 1988 to 2019. We obtain the results by demeaning all dependent and independent variables in equations (3)-(8) relative to the firm-specific averages to remove firm fixed effects. We then estimate the equations individually for each year. As such, the yearly coefficient estimates also satisfy the add-up constraints (9) and (10). In 1988, firms on average spend 61 cents out of a one-dollar increase in cash flow making investment and raising working capital. They also add 17 cents to cash reserves, use 21 cents to reduce external finance, and pay out 1 cent as dividends. The allocation of cash flow to investment and cash dividends remains relatively stable over time, but the allocation to the other four uses experience changes of varying degrees. Firms increasingly use cash flow to lower their use of equity, spending almost an additional 30 cents out of a dollar in 2019 compared to 1988. Firms gradually reduce their spending on working capital, with a reduction of 14 cents from 1988 to 2019. Firms also display some tendencies to save more cash out of cash flow and spend less cash flow on reducing their use of debt over time, although these trends are less salient than those for working capital and equity reductions.

[Insert Figure 3 here]

To rigorously detect the time trends, we perform the Augmented Dickey-Fuller (ADF) test on the yearly estimates of cash flow allocation to the six uses of funds. The ADF test takes the following form:

$$\Delta Y_t = \delta_0 + \delta_1 Trend + \delta_2 Y_{t-1} + \delta_3 \Delta Y_{t-1} + \varepsilon_t, \tag{11}$$

where Y represents the yearly estimates of cash flow allocation coefficients ($\alpha^{INV}, \alpha^{\Delta WC}, \alpha^{\Delta CASH}$, $\alpha^{\Delta D}$, $\alpha^{\Delta E}$, or α^{DIV}). The coefficient $\delta_1$captures the linear trend of the allocation of cash flow to a particular use. We choose one lag of ΔY based on the Bayesian Information Criterion (BIC), although our results are robust to including more distant lags (untabulated).The ADF test results reported in Panel A of Table 3 confirm our key observations from Figure 3 and identify two time trends that are significant both statistically and economically.[17] Given a one-dollar increase in cash flow, firms on average spend 0.4 cents less on working capital and use an additional 0.8 cents to reduce equity financing each year over the period from 1988 to 2019. The trend coefficient for cash dividends is 0.0001 albeit

[17] Note that our test of the time trend is not affected by whether or not Y has a unit root.

statistically significant. The trend coefficient for the other three uses are economically small and statistically insignificant.

[Insert Table 3 here]

The estimated yearly allocation coefficients in Figure 3 display significant volatility. To better visualize the time trends, we present allocation over eight consecutive 4-year periods in the rest of the paper. Specifically, we re-estimate the allocation coefficients by running OLS regressions using the demeaned variables and time dummies for the subsample periods of 1988-1991, 1992-1995, 1996-1999, 2000-2003, 2004-2007, 2008-2011, 2012-2015, and 2016-2019. Figure 4 presents the subsample results. It is now apparent that the amount of cash flow firms allocate to working capital declines almost monotonically over the eight sub-periods, from 33 cents (out of a dollar of cash flow) in 1988-1991 to about 16 cents in 2016-2019. On the other hand, firms dramatically increase their spending on net equity reduction, from 9.3 cents out of an additional dollar of cash flow in 1988-1991 to more than 30 cents in 2016-2019. The allocation to the other four uses of funds display little variation across sub-periods. Overall, these results reaffirm the evidence presented in Figure 3.

[Insert Figure 4 here]

B. Allocation of cash flow to investment

In Section III.A, we show that the allocation to investment (investment-cash flow sensitivity) has been largely stable over the period 1988-2019. Chen and Chen (2012), on the other hand, find investment-cash flow sensitivity has declined significantly since 1967 and disappeared by the end of 2006. To reconcile these findings, we investigate the impact of different measures of investment and cash flow on the estimated cash-flow sensitivities. As we have explained in Section II.C, our SCF-based measures of investment (*INV*) and cash flow (*CF*) are more comprehensive than the conventional measures (*NCE* and *CCF*) used by Chen and Chen (2012). We show in Chart A of Figure 5 that the sensitivities estimated using *INV* and *CF* are on average about five times the sensitivities estimated using *NCE* and *CCF*.[18] Using various combinations of conventional and comprehensive measures of investment and cash flow, Figure 5 further reveals that the main cause of the difference in the two sets of sensitivity estimates is the difference in the measures of investment.[19] Compared with the baseline estimation using *NCE* and *CCF,* switching to *CF* while keeping *NCE* only causes a moderate increase of 58% in the average estimated sensitivities, whereas switching to *INV* while keeping *CCF* results in a 171% increase in the average estimated sensitivities. In sum, we show that the estimated allocation to investment is sensitive to the definition of investment and cash flow, and the finding of disappearing sensitivity by Chen and Chen (2012) is specific to the narrow measures of investment and cash flow that they adopted.

[Insert Figure 5 Here]

We have seen earlier in Chart D of Figure 1 that the relative size of various forms of investment has varied over time. Next, we explore how the three components of investment contribute to investment-cash flow sensitivities over time. By virtue of the cash flow identity, decomposing each use of funds into its individual components does not affect the add-up constraints. The estimated allocation to individual components of a use should add up to the overall allocation to that use. In our estimation framework, the allocation to a component of investment can be obtained by regressing that component of investment on cash flow, i.e., replacing *INV* in equation (3) with each component of investment. *INV* is made up of net capital expenditure (*NCE*), acquisitions (*Acq*), and other investment (*OINV*). Thus the regression equations take the following forms:

[18] How investment and cash flow are normalized in the regression analysis also affects the estimated allocation. As we use a comprehensive measure of investment which accounts for more than investment in fixed assets, we choose total assets rather than PPE (used by Chen and Chen, 2012) as the scaling factor in our empirical analyses. However, we are able to replicate the disappearing sensitivity result of Chen and Chen (2012) when using PPE as the scaling factor. The replication result is reported in Figure A5 of the Internet Appendix.

[19] Lewellen and Lewellen (2016) suggest that the disappearing investment-cashflow sensitivity is caused by the increasing gap between *CCF* and *CF*. It is noteworthy that although they also use *SCF* data to define cash flow, our measure of cash flow differs from theirs in that we start our sample from 1988 to ensure all firms consistently report under format code 7, whereas their sample contains firms using different format codes over time. Our sample choice enables us to more precisely estimate the cash flow components. Moreover, we supplement missing *SCF* data with hand-collected data, from 10-K statements that firms file with the Securities and Exchange Commission. This gives us a more complete set of data to begin with.

$$NCE_{it} = \gamma_0 + \gamma_1 CF_{it} + \gamma_2 Y_{it-1} + f_i + y_t + \varepsilon_{it}, \tag{12}$$

$$Acq_{it} = \gamma_0 + \gamma_1 CF_{it} + \gamma_2 Y_{it-1} + f_i + y_t + \varepsilon_{it}, \tag{13}$$

$$OINV_{it} = \gamma_0 + \gamma_1 CF_{it} + \gamma_2 Y_{it-1} + f_i + y_t + \varepsilon_{it} \tag{14}$$

Note that the sum of the estimated coefficients on cash flow from equations (12)-(14) equals the estimated coefficient on cash flow from equation (3). Chart B of Figure 5 reports the estimated allocation to the three components of investment as well as their percentage contribution to the overall allocation to total investment. Two noticeable patterns emerge from the figure. First, *OINV* accounts for the largest proportion of cash flow allocated to total investment, followed by *NCE* and *Acq*. *OINV* primarily consists of financial investments. Although its mean and median values are close to zero, it absorb a large fraction of cash flow shocks, indicating that firms have consistently utilized financial investment to smooth out the impact of volatile cash flow on their investment decisions. This result again highlights the significant impact of the investment measure on the estimation of investment-cash flow sensitivities. Second, the allocation to the three components of investment remains relatively stable over time. ADF test result reported in Panel B of Table 3 confirms that there are no statistically significant time trends in the fractions of cash flow allocated to the three investment components.

In sum, our results in this section show that using the comprehensive measure of investment enhances the informativeness of the cash-flow allocation to investment, and provides a complete picture of the allocation to each component of investment. The cash-flow allocation to investment has neither declined nor disappeared when investment is not restricted to capital expenditure. The investment-cash flow sensitivities estimated using the conventional measure of investment consistently underestimates the allocation of cash flow to total investment. Hence, the disappearing investment-cash flow sensitivity is a result of narrow definitions of investment and cash flow.

C. Allocation of cash flow to working capital

Firms use working capital to smooth the impact of cash-flow shocks on investment. As such, working capital management is an integral part of firms' liquidity management (Fazzari and Petersen, 1993). However, working capital has to be financed at a cost and carrying excessive working capital harms firms' performance (Aktas, Croci, and Petmezas, 2015; Kieschnick, Laplante, and Moussawi, 2013). Our baseline result reported in Figure 4 shows that the allocation of cash flow to the change in working capital has more than halved during our sample period. In this sub-section, we investigate the cause of the declining allocation to working capital by looking at the allocation of cash flow to the main components of working capital. As specified in Equation (15), the change in working capital equals the sum of the change in account receivable (ΔAR) and the change in inventory (ΔIV, minus the change in account payable (ΔAP) and the change in other payable (ΔOP).

$$\Delta WC = \Delta AR + \Delta IV - \Delta AP - \Delta OP. \tag{15}$$

Charts A and B of Figure 6 show that the declining trend in the allocation to the change in working capital ($\alpha^{\Delta WC}$) is mirrored by a similar downward trend in the allocation to the change in accounts receivable and inventory. ADF test results reported in Panel C of Table 3 confirm that these time trends are statistically significant. The allocation to ΔAR out of every additional dollar of cash flow reduces by 0.4 cents each year. The reduction in the allocation to ΔIV is 0.2 cents per year. The allocations to ΔAP decreases by 0.1 cents per year, while the allocation to the other net payable is fairly stable overtime.

[Insert Figure 6 here]

Bates, Kahle, and Stulz (2009) document a significant reduction in inventory and account receivable as a percentage of firms' total assets from the 1980s to the 2000s. Similar findings for inventory and account receivable scaled by sales are reported by Aktas, Croci, and Petmezas (2015). Therefore, the decline in the cash-flow allocation to ΔAR and ΔIV tie in with the general trend in firms' working capital management over time. The decline in inventory is often attributed to the adoption of the just-in-time (JIT) inventory management system, introduced to the U.S. in the early

1980s. Chen, Frank, and Wu (2005) show that by shortening the inventory-holding period, the JIT system significantly improves the efficiency of inventory management and reduces resources held up in inventory. The declining cash-flow allocation to inventory can therefore be explained by firms' decreasing need to finance inventory. Gao (2018) suggest that firms shift resources from inventory to cash reserves following the adoption of JIT. We do not observe an increasing allocation to cash holdings; instead, we find that cash flow is increasing used to reduce firms' reliance on external equity finance.

Recent studies on trade credit indicate that the reduction in cash-flow allocation to account receivable can be attributed to firms' improved efficiency in the management of customers' receivable accounts, their engagement in account receivable financing (such as factoring or reverse factoring), and their improved access to credit in financial markets. For example, Na (2019) finds that the adoption of information technology helps U.S. firms to reduce accounts receivable over the past five decades. Seifert and Seifert (2011) show that some of the U.S. firms using factoring or reverse factoring are able to reduce their accounts receivable and improve efficiency in their working capital management. Choi and Kim (2005) document a negative relation between accounts receivable and credit conditions. In other words, the ease of credit condition in financial markets is associated with a reduction in allocation to accounts receivable in the U.S.

D. Allocation of cash flow to reductions in external financing

Our baseline result reported in Figure 4 shows that firms on average increasingly use cash flow to reduce equity finance. On the other hand, the allocation to net debt reductions displays no salient time trend. To understand whether these patterns are driven more by security issuances or repurchases, we further decompose ΔD to debt retirement (DR) and issuance (DI), and decompose ΔE to equity repurchase (ER) and issuance (EI). Recall that we define net debt reduction as $\Delta D = DR - DI$ and net equity reduction as $\Delta E = ER - EI$. DI and EI are both sources of funds that supplement cash flow, so a negative coefficient for *DI* and *EI* represents, respectively, the increase (reduction) in the issuance of debt and equity due to a reduction (increase) in cash flow.

Figure 7 reports the allocation to components of ΔD and ΔE. It is apparent from Chart F that the increasing allocation to net equity reduction is driven by an increasingly negative coefficient for *EI*, which suggests increasing substitution between cash flow and new equity capital. ADF test result reported in Panel D of Table 3 further confirms that out of every additional dollar of cash flow, firms on average reduces the issuance of equity by 0.7 cents each year. At the same time, firms on average only spend an additional 0.1 cents out of an extra dollar of cash flow each year to repurchase equity. The allocation to components of debt finance show weak or no trend. Taken together, U.S. firms have been increasingly substituting their costly external equity finance with internally generated cash flow. They do so more by varying the amount of equity issuances than repurchases. We do not observe such substitution between debt finance and cash flow.

[Insert Figure 7 here]

IV. Additional analyses

In this section, we extend our main analyses in a number of directions. First, we explore the role macroeconomic conditions play in shaping the time trends in firms' cash flow allocation. Second, we investigate whether time trends differ for firms across different industries. Third, we explore whether the time trends in allocation are caused by changes in sample composition. Fourth, we provide evidence that our key results are robust to alternative regression specifications that account for measurement error and intertemporal cash flow allocations. Fifth, we compare the time trends in cash flow allocation for firms facing different levels of financial constraint. Last, we assess the impact of adjusting cash flow for net working capital and adjusting both cash flow and investment for R&D investment on the estimated time trends.

A. Macroeconomic variables and corporate uses of cash flow

Macroeconomic conditions can affect how firms allocate cash flow to various uses. For example, the size of firms' cash reserves is influenced by the opportunity cost of holding cash (Azar, Kagy, and Schmalz, 2016); firms may have reduced ability to raise external capital during market downturns (Erel et al., 2012); and advancements in technology can help firms more efficiently manage working capital. To investigate if the temporal variations in the cash-flow allocation can be explained by macroeconomic factors, we regress yearly allocation coefficients on a set of concurrent macroeconomic variables. Specifically, we estimate regressions of the following form:

$$\Delta Y_t = \theta + \beta Trend + \phi Y_{t-1} + \mu \Delta Y_{t-1} + \delta \Delta M_t + \varepsilon_t, \tag{16}$$

where Y takes on the value of $\alpha^{INV}, \alpha^{\Delta WC}, \alpha^{\Delta CASH}$, $\alpha^{\Delta D}$, $\alpha^{\Delta E}$ and α^{DIV}, and M is a list of macroeconomic variables. The α coefficients are obtained by estimating equations (3)-(8) each year in a cross-sectional regression. We adopt the same ADF regression format as in Table 3 and use the first difference in the macroeconomic variables to mitigate the issue that many of the variables are highly persistent. We use *Real GDP Growth* to measure general economic conditions. We use *Cost of Carry* defined by Azar, Kagy, and Schmalz (2016) to proxy for the opportunity cost of holding cash. It is the spread between the T-bill rate and the return on the nonfinancial corporate sector's liquid-assets portfolio. We use *Credit Spread* as a gauge for credit market conditions. It is the difference between the 10-year Baa-rated corporate bond yield (by Moody) and the 10-year Treasury bond yield. We include two measures for stock market conditions: *Stock Market Return*, which is the annualized monthly returns on the CRSP value-weighted index of stocks traded on NYSE, NASDAQ, and AMEX, and the cyclically adjusted Price-to-earnings ratio *P/E*. Lastly, we include *RND_Capital* as an indicator of technological development. It is the contribution of Research and Development (RND) capital to the gross value-added output of the U.S. private sectors.

We report in Table 4 that the macroeconomic variables have some explanatory power for the time-series variations in allocation. The Adjusted R-squared of the regressions ranges from 16.8% for the change in net working capital to 54.1% for investment, but only a few coefficients are statistically significant. We find that *Real GDP Growth* is positively correlated with the allocation to cash holdings and negatively correlated with the allocation to net equity reduction. This result is consistent with firms saving more cash out of cash flow during economic expansions due to precautionary motives, and increasing their reliance on equity capital. The *Cost of Carry* does not show statistically significant impact on any of the allocations, although the coefficient for the allocation to cash holdings has the expected negative sign. A wider *Credit Spread* is associated with a larger allocation to net debt reduction due to higher borrowing costs. *Stock Market Return* does not seem to have any significant impact on the estimated allocations. On the other hand, *P/E* is positively correlated with the allocation to net equity reduction and negatively correlated with the allocation to cash holdings. We conjecture that if high stock market valuation reflects rents enjoyed by firms as they grow larger and more mature, then firms would have more free cash flow to pay out and less need to save. This interpretation is consistent with the finding of Lee, Shin, and Stulz (2021) that net equity funding is negatively correlated with Tobin's q for large and old firms. Finally, *RND_Capital* is negatively related to the allocation to investment and positively related to the allocation to net debt reduction. Intuitively, as R&D is not considered part of investment in our definition, the allocation to investment reduces as R&D spending becomes a more significant driving force of economic output. The relation between *RND_Capital* and the allocation to net debt reduction reflects firms' tendency to reduce their reliance on debt financing as R&D becomes more important.

[Insert Table 4 here]

B. Cross-industry analyses

In this sub-section, we investigate whether and how the time trends in cash flow allocation vary across industries. We split firms into industry groups based on: 1) Fama and French 12 industry portfolios and 2) the first digit of the SIC code for Manufacturing versus Nonmanufacturing classifications. Manufacturing firms are further divided into Durable Goods, Nondurables, and High-tech firms. We first estimate yearly allocation across the six uses for each industry group, we then run ADF tests in the form of equation (11) to obtain the time trends. Table 5 reports the time trends for all six uses by industry group.

[Insert Table 5 here]

In general, our core finding of increasing allocation to change in net working capital and decreasing allocation to net equity reduction for the whole sample is upheld across industry groups. Column (2) of Table 5 shows that the time trend for working capital is either both negative and statistically significant or it is statistically insignificant across industry groups. The negative trend is most pronounced for firms in *Consumer NonDurables* and *Wholesale and Retail*. Similarly, column (5) reports that the time trend for net equity reduction is positive if it is statistically significant. *Wholesale and Retail* firms as well as *High-Tech* firms display the strongest increase in the allocation to net equity reduction, indicating that these industries have been more actively using cash flow to reduce their reliance on external equity finance over time.

Unlike in the full sample, firms in certain industries have spent less to reduce their reliance on debt over time and have saved more cash out of cash flow. These are reflected in the negative and statistically significant coefficients in column (4) and the positive and significant coefficients in column (3). We see a divide among industry groups when it comes to the allocation to investment. Column (1) shows that *Consumer Durables*, *Health, High-Tech*, and some *Nonmanufacturing* firms have reduced their allocation to investment, whereas firms in *Consumer NonDurables* and *Telecommunications* have increased their allocation. We conclude that although the allocation to investment in aggregate has remained stable, there are industry trends that have offsetting effects.

C. Sample composition

It is possible that the time trends in the allocation of cash flow we document are driven by changes in sample composition over time. There is an influx of new listings in the 1980s and the 1990s, and the new entrants differ significantly from the incumbent firms (Fama and French, 2004). Graham and Leary (2018) attribute the secular rise in the average cash holdings of U.S. firms in recent decades to the entrants of high-cash firms rather than a change of firms' cash policy over time. To disentangle the time-series change in cash flow allocation from the impact of changes in sample composition, we repeat our baseline regression analysis for incumbent firms and new entrants separately.

We classify firms as incumbents or entrants based on their year of listing. Specifically, we classify firms as incumbents if they were listed before 1988 and as entrants if they were listed after 1988.[20] Figure 8 shows that incumbents and new entrants exhibit similar trends in the allocation across all six uses over our sample period. However, the gap in the estimated allocation to investment between incumbents and entrants widens in the second half of the sample period as illustrated in Chart A of Figure 8. The ADF test results reported in Table 3 Panels E and F confirm that incumbents spend more on investment over time but entrants do the opposite. For every dollar increase in cash flow, incumbents on average increase their allocation to investment by 3 cents every year whereas entrants reduce their allocation by 3 cents. The trend coefficient for the other five uses are generally consistent in both magnitude and statistical significance. We do observe, in Figure 8 Chart E, a more volatile allocation to net equity reduction by entrants compared to incumbents. New entrants are typically small firms that rely more heavily on equity finance than incumbent firms (e.g. Frank and Goyal, 2003), thus the higher volatility could be due to entrants accessing the equity markets more frequently than incumbents do.

[Insert Figure 8 Here]

To further mitigate the concern that the time trends are driven by sample composition, we repeat the baseline analysis using two16-year balanced panels: 1988-2003 and 2004-2019. To be included in a balanced panel, a firm must have nonmissing data every year over the relevant 16-year period. This "Survivors" sample allows us to track the changes in the estimated allocations for the same group of firms over time. The results presented in Figure A1 of the Internet Appendix show similar patterns

[20] Our findings are qualitatively similar if we use alternative classification rules for entrants.

to those documented in Figure 5 for the full sample.[21] Taken together, the evidence presented in this subsection suggests that the time trends in allocation documented in Section III.A are not caused by changes in sample composition.

D. Trend and Cycle components of cash flow

Prior studies (e.g., Erickson and Whited, 2000) point out that cash flow may contain information about firms' future growth prospects due to measurement error in Tobin's q. This may in turn cause researchers to draw erroneous inferences from the cash flow coefficients. As a result, a number of studies (e.g., Whited, 2006; Riddick and Whited, 2009) employ a modified GMM (Generalized Method of Moments) method based on higher-order moments to correct for the measurement errors. Chang et al. (2014), however, show that the GMM estimators do not offer economically meaningful estimates of the cash flow allocation across various uses.[22] As such, they use the approach of Beveridge and Nelson (1981) to decompose cash flow into a trend (permanent) and a cycle (transitory) component. The trend component of cash flow contains information about future cash flow growth, thus is likely to correlate with the error terms when the regression specification does not adequately control for growth opportunities. In contrast, the cycle component of cash flow contains little information about future growth beyond short-term momentum. Therefore, the coefficients of the cycle component can be more meaningfully interpreted as estimates of the use of cash flow.

We use Beveridge and Nelson's decomposition to alleviate the concern that the information content of cash flow affects our inference. We restrict the sample to firms with at least 10 years of cash flow data to ensure that we perform the cash flow decomposition with a reasonably long time series. Our results (untabulated) are qualitatively similar if we require firms to have at least

[21] We note that, the allocation to investment is slightly larger for the survivors than for the unbalanced full sample, and the allocation to net equity repurchase is consistently lower for the survivors compared to the full sample.

[22] Specifically, while the true values of cash flow coefficients in Equations (3)-(8) are unknown to researchers, to the extent that GMM estimators offer consistent estimates for all equations, the cash flow coefficients should add up to unity across four equations. Chang et al. (2014) show that unlike OLS estimates that always satisfy the adding-up constraint, GMM estimates violate the constraint often by large amounts. This finding is consistent with that of Almeida, Campello, and Galvao (2010) who use Monte Carlo simulations and real data to show that fixed effects, error heteroscedasticity, and data skewness cause higher-order GMM estimators to deliver biased coefficients.

consecutive 15 or 20 years of cash flow data. The resulting trend and cycle components of cash flow, deflated by the beginning-of-period book value of assets, are denoted by *CF_Trend* and *CF_Cycle* respectively.

[Insert Figure A2 here]

We then replace *CF* by *CF_Trend* and *CF_Cycle* and estimate Equations (3)-(8) over the eight subsample periods. Figure A2 in the Internet Appendix reports the coefficients of *CF_Cycle* and *CF_Trend*.[23] Our focus is on the coefficients of *CF_Cycle*, which is more likely to be free from the influence of future growth opportunities than *CF_Trend*. These results are qualitatively similar to those reported in Figure 4.

E. Intertemporal cash flow allocation

Thus far we have focused on concurrent allocation of cash flow to various uses. Yet Dasgupta, Noe, and Wang (2011) show that firms stage their response to cash flow shocks. When facing an increase in cash flow, firms add to their cash reserves and reduce external finance rather than increasing investment substantially in the current period. They do so to facilitate future investment by drawing down their cash holdings or raising external capital in subsequent periods. As a result, *INV ΔCASH, ΔD,* and *ΔE* could all be affected by cash flow realized in the past as well as in the current period. To account for the intertemporal allocation of cash flow, we augment equations (3)-(8) by adding two lags of cash flow as additional controls. Table A1 in the Internet Appendix reports the regression results for the entire sample. These results corroborate the findings by Dasgupta, Noe, and Wang (2011). We show that in response to a positive cash flow shock, in addition to drawing down cash reserves and issuing additional debt, firms in subsequent periods also tap into their working capital to facilitate investment. Figure A3 in the Internet Appendix plots the contemporaneous cash flow allocation to the six uses. It indicates that the inclusion of lagged cash flow has no material

[23] Note that for both *CF_Trend* and *CF_Cycle*, the adding-up constraint (9) is satisfied – the sum of the coefficients for each component across the various uses is close to unity.

impact on our baseline results. In a separate test, we add the lagged depended variable in equations (3)-(8) to account for persistence in corporate policies caused by intertemporal adjustment costs. This approach is suggested by Gatchev, Pulvino, and Tarhan (2010) to address concerns of omitted variable bias in cash flow sensitivity regressions. As shown in Figure A4 of the Internet Appendix, the cash flow sensitivities estimated using this augmented regression approach display similar patterns as the ones in our baseline results.

F. Financial constraints and cash flow allocation

Chang et al. (2014) find significant differences between financially constrained and unconstrained firms in how they allocate cash flow. In this sub-section, we examine if cross-sectional differences also exist in the time trends of cash flow allocation. To answer this question, we first divide our sample into unconstrained and constrained firms using the Hadlock and Pierce (*HP*) index (Hadlock and Pierce, 2010).[24] By construction, higher scores of the *HP* index indicate that firms are *more* financially constrained. Each year a firm is classified as more (less) financially constrained if its *HP* index is in the top (bottom) three deciles of the distribution. We then estimate the cash-flow allocation to each use of funds for financially more constrained and less constrained firms separately. We present the results in Figure A6 of the Internet Appendix.

Compared to financially more constrained firms (*Constrained*), financially less constrained firms (*Unconstrained*) on average invest more out of an additional dollar of cash flow. In contrast, the allocations to net equity reduction and net debt retirement are lower for *Unconstrained* firms than for *Constrained* firms. The allocation to change in cash and change in net working capital are similar between the two groups. Despite the cross-sectional differences in allocation between *Unconstrained* and *Constrained* firms, the time trends in allocation displayed in Figure A6 are similar for the two groups of firms.

[24] The *HP* index is defined as $-0.737 \times Ln(Assets) + 0.043 \times Ln(Assets)^2 + 0.04 \times Firm\ Age$. *Firm Age* is the number of years elapsed since a firm enters the CRSP database.

G. An alternative definition of cash flow

Several recent studies on cash flow sensitivities (e.g., Gatchev, Pulvino, and Tarhan, 2010; Chang et al, 2014) define cash flow as the operating cash flows, net of the change in working capital. Bushman, Smith, and Zhang (2011) suggest that the conventional measure of cash flow in the investment-cash flow literature (e.g., Fazzari, Hubbard, and Petersen, 1988) is essentially earnings before depreciation, which contains a true cash component (operating cash flows) and a non-cash component in the form of working capital accruals. Thus, by removing the effect of the change in working capital and focusing on cash flows from operations, we can mitigate the concern that our cash flow sensitivity results are driven by the correlations between the uses of funds (e.g., investment) and working capital accruals.

Figure A7 in the Internet appendix plots the allocation to the five uses of cash flow, where cash flow is defined both as our original measure (*CF*) and as cash flow net of change in working capital (CF-ΔWC). We observe an increasing trend in the allocation to net equity reduction using both cash flow measures, but the trend is more pronounced in the first half of the sample using *CF*. ADF test results, reported in Table A2 of the Internet Appendix, confirm the milder time trend from using the alternative cash flow measure. From Panel B, firms on average allocate an additional 0.3 cents each year out of an additional dollar of CF-ΔWC, this is in comparison to an additional 0.8 cents each year out of an additional dollar of *CF* (reported in Panel A). The statistical significance of the time trend also reduces when using CF-ΔWC. Chart C of Figure A7 seems to show a downward trend in the allocation to net debt reduction when using CF-ΔWC. However, the ADF test result shows that the negative trend is not statistically significant. We also observe in Figure A7 that the allocation to cash holdings from CF-ΔWC is consistently higher than the allocation from *CF*. The allocation to investment and dividends are more or less the same using the two cash flow measures. We therefore conclude that the patterns in cash flow allocation across various uses is largely unaffected by the definition of cash flow in terms of the treatment of net working capital.

H. R&D investment

Our comprehensive investment measure does not include intangible investment. The neoclassical theory of investment focuses primarily on investment in physical assets, although the U.S. economy in the past three decades has transitioned from being more manufacturing-based to more service- or technology-driven.[25] Intangible investment accounts for a non-negligible proportion of total investment of new-economy firms. However, a large proportion of intangible investment, in particular research and development (R&D), are considered operating expenses and excluded from cash flow from investment. Two approaches have been used in recent studies investigating the relation between intangible investment and cash flow. The first approach treats R&D as intangible investment and either adds them to cash flow (e.g., Brown, Martinsson, and Petersen, 2013) or makes no adjustments for them in the cash flow measure (e.g., Baker, Stein, and Wurgler, 2003). The second approach capitalizes R&D expenses into intangible investment using a perpetual inventory method (e.g., Peters and Tylor, 2017).

Our comprehensive investment measure excludes R&D for the following three reasons: First, we cannot capitalize expenses using a perpetual inventory method since it will violate the cash flow identity. Second, a simple way to include R&D expenditures as part of investment is to simultaneously add them to both investment and cash flow. However, this approach will create a mechanical relation between intangible investment and cash flow in our regression analysis, inflating the cash-flow allocation to total investment.[26] Third, around 40% of Compustat firms have missing R&D expenses. Koh and Reeb (2015) show that many firms deliberately choose not to report R&D, or not to report R&D separately from other expenses. They argue that simply replacing missing R&D with zero will lead to biased empirical tests where R&D plays a significant role. In a recent study,

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[25] Buera and Kaboski (2012) show that the US economic growth has been largely driven by high-skilled labor in service sectors, especially after 1980. Begenau and Palazzo (2017) show that the composition of US public companies shifted toward high-tech and R&D–intensive firms over the past 35 years.

[26] In our empirical result, we show that the cash-flow allocation to investment has not disappeared, contrary to the findings of Chen & Chen (2012). Adjusting investment for intangible investment will make our result even stronger than currently reported. Not including R&D in total investment therefore works against us from finding the reported result.

Canace, Jackson, and Ma (2018) suggest that U.S. firms adjust R&D to manage their earnings, and a lot of reported capital expenditures might already include R&D investment that have been capitalized.

If we ignore all issues mentioned above and add R&D to both sides of the cash flow identity, i.e. add R&D expense to both investment and cash flow, we are essentially treating R&D as a use of the augmented cash flow measure. We re-run our baseline regressions using these augmented investment and cash flow measures and plot the allocation to the six uses in Figure A8 of the Internet Appendix. We confirm that our baseline results are largely unaffected by the inclusion of R&D expenditure in the cash flow identity.

V. Conclusion

We study the evolution of cash-flow allocation of U.S. firms over the period 1988 to 2019. We find secular trends in the cash-flow allocation to change in net working capital and net equity reduction. The allocation to net working capital has almost halved over time, while the allocation to the reduction of equity finance has increased from 9 cents to 38 cents per additional dollar of cash flow. These time trends in allocation tie in with the decline in working capital and the rise in stock repurchases of U.S. firms over the same period. We further demonstrate that the conventional measures of investment and cash flow have become less representative of firms' overall investment activities and cash flow availability. Hence, they contribute significantly to the phenomenon of disappearing investment-cash flow sensitivity documented in prior literature. Using comprehensive measures of investment and cash flow based on SCF data, we show that investment remains an important use of cash flow. We further illustrate that variations in allocation over time are associated with measures of macroeconomic conditions, but there are cross-sectional variations across industries. Overall, our findings reveal fundamental changes in the way U.S. firms allocate internally generated cash flow over the past three decades.

An important implication emerges from our analysis: cash flow allocations to various uses of cash flow vary over time in an interdependent nature. Future researchers studying (changes in) firms' investment, financing, or payout decisions can benefit from our findings by taking into account the endogenous nature of these decisions. Although we do not claim causal relations among contemporaneous changes in the cash-flow allocation to various uses, we provide important new insights into how cash flow has been shifted across different uses over time, thereby offering a complete picture of the evolution of cash flow allocation.

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Exhibit 1. Definition of variables in the Statement of Cash Flow

This exhibit details the definition of variables in equation (2) using the SCF data from Compustat. We include in parentheses the Compustat XPF variable names in lowercase italics. *NCF* include deferred taxes (*txdc*), gains in sales of PPE and investments (*sppiv*), exchange rate effect (*exre*) and other funds from operations (*fopo*). *OCF* is the sum of extraordinary items and discontinued operations (*xidoc*) and equity in net loss (*esubc*). Other long-term investments (*OILT*) is the increase in investments (*ivch*) minus the sum of sales of investments (*siv*) and other investing activities (*ivaco*). A positive value of *siv*, *ivaco*, or *ivstch* in the SCF respresents a cash inflow. The change in other net payable (ΔOP) consists of increases in accrued income taxes (*txach*) and other net liabilities (*aoloch*) and other financing activities (*fiao*). A positive value of *recch* and *invch* in the SCF represents a decrease in accounts receivable and inventory.

$$\boxed{\text{cash flow } (CF)} = \boxed{\text{investment } (INV)} + \underbrace{\boxed{\Delta CASH}}_{\substack{\text{the increase or decrese in}\\ \text{cash and cash equivalents}\\ (chech)}} + \boxed{\Delta WC} + \underbrace{\boxed{DIV}}_{\substack{\text{cash dividends}\\ (dv)}} + \underbrace{\boxed{\Delta D}}_{\substack{\text{long-term debt reduction}\\ (dltr)\text{ minus the sum of}\\ \text{long-term debt issuance}\\ (dltis)\text{ and changes in}\\ \text{current debt } (dlcch)}} + \underbrace{\boxed{\Delta E}}_{\substack{\text{purchase of common and preferred}\\ \text{stock } (prstkc)\text{ minus the sum of}\\ \text{sale of common and preferred}\\ \text{stock } (sstk)\text{ and excess tax benefit}\\ \text{of stock options } (txbcof)}}$$

$$\boxed{\text{cash flow } (CF)} = \underbrace{\boxed{\substack{\text{income before}\\ \text{extraordinary items}\\ (ibc)}} + \boxed{\substack{\text{depreciation and}\\ \text{amortization}\\ (dpc)}}}_{\text{Conventional Cash Flow } (CCF)} + \boxed{\substack{\text{adjustments for}\\ \text{non-cash items } (NCF)\\ (txdc + sppiv + exre + fopo)}} + \boxed{\substack{\text{other adjustments}\\ (OCF)\\ (xidoc + esubc)}}$$

$$\boxed{\text{investment } (INV)} = \overbrace{\underbrace{\boxed{\substack{\text{capital}\\ \text{expenditure}\\ (capx)}}}_{\text{conventional investment}} - \boxed{\substack{\text{sale of PPE}\\ (sppe)}}}^{\text{net capital expenditure } (NCE)} + \boxed{\substack{\text{acquisitions } (ACQ)\\ (aqc)}} + \overbrace{\boxed{\substack{\text{other investment}\\ \text{long-term } (OILT)\\ (ivch - siv - ivaco)}} + \boxed{\substack{\text{other investment}\\ \text{short-term } (OIST)\\ (-ivstch)}}}^{\text{other investments } (OINV)}$$

$$\boxed{\substack{\text{change in working capital}\\ (\Delta WC)}} = \boxed{\substack{\text{change in accounts}\\ \text{receivable } (\Delta AR)\\ (-recch)}} + \boxed{\substack{\text{change in inventory } (\Delta IV)\\ (-invch)}} - \boxed{\substack{\text{change in accounts}\\ \text{payable and accrued}\\ \text{liabilities } (\Delta AP)\\ (apalch)}} - \boxed{\substack{\text{change in other net payable}\\ (\Delta OP)\\ (txach + aoloch + fiao)}}$$

Figure 1. The aggregate amounts of cash flow and investment, 1988-2019

The sample includes firm-years jointly covered in Compustat and CRSP for the period 1988 to 2019. Chart A (C) depicts the proportions and amounts of cash flow (investment) components aggregated over the entire sample period. Cash flow (*CF*) is the sum of conventional cash flow (*CCF*), non-cash adjustments (*NCF*), and other cash-flow adjustments (*OCF*). Investment (*INV*) is the sum of net capital expenditure (*NCE*), acquisitions (*ACQ*), and other investments (*OINV*). Charts B and D depict the aggregate annual amounts of cash flow and investment components respectively. All variables are defined in Exhibit 1.

Chart A: Aggregate Cash Flow (*CF*)
In 2019 constant U.S. dollars

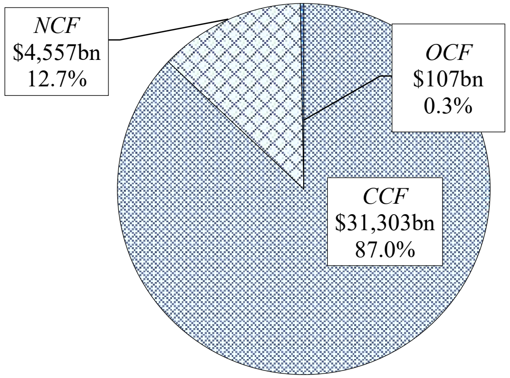

Chart B: Cash Flow (*CF*) By Year
In nominal U.S. dollars

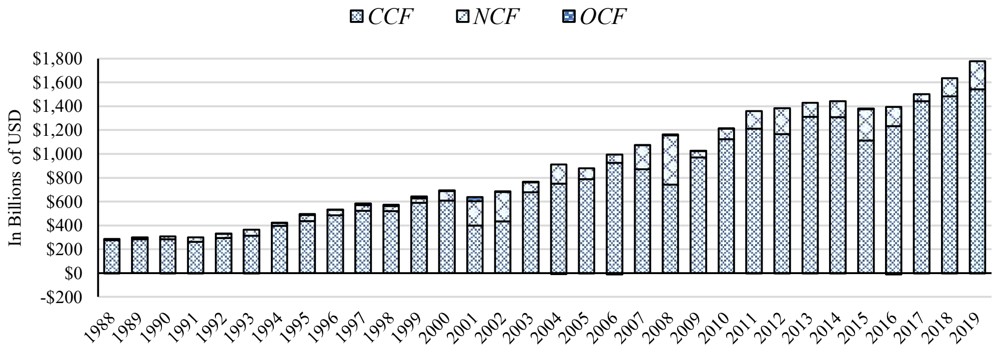

Chart C: Aggregate Investment (*INV*)
In 2019 constant U.S. dollars

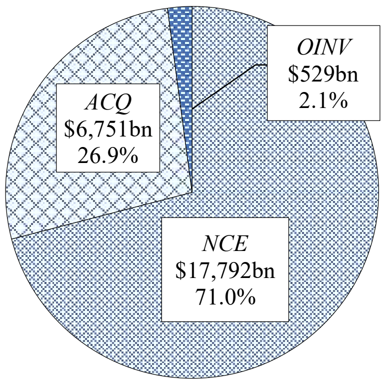

Chart D: Investment (*INV*) By Year
In nominal U.S. dollars

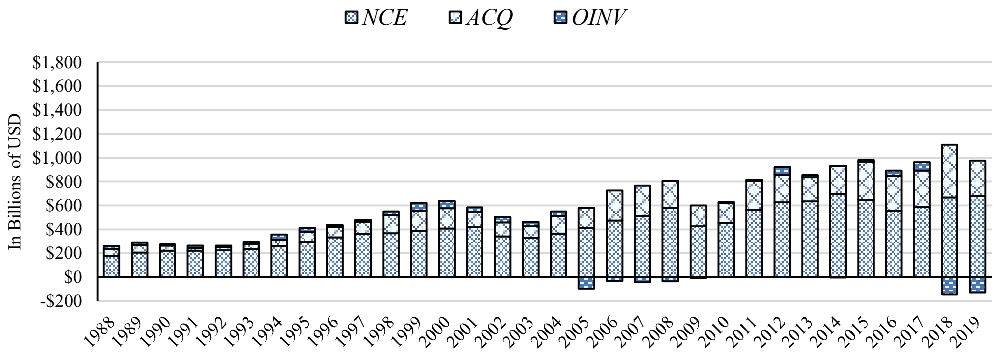

Figure 2. Time trend of Statement of Cash Flow (SCF) variables, 1998-2019

The sample includes firm-years jointly covered in Compustat and CRSP for the period 1988 to 2019. Chart A reports the number of firms by year. Charts B to H depict the mean and median values of the SCF variables, which include cash flow (*CF*), investment (*INV*), the change in working capital (ΔWC), the change in cash holdings ($\Delta CASH$), net debt reduction (ΔD), net equity reduction (ΔE) and cash dividends (*DIV*). The variables are normalized by lagged total assets and variable definitions are provided in Exhibit 1.

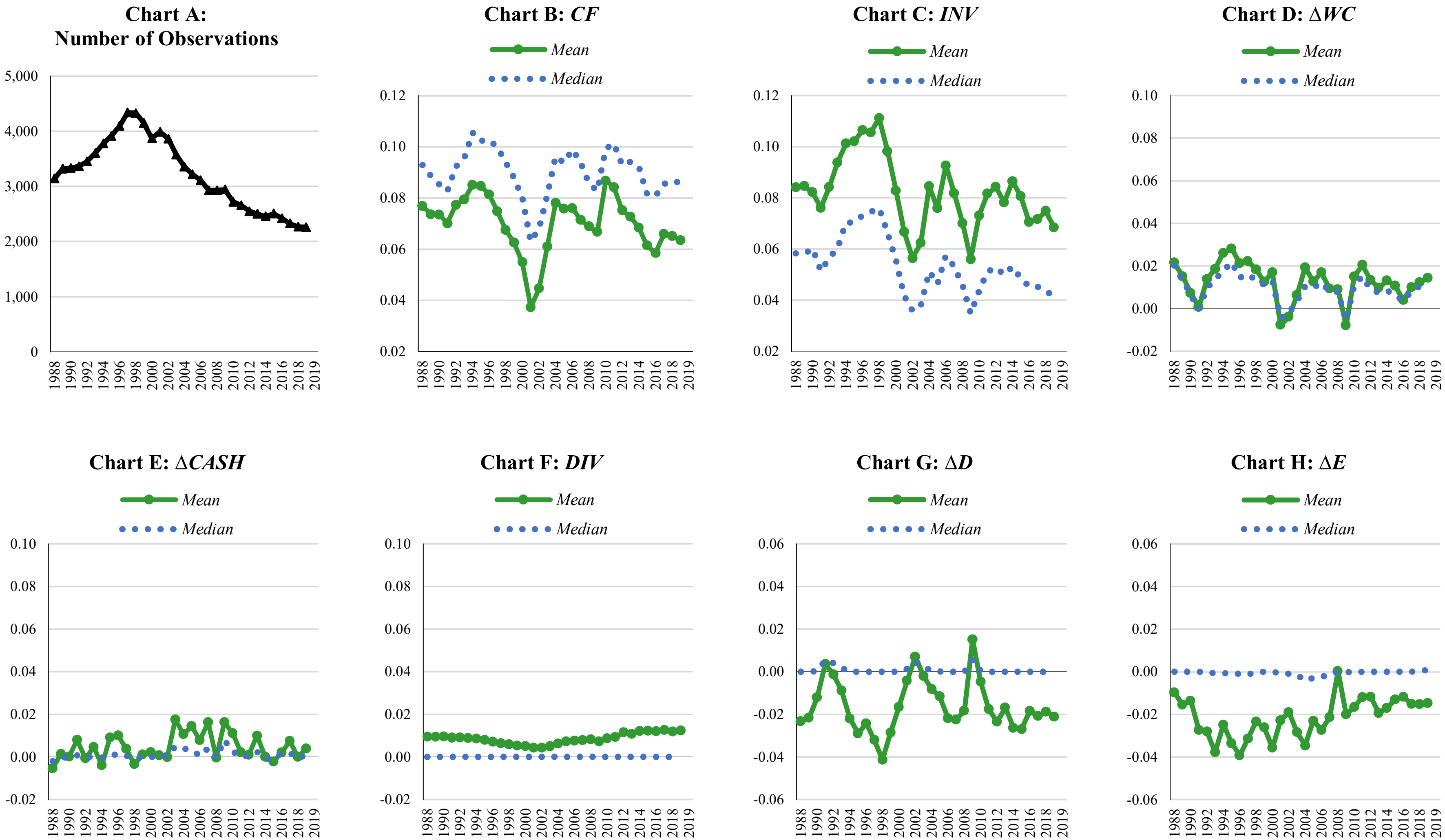

Figure 3. Corporate uses of cash flow, 1988-2019

This figure depicts the annual allocations of cash flow (*CF*) to various uses of funds for the period 1988 to 2019. The rates of allocation are the estimated coefficients on *CF* in equations (3) to (8) i.e., $\alpha^{INV}, \alpha^{\Delta CASH}, \alpha^{\Delta WC}, \alpha^{DIV}, \alpha^{\Delta D}$, and $\alpha^{\Delta E}$, respectively. All variables are demeaned by firm to remove firm fixed effects. Cross-sectional regression is then estimated every year. Uses of funds include investment (*INV*), the change in working capital (*ΔWC*), the change in cash holdings *(ΔCASH*), cash dividends (*Div*), net debt reduction (*ΔD*), and net equity reduction (*ΔE*). The variables are normalized by lagged total assets and variable definitions are provided in Exhibit 1. Control variables are included in the regressions to account for various firm characteristics. They include the market-to-book ratio (*MB*), defined as (total assets + market value of equity - book value of equity) / total assets, the natural log of the book value of assets (*Ln*(*Assets*)), the annual sales growth rate (*SalesG*), which is the change in net sales scaled by lagged net sales, the net property, plant, and equipment-to-assets ratio (*PPE*/*Assets*), and the leverage ratio (*Leverage*) i.e., total debt (sum of short-term and long-term debt) divided by total assets.

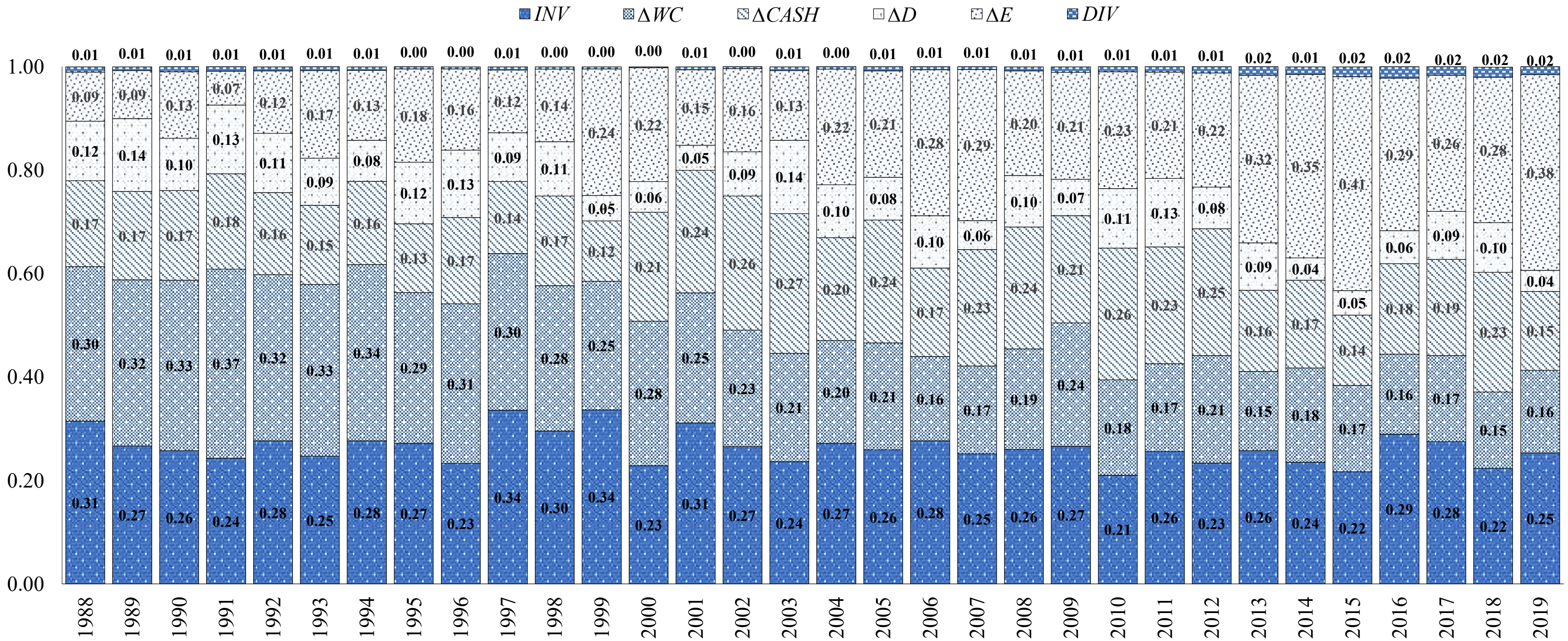

Figure 4. Corporate uses of cash flow by sub-periods

This figure depicts the allocation of cash flow (*CF*) to various uses of funds over eight consecutive sub-periods, 1988-1991, 1992-1995, 1996-1999, 2000-2003, 2004-2007, 2008-2011, 2012-2015, and 2016-2019. The rates of allocation are the estimated coefficients on *CF* in equations (3) to (8) i.e., α^{INV}, $\alpha^{\Delta WC}$, $\alpha^{\Delta CASH}$, $\alpha^{\Delta D}$, $\alpha^{\Delta E}$, and α^{DIV} respectively. All variables are demeaned by firm to remove firm fixed effects. Cross-sectional regressions with year fixed effects are then estimated for each sub-period. The Statement of Cash Flow variables are normalized by lagged total assets and variable definitions are provided in Exhibit 1. Control variables are the same as those defined in Figure 3.

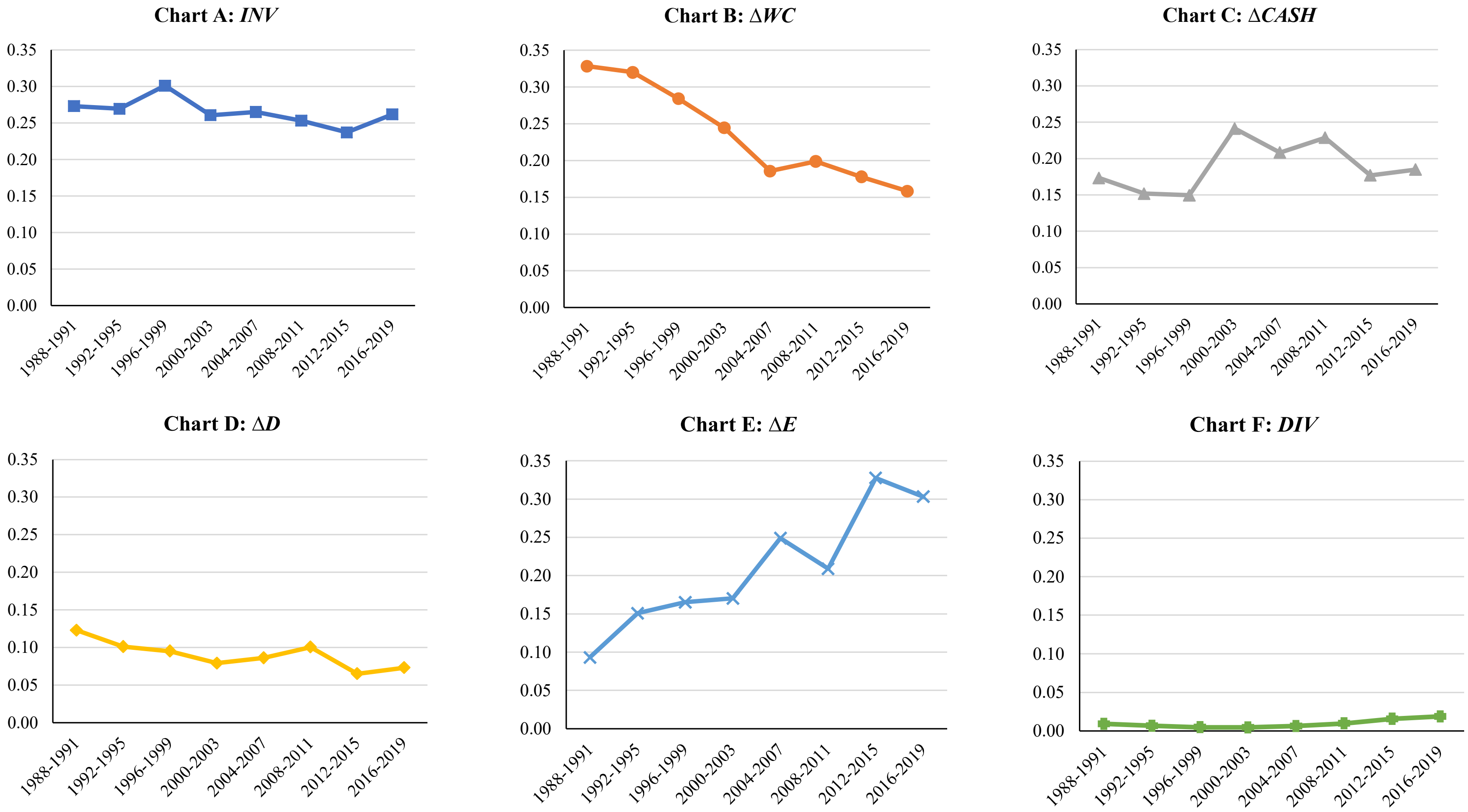

Figure 5. The evolution of investment-cash flow sensitivity: SCF versus conventional measures

Chart A depicts the investment-cash flow sensitivities estimated using alternative measures of investment or cash flow for eight consecutive sub-periods (1988-1991, 1992-1995, 1996-1999, 2000-2003, 2004-2007, 2008-2011, 2012-2015 and 2016-2019). *NCE* is a firm's net capital expenditure whereas *INV* is the Statement of Cash Flow (SCF) measure of investment. *CCF* is the conventional cash flow measure and *CF* is the SCF cash flow measure. Chat B depicts the composition of investment-cash flow sensitivities. *INV* is the sum of net capital expenditure (*NCE*), acquisitions (*ACQ*), and other investments (*OINV*). The variables are normalized by lagged total assets and variable definitions are provided in Exhibit 1. Control variables are the same as those defined in Figure 3.

Chart A

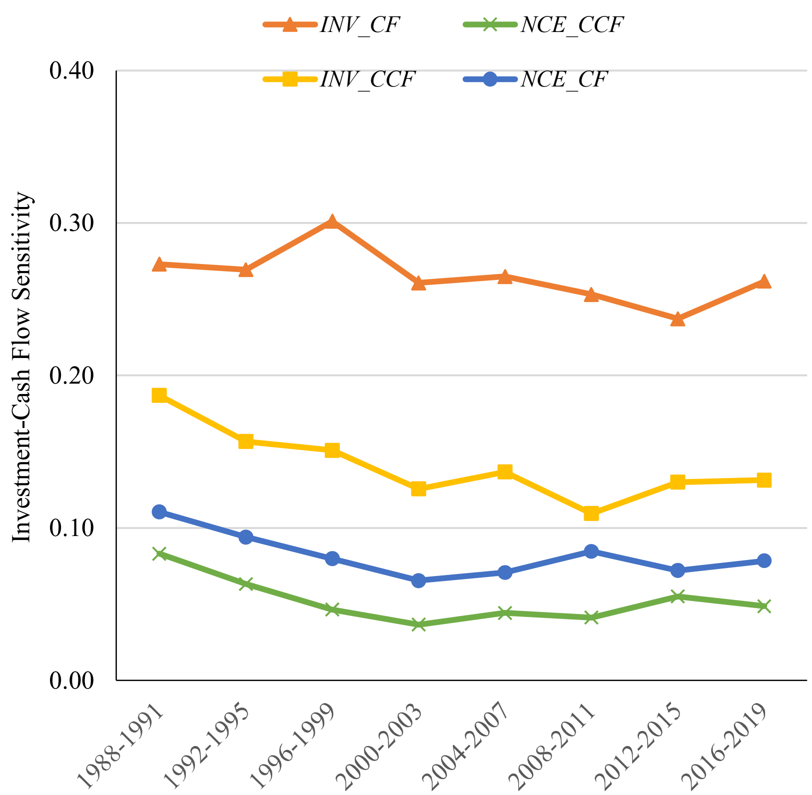

Chart B

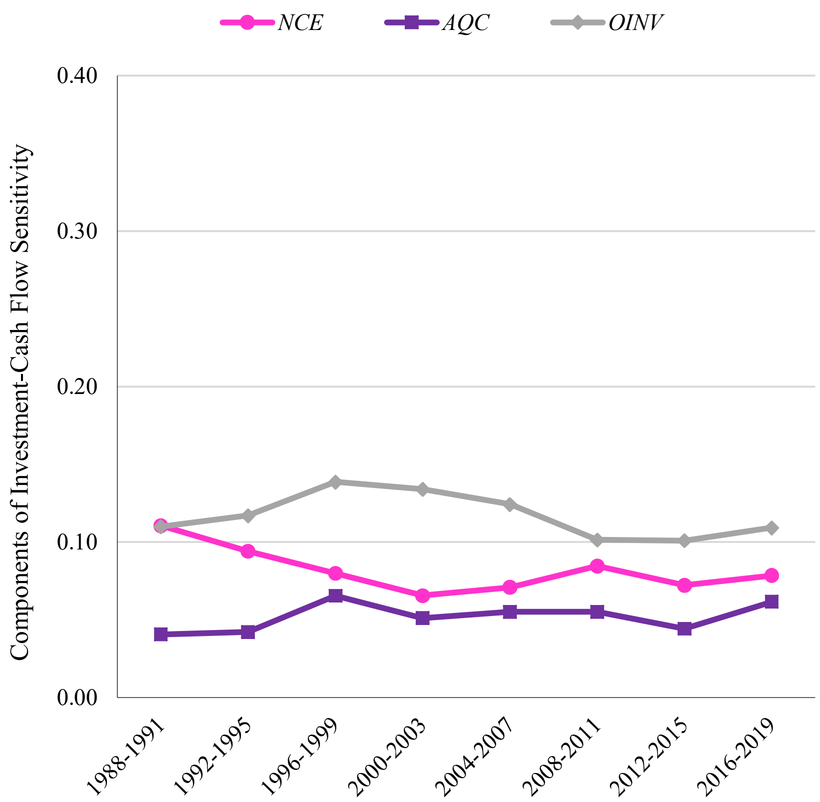

Figure 6. The allocation of cash flow to components of the change in working capital

This figure depicts the allocation of cash flow (*CF*) to various components of the change in working capital (*ΔWC*). The estimated allocation is the regression coefficient on *CF* in equation (4), but with *ΔWC* replaced by its components as defined in equation (15). That is, *ΔWC* is composed of the changes in accounts receivable (*ΔAR*), inventory (*ΔIV*), accounts payable and accrued liabilities (*ΔAP*), and other net payable (*ΔOP*). The variables are normalized by lagged total assets and variable definitions are provided in Exhibit 1. Control variables are the same as those defined in Figure 3.

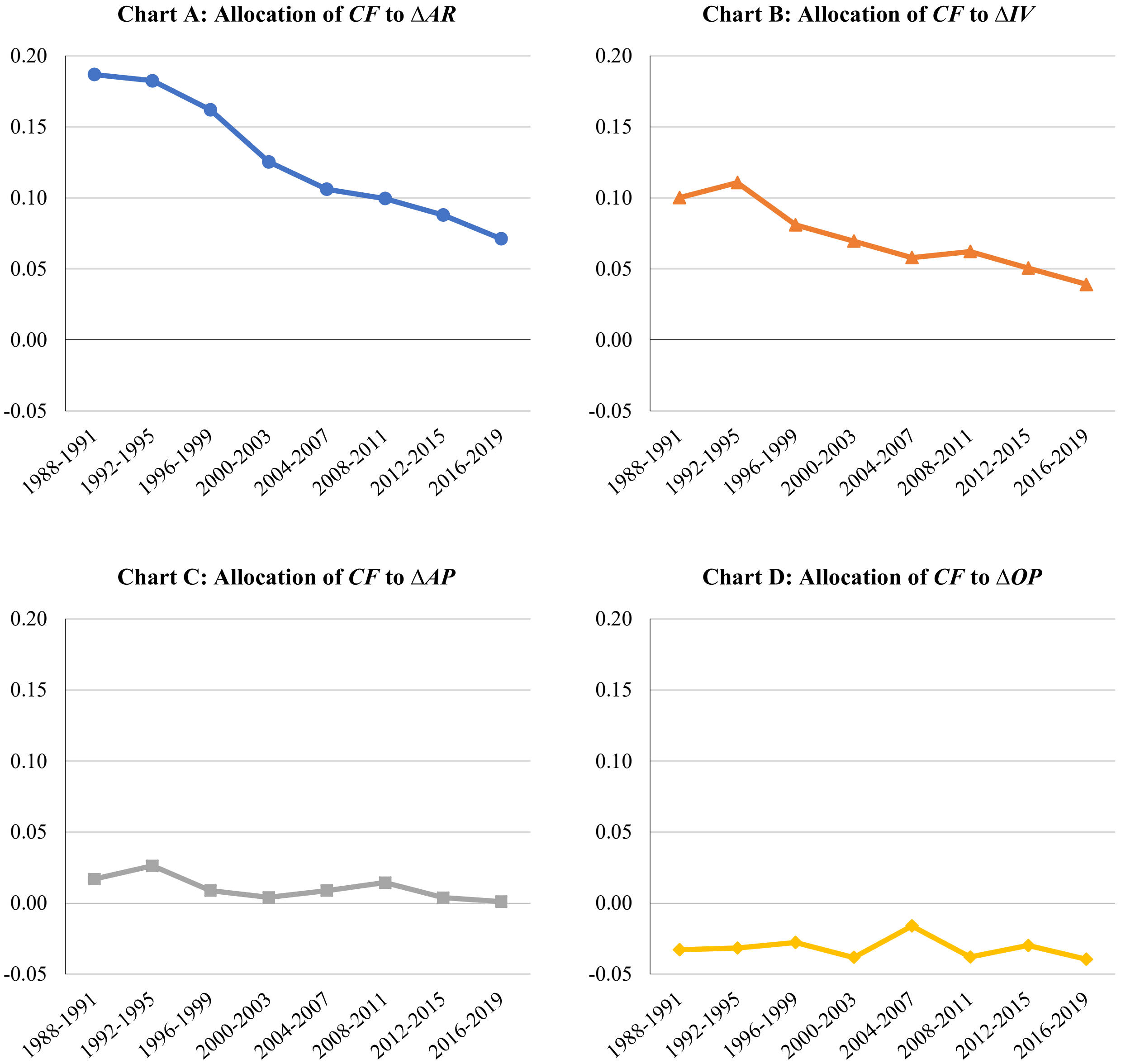

Figure 7. The allocation of cash flow to debt and equity reductions

This figure depicts the allocation of cash flow (*CF*) to net debt and equity reductions for eight consecutive sub-periods, 1988-1991, 1992-1995, 1996-1999, 2000-2003, 2004-2007, 2008-2011, 2012-2015, and 2016-2019. The rates of allocation are the estimated coefficients on *CF* in equations (7) and (8) i.e., $\alpha^{\Delta D}$ and $\alpha^{\Delta E}$ respectively. In addition, we replace *ΔD* and *ΔE with* their components i.e., *DR* (debt repurchase) and *DI* (debt issuance), and *ER* (equity repurchase) and *EI* (equity issuance), respectively, and estimate the allocation of *CF* to these components. All variables are demeaned by firm to remove firm fixed effects. Cross-sectional regressions with year fixed effects are then estimated for each sub-period. The variables are normalized by lagged total assets and variable definitions are provided in Exhibit 1. Control variables are the same as those defined in Figure 3.

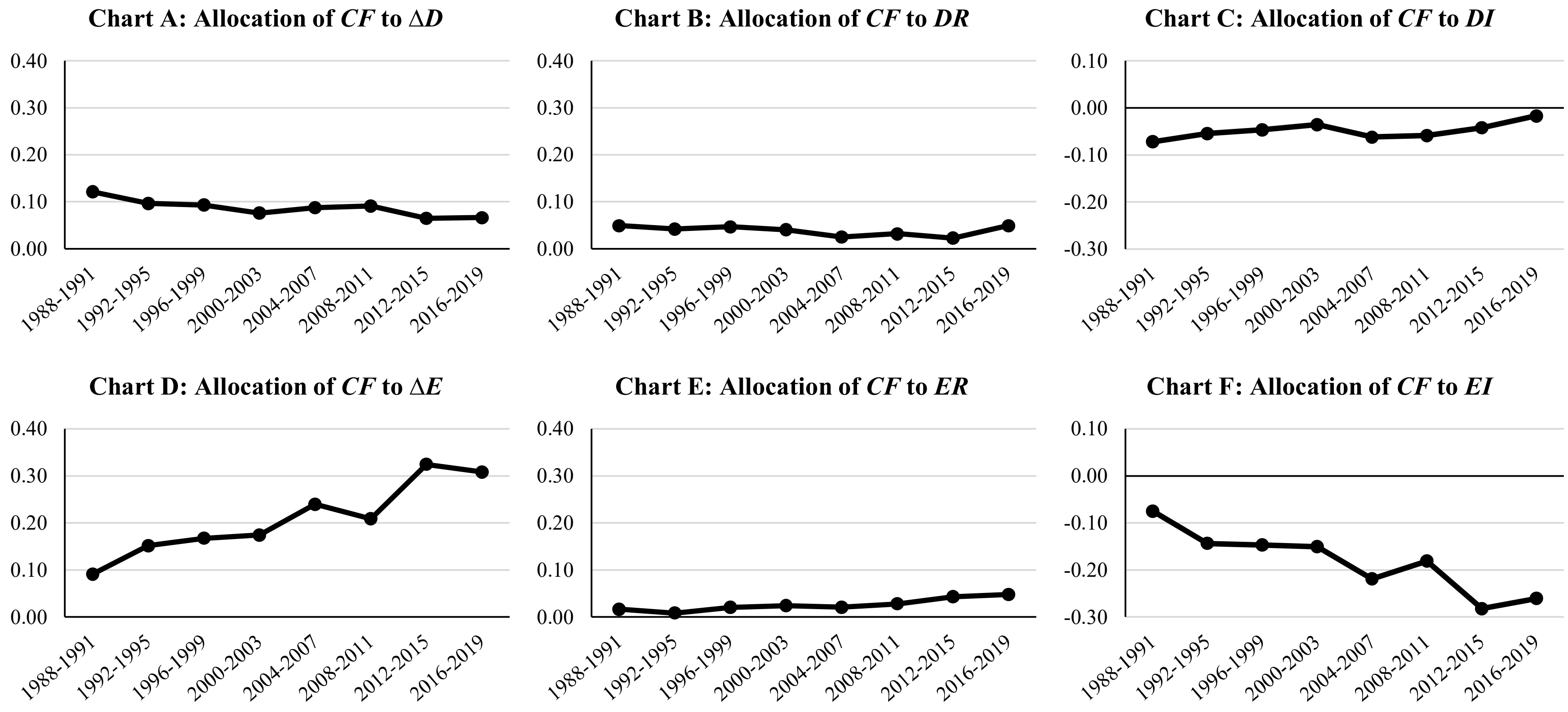

Figure 8. The allocation of cash flow: Incumbents versus entrants

This figure depicts the allocation of cash flow (*CF*) to various uses of funds for incumbent and entrant firms. Incumbents (entrants) refer to firms listed before (in or after) 1988. The rates of allocation are regression coefficients on *CF* in equations (3) to (8) i.e., $\alpha^{INV}, \alpha^{\Delta WC}, \alpha^{\Delta CASH}, \alpha^{\Delta D}$, $\alpha^{\Delta E}$, and α^{DIV} respectively, estimated with eight consecutive panels (1988-1991, 1992-1995, 1996-1999, 2000-2003, 2004-2007, 2008-2011, 2012-2015 and 2016-2019). Uses include investment (*INV*), the change in working capital (*ΔWC*), the change in cash holdings (*ΔCASH*), net debt reduction (*ΔD*), net equity reduction (*ΔE*), and cash dividends (*Div*). The variables are normalized by lagged total assets and variable definitions are provided in Exhibit 1. Control variables are the same as those defined in Figure 3.

Chart A: Allocation of *CF* to *INV*

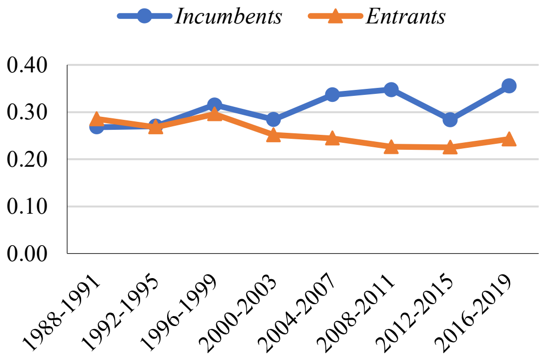

Chart B: Allocation of *CF* to Δ*WC*

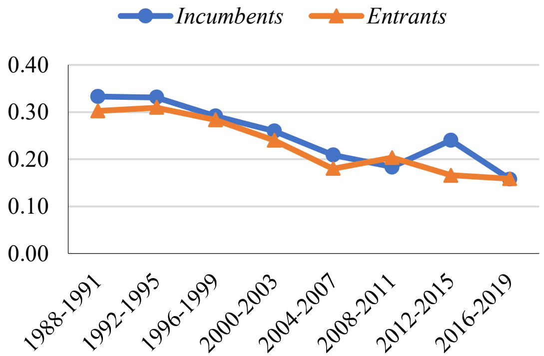

Chart C: Allocation of *CF* to Δ*CASH*

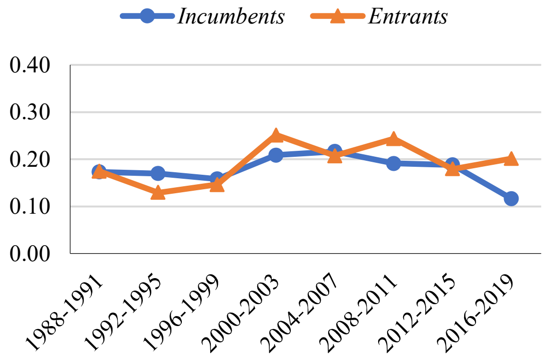

Chart D: Allocation of *CF* to Δ*D*

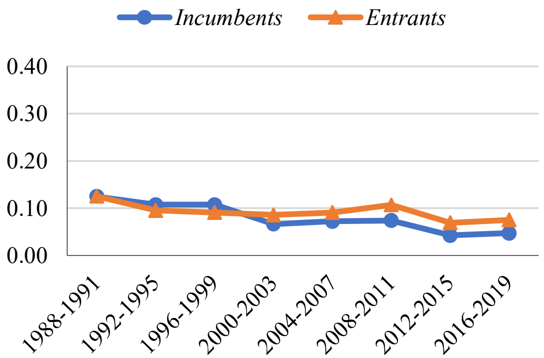

Chart E: Allocation of *CF* to Δ*E*

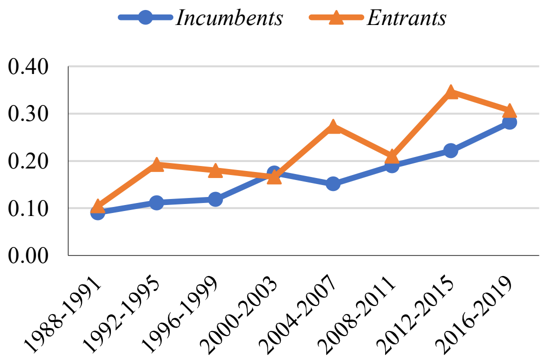

Chart F: Allocation of *CF* to *DIV*

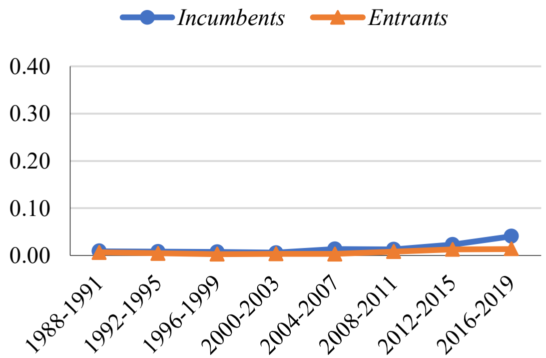

Table 1. Summary statistics, 1988-2019

This table reports summary statistics of the key variables used in the analysis. Panel A summarizes the statistics of the Statement of Cash Flow (SCF) variables that are defined in Exhibit 1. *DIF* is the difference between *CF* and the sum of *INV*, ΔWC, $\Delta CASH$, ΔD, ΔE and *DIV*. Panels B, C, and D present the statistics of the components of *CF*, *INV,* and ΔWC respectively. All key variables are normalized by the beginning-of-period total assets. Panel E describes the characteristics of firms in our sample. *MB* is the market-to-book ratio, defined as (total assets + market value of equity - book value of equity) / total assets. *Ln*(*Assets*) is the natural log of the total book value of assets. *SalesG* is the change in net sales scaled by lagged net sales. *PPE*/*Assets* is net property, plant, and equipment divided by total assets. *Leverage* is total debt (i.e., the sum of short-term and long-term debt) divided by total assets.

Variable	Mean	S.D.	Min.	25th	Median	75th	Max.
Panel A: SCF variables							
INV	0.083	0.137	-0.340	0.015	0.053	0.123	0.940
$\Delta CASH$	0.005	0.093	-0.364	-0.023	0.001	0.029	0.616
ΔWC	0.013	0.080	-0.325	-0.021	0.009	0.045	0.373
DIV	0.008	0.018	0.000	0.000	0.000	0.009	0.136
ΔD	-0.016	0.105	-0.740	-0.031	0.000	0.025	0.260
ΔE	-0.023	0.119	-1.220	-0.009	0.000	0.002	0.206
CF	0.070	0.144	-0.791	0.025	0.090	0.147	0.446
DIF	0.000	0.000	-0.010	0.000	0.000	0.000	0.010
Panel B: Components of *CF*							
CCF	0.044	0.175	-0.986	0.007	0.079	0.135	0.445
NCF	0.026	0.072	-0.185	-0.001	0.010	0.033	0.446
OCF	0.000	0.011	-0.062	0.000	0.000	0.000	0.059
Panel C: Components of *INV*							
CE	0.061	0.073	0.000	0.017	0.037	0.075	0.451
NCE	0.057	0.069	-0.033	0.015	0.035	0.072	0.426
ACQ	0.025	0.076	-0.003	0.000	0.000	0.006	0.579
OINV	0.001	0.084	-0.376	-0.009	0.000	0.008	0.469
Panel D: Components of ΔWC							
ΔAR	0.012	0.057	-0.173	-0.008	0.004	0.027	0.274
ΔIV	0.008	0.044	-0.138	-0.002	0.000	0.015	0.213
ΔAP	0.007	0.043	-0.141	-0.005	0.000	0.017	0.209
ΔOP	0.000	0.051	-0.220	-0.017	-0.001	0.014	0.245
Panel E: Firm characteristics							
MB	1.814	1.255	0.553	1.067	1.409	2.063	7.964
Ln(*Assets*)	5.545	2.164	1.035	3.953	5.495	7.053	10.776
SalesG	0.080	0.242	-0.614	-0.039	0.066	0.189	0.823
PPE/*Assets*	0.272	0.229	0.005	0.091	0.204	0.393	0.899
Leverage	0.232	0.209	0.000	0.039	0.199	0.363	0.846

Table 2. The allocation of cash flow

This table reports the results of panel regressions investigating the allocation of cash flow (*CF*) to various uses for the period 1988 to 2019. The cash-flow allocations are captured by the regression coefficients on *CF* in equations (3)-(8) ($\alpha^{INV}, \alpha^{\Delta WC}, \alpha^{\Delta CASH}, \alpha^{\Delta D}, \alpha^{\Delta E}$, and α^{DIV}). Uses of cash flow include investment (*INV*), the change in working capital (*ΔWC*), the change in cash holdings (*ΔCASH*), net debt reduction (*ΔD*), net equity reduction (*ΔE*) and cash dividends (*Div*). The variables are defined in Exhibit 1. Control variables include the market-to-book ratio (*MB*), the natural log of the book value of assets (*Ln*(*Assets*)), the annual sales growth rate (*SalesG*), the net property, plant, and equipment-to-assets ratio (*PPE*/*Assets*), and the leverage ratio (*Leverage*). Firm and year fixed effects are included, and the standard errors are clustered at the firm level. Coefficients significant at the 10%, 5%, and 1% levels are indicated by *, **, and ***, respectively. The *t*-statistics are presented in parentheses.

Dependent Variables	(1) INV_t	(2) ΔWC_t	(3) $\Delta Cash_t$	(4) ΔD_t	(5) ΔE_t	(6) DIV_t
CF_t	0.269***	0.251***	0.190***	0.092***	0.190***	0.008***
	(50.3)	(65.3)	(37.6)	(19.8)	(28.5)	(20.8)
MB_{t-1}	0.019***	0.003***	0.002***	-0.007***	-0.018***	0.001***
	(31.1)	(9.5)	(4.7)	(-16.6)	(-27.4)	(21.2)
$SalesG_{t-1}$	0.016***	0.006***	-0.001	-0.010***	-0.010***	-0.001***
	(13.2)	(8.0)	(-1.1)	(-10.7)	(-7.3)	(-13.9)
$Ln(Assets)_{t-1}$	-0.014***	-0.007***	-0.012***	0.005***	0.027***	0.001***
	(-17.2)	(-14.1)	(-18.3)	(7.6)	(35.8)	(11.7)
$Leverage_{t-1}$	-0.113***	-0.020***	0.027***	0.168***	-0.054***	-0.009***
	(-31.3)	(-9.1)	(10.3)	(48.4)	(-17.3)	(-26.4)
$PPE/Assets_{t-1}$	0.024***	-0.009***	0.086***	-0.064***	-0.036***	-0.000
	(4.2)	(-2.8)	(20.9)	(-13.3)	(-7.7)	(-1.0)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	103,246	103,246	103,246	103,246	103,246	103,246
Adjusted R-squared	0.28	0.23	0.09	0.13	0.36	0.64

Table 3. Time trends of the cash-flow allocations

This table reports the estimated time trends in the allocations of cash flow to the six uses. The time trends are estimated using the Augmented Dickey-Fuller (ADF) model specified in equation (11). The dependent variable in each column is ΔY_t and the independent variables include a time trend variable (*Trend*), Y_{t-1} and ΔY_{t-1}. In Panel A, Y stands for estimated coefficients on *CF* in equations (3)-(8) ($\alpha^{INV}, \alpha^{\Delta WC}, \alpha^{\Delta CASH}$, $\alpha^{\Delta D}$, $\alpha^{\Delta E}$ and α^{DIV}). In Panel B, Y stands for estimated allocations of cash flow to the components of investment (*INV*) in equations (11)-(14) ($\alpha^{NCE}, \alpha^{ACQ}, \alpha^{OINV}$, α^{OILT}, and α^{OIS}). In Panel C, Y stands for estimated allocations of cash flow to the components of the change in working capital (*ΔWC*) in equation (15) ($\alpha^{\Delta AR}, \alpha^{\Delta IV}, \alpha^{\Delta AP}$, and $\alpha^{\Delta OP}$). In Panel D, Y stands for estimated allocations of cash flow to equity reduction (*ER*), equity issuance (*EI*), debt reduction (*ER*), and debt issuance (*DI*) ($\alpha^{ER}, \alpha^{EI}, \alpha^{DR}$ and α^{DI}). Panels E and F report the results for the sample of incumbents and the sample of new entrants respectively. Incumbents (entrants) refer to firms listed before (in or after) 1988. ADF unit root test statistics are reported in each panel and MacKinnon approximate *p*-values are based on the interpolated critical values from the table of values in Fuller (1996). *t*-statistics are reported in parentheses. Statistical significance at the 1%, 5%, or 10% level is marked by ***, **, and *, respectively.

Panel A. The whole sample

Dependent Variables	(1) $\Delta\alpha^{INV}$	(2) $\Delta\alpha^{\Delta WC}$	(3) $\Delta\alpha^{\Delta CASH}$	(4) $\Delta\alpha^{\Delta D}$	(5) $\Delta\alpha^{\Delta E}$	(6) $\Delta\alpha^{DIV}$
Trend	-0.001	-0.004**	0.0002	-0.001	0.008***	0.0001**
	(-1.47)	(-2.44)	(0.24)	(-1.68)	(3.91)	(2.09)
Lagged α	-1.028***	-0.564**	-0.369*	-0.875***	-0.967***	-0.187
	(-3.47)	(-2.58)	(-1.80)	(-3.58)	(-4.32)	(-1.54)
Lagged Δα	-0.118	-0.135	-0.367*	0.096	0.361*	-0.468**
	(-0.62)	(-0.72)	(-1.87)	(0.48)	(1.88)	(-2.63)
ADF test statistics	-3.47	-2.58	-1.80	-3.58	-4.32	-1.54
MacKinnon approximate *p*-value	0.043	0.291	0.703	0.031	0.003	0.814
Observations	30	30	30	30	30	30
Adjusted *R*-squared	0.543	0.252	0.284	0.339	0.362	0.263

Panel B. Allocation of cash flow to the three components of investment

Dependent Variables	(1) $\Delta\alpha^{NCE}$	(2) $\Delta\alpha^{ACQ}$	(3) $\Delta\alpha^{OINV}$
Trend	-0.0003	0.0003	-0.001
	(-0.88)	(0.90)	(-1.28)
Lagged α	-0.641***	-1.234***	-0.891***
	(-3.18)	(-4.60)	(-3.50)
Lagged Δα	-0.264	0.266	0.037
	(-1.62)	(1.38)	(0.20)
ADF test statistics	-3.18	-4.60	-3.50
MacKinnon approximate *p*-value	0.088	0.001	0.039
Observations	30	30	30
Adjusted *R*-squared	0.417	0.459	0.372

Panel C. Allocation to the components of change in working capital

Dependent Variables	(1) $\Delta\,\alpha^{\Delta AR}$	(2) $\Delta\,\alpha^{\Delta IV}$	(3) $\Delta\alpha^{\Delta AP}$	(4) $\Delta\alpha^{\Delta OP}$
Trend	-0.004***	-0.002***	-0.001**	-0.0001
	(-3.11)	(-2.89)	(-2.41)	(-0.23)
Lagged α	-0.810***	-0.745***	-1.425***	-1.024***
	(-3.34)	(-3.03)	(-5.15)	(-3.65)
Lagged Δα	0.098	-0.089	0.354**	0.004
	(0.48)	(-0.46)	(2.41)	(0.0)
ADF test statistics	-3.34	-3.03	-5.15	-3.65
MacKinnon approximate *p*-value	0.061	0.123	0.000	0.026
Observations	30	30	30	30
Adjusted *R*-squared	0.279	0.345	0.517	0.467

Panel D. Allocation to the components of change in equity and debt issuance

Dependent Variables	(1) $\Delta\,\alpha^{ER}$	(2) $\Delta\,\alpha^{EI}$	(3) $\Delta\,\alpha^{DR}$	(4) $\Delta\,\alpha^{DI}$
Trend	0.001***	0.007***	-0.001*	0.0003
	(2.91)	(3.66)	(-1.70)	(0.37)
Lagged α	-0.610***	-1.020***	-0.703***	-0.655***
	(-2.77)	(-4.31)	(-2.81)	(-2.70)
Lagged Δα	-0.134	0.316	-0.147	-0.190
	(-0.65)	(1.61)	(-0.77)	(-0.97)
ADF test statistics	-2.77	-4.31	-2.81	-2.70
MacKinnon approximate *p*-value	0.210	0.003	0.193	0.237
Observations	30	30	30	30
Adjusted *R*-squared	0.309	0.376	0.369	0.353

Panel E. The incumbents

Dependent Variables	(1) $\Delta\alpha^{INV}$	(2) $\Delta\,\alpha^{\Delta WC}$	(3) $\Delta\,\alpha^{\Delta CASH}$	(4) $\Delta\alpha^{\Delta D}$	(5) $\Delta\alpha^{\Delta E}$	(6) $\Delta\alpha^{DIV}$
Trend	0.003*	-0.004**	-0.001	-0.003**	0.007***	0.0004**
	(1.97)	(-2.78)	(-0.94)	(-2.28)	(3.08)	(1.78)
Lagged α	-1.039***	-0.631***	-0.425	-1.026***	-1.093***	-0.163
	(-4.05)	(-3.06)	(-1.65)	(-3.86)	(-3.46)	(-0.84)
Lagged Δα	0.183	0.072	-0.516**	0.146	0.044	-0.123
	(0.94)	(0.38)	(-2.64)	(0.74)	(0.21)	(-0.54)
ADF test statistics	-4.05	-3.06	-1.65	-3.86	-3.46	-0.84
MacKinnon approximate *p*-value	0.007	0.117	0.771	0.014	0.044	0.963
Observations	30	30	30	30	30	30
Adjusted *R*-squared	0.395	0.223	0.464	0.391	0.442	0.0397

Panel F. The entrants

Dependent Variables	(1) $\Delta\alpha^{INV}$	(2) $\Delta\,\alpha^{\Delta WC}$	(3) $\Delta\,\alpha^{\Delta CASH}$	(4) $\Delta\alpha^{\Delta D}$	(5) $\Delta\alpha^{\Delta E}$	(6) $\Delta\alpha^{DIV}$
Trend	-0.003**	-0.004***	0.001	-0.001**	0.006**	0.0002***
	(-2.63)	(-2.83)	(0.97)	(-2.12)	(2.63)	(2.58)
Lagged α	-1.196***	-0.598***	-0.534**	-1.375***	-0.792***	-0.406***
	(-3.96)	(-2.97)	(-2.42)	(-7.00)	(-3.71)	(-2.92)
Lagged Δα	-0.008	-0.108	-0.183	0.206**	0.099	-0.149
	(-0.04)	(-0.69)	(-1.01)	(2.67)	(0.53)	(-1.26)
ADF test statistics	-3.96	-2.97	-2.42	-7.00	-3.71	-2.92
MacKinnon approximate *p*-value	0.010	0.141	0.238	0.000	0.022	0.156
Observations	30	30	30	30	30	30
Adjusted *R*-squared	0.574	0.262	0.289	0.616	0.320	0.187

Table 4: Cash flow allocation and macroeconomic conditions

This table examines the link between the yearly cash flow allocation and concurrent macroeconomic conditions. The dependent variable in each column is the rate of change in the cash flow allocation to a particular use, i.e., $\alpha^{INV}, \alpha^{\Delta WC}, \alpha^{\Delta CASH}, \alpha^{\Delta D}$, $\alpha^{\Delta E}$ and α^{DIV}, respectively in equations (3)-(8), estimated annually for the period 1988 to 2018. The independent variables include a time trend variable (*Trend*), the lagged (and lagged change in) cash flow allocation to that particular use, and a set of variables capturing macroeconomic or capital market conditions each year. *Real GDP Growth* is the percentage increase in real GDP in 2005 dollars. *Cost of Carry* is calculated following Azar et al. (2016). *Credit Spread* is the difference between the December 10-year Baa Moody's rated corporate bonds yield and the annualized yield of 10-year Treasury Bond. *Stock Market Return* is the annualized monthly returns on the CRSP value-weighted index of stocks traded on NYSE, NASDAQ, and AMEX. *RND_Capital* is the share of Research and Development (RND) capital contribution to gross value-added output of the U.S. private sectors (constructed from the US BEA/BLS Integrated Industry-level Production Account). Standard errors are Newey-West, using the automatic bandwidth selection procedure of Newey and West (1994). Statistical significance at the 1%, 5%, or 10% level is marked by ***, **, and *, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	$\Delta\alpha^{INV}$	$\Delta\alpha^{\Delta WC}$	$\Delta\alpha^{\Delta CASH}$	$\Delta\alpha^{\Delta D}$	$\Delta\alpha^{\Delta E}$	$\Delta\alpha^{DIV}$
Trend	-0.001	-0.004*	0.0003	-0.001*	0.007***	0.0001**
	(-1.47)	(-1.89)	(0.35)	(-1.76)	(3.11)	(2.21)
Lagged α	-0.911**	-0.567**	-0.478**	-0.812***	-0.842***	-0.129
	(-2.28)	(-2.10)	(-2.72)	(-3.64)	(-2.87)	(-0.74)
Lagged Δα	-0.131	-0.048	-0.407**	0.156	0.302	-0.553***
	(-0.47)	(-0.21)	(-2.15)	(0.72)	(1.71)	(-4.24)
Δ Real GDP Growth	-0.263	0.499	0.787*	0.404	-1.575**	-0.010
	(-0.69)	(1.09)	(1.77)	(1.10)	(-2.42)	(-0.32)
Δ Cost of carry	0.022	0.009	-0.010	0.001	-0.020	-0.001
	(1.01)	(0.33)	(-0.43)	(0.04)	(-0.66)	(-0.74)
Δ Credit Spread	-0.283	0.101	1.096	1.881**	-1.742	-0.089
	(-0.29)	(0.12)	(1.56)	(2.42)	(-1.36)	(-1.12)
Δ Stock Market Return	0.025	-0.004	-0.033	0.038	0.012	-0.000
	(0.82)	(-0.16)	(-0.88)	(1.36)	(0.26)	(-0.17)
Δ P/E	0.000	-0.001	-0.006***	0.001	0.005**	-0.000
	(0.09)	(-0.68)	(-3.63)	(1.05)	(2.11)	(-1.26)
Δ RND_Capital	-12.207*	-5.580	5.725	11.110**	2.685	-0.231
	(-1.96)	(-1.17)	(0.88)	(2.62)	(0.30)	(-0.63)
Observations	30	30	30	30	30	30
Adjusted *R*-squared	0.541	0.168	0.504	0.502	0.424	0.202

Table 5. Time trends of cash-flow allocations to all uses: Cross-industry analysis

This table reports the estimated time trends in the allocations of cash flow in different industries. The time trends are estimated using the Augmented Dickey-Fuller (ADF) model specified in equation (11). The dependent variable in each column is ΔY_t and the independent variables include a time trend variable (*Trend*), Y_{t-1} and ΔY_{t-1}. Y stands for coefficient estimates from equations (3)-(8) ($\alpha^{INV}, \alpha^{\Delta WC}, \alpha^{\Delta CASH}$, $\alpha^{\Delta D}$, $\alpha^{\Delta E}$, and α^{DIV}). Uses of cash flow include investment (*INV*), the change in working capital (*ΔWC*), the change in cash holdings (*ΔCASH*), net debt reduction (*ΔD*), net equity reduction (*ΔE*), and cash dividends (*Div*). Statistical significance at the 1%, 5%, or 10% level is marked by ***, **, and *, respectively.

Dependent Variables	(1) $\Delta\alpha^{INV}$	(2) $\Delta\,\alpha^{\Delta WC}$	(3) $\Delta\,\alpha^{\Delta CASH}$	(4) $\Delta\alpha^{\Delta D}$	(5) $\Delta\alpha^{\Delta E}$	(6) $\Delta\alpha^{DIV}$
Trend in Fama and French 12 Industries						
Consumer NonDurables	0.006**	-0.012***	-0.000	-0.007***	0.002	0.001**
	(2.32)	(-4.76)	(-0.12)	(-2.81)	(0.54)	(2.72)
Consumer Durables	-0.016***	-0.004	0.003	0.004	0.003	0.000
	(-3.29)	(-0.95)	(1.25)	(1.00)	(0.78)	(1.14)
Manufacturing	0.006	-0.006***	0.002	-0.006**	0.005*	0.001
	(1.46)	(-3.26)	(1.47)	(-2.29)	(1.80)	(1.54)
Energy	0.003	-0.001	0.004*	-0.007*	0.002	0.000
	(0.61)	(-0.23)	(1.76)	(-2.01)	(0.62)	(1.28)
Chemicals	0.002	-0.000	0.010***	-0.002	-0.006	0.000
	(0.36)	(-0.09)	(3.17)	(-0.45)	(-1.52)	(1.05)
Business Equipment	-0.002	-0.005**	0.003**	0.001	0.006***	0.000
	(-1.53)	(-2.53)	(2.23)	(1.34)	(6.13)	(1.69)
Telecommunications	0.008**	-0.009**	0.007*	-0.004	-0.003	0.001*
	(2.14)	(-2.43)	(2.01)	(-0.99)	(-0.73)	(1.76)
Wholesale and Retail	-0.002	-0.011**	0.003**	-0.003	0.011**	0.000**
	(-0.61)	(-2.52)	(2.17)	(-1.47)	(2.54)	(2.25)
Health	-0.005**	-0.004**	-0.002	0.002	0.013*	-0.000
	(-2.10)	(-2.12)	(-0.91)	(0.81)	(2.02)	(-1.67)
Others	-0.004**	-0.005***	0.000	-0.000	0.005*	0.000*
	(-2.10)	(-3.94)	(0.10)	(-0.15)	(1.91)	(1.95)
Trend in Industry Groups						
Manufacturing						
Durable Goods	0.003	-0.007***	0.005***	-0.005**	0.004	0.001*
	(1.41)	(-3.02)	(3.07)	(-2.28)	(1.68)	(1.99)
Nondurables	0.002	-0.007**	-0.000	-0.000	0.002	0.001**
	(0.86)	(-2.11)	(-0.14)	(-0.24)	(0.83)	(2.61)
High-Tech	-0.004***	-0.003*	-0.001	0.001	0.013***	0.000
	(-3.46)	(-1.93)	(-0.69)	(0.78)	(3.45)	(1.18)
Nonmanufacturing						
	-0.003***	-0.006***	0.001	-0.001	0.005**	0.000*
	(-3.16)	(-4.85)	(1.11)	(-1.10)	(2.51)	(2.00)

Internet Appendix

Figure A1. The allocation of cash flow: Balanced panels

This figure depicts, for a subsample of our sample firms, the annual allocations of cash flow (*CF*) to various uses of funds for the period 1988 to 2019. The rates of allocation are the estimated coefficients on *CF* in equations (3) to (8) i.e., $\alpha^{INV}, \alpha^{\Delta CASH}, \alpha^{\Delta WC}, \alpha^{DIV}, \alpha^{\Delta D}$, and $\alpha^{\Delta E}$ respectively. The subsample consists of two 16-year balanced panels where Panel 1 covers the period 1988-2003 and Panel 2 covers the period 2004-2019. To be included in a balanced panel, a firm must have nonmissing data every year over the relevant 16-year period. All variables are demeaned by firm to remove firm fixed effects. Cross-sectional regressions are then estimated every year. Uses of funds include investment (*INV*), the change in working capital (*ΔWC*), the change in cash holdings (*ΔCASH*), cash dividends (*Div*), net debt reduction (*ΔD*), and net equity reduction (*ΔE*). The variables are normalized by lagged total assets and variable definitions are provided in Exhibit 1. Control variables are the same as those defined in Figure 3.

Chart A: Allocation of *CF* to *INV*

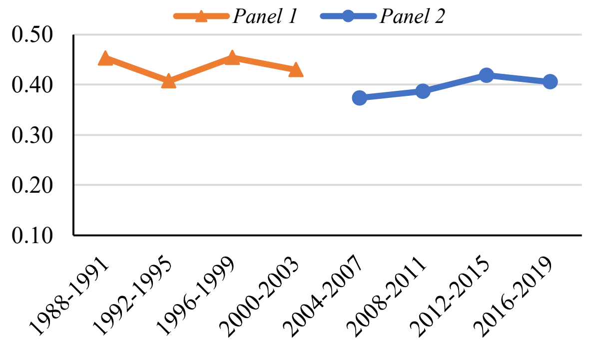

Chart B: Allocation of *CF* to Δ*WC*

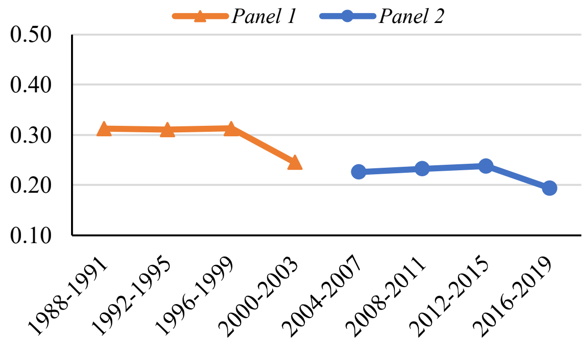

Chart C: Allocation of *CF* to Δ*CASH*

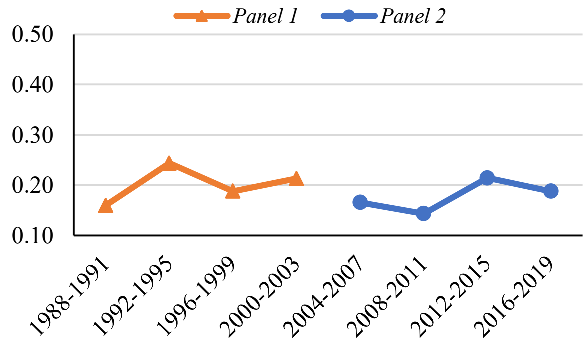

Chart D: Allocation of *CF* to Δ*D*

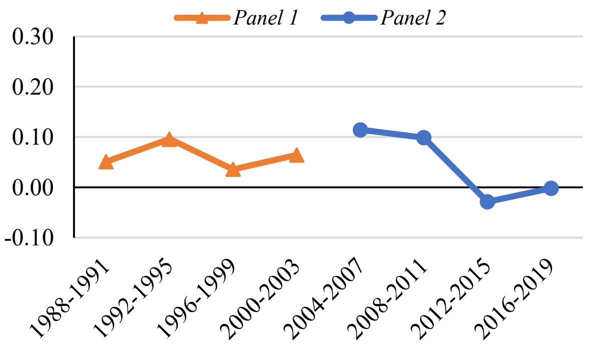

Chart E: Allocation of *CF* to Δ*E*

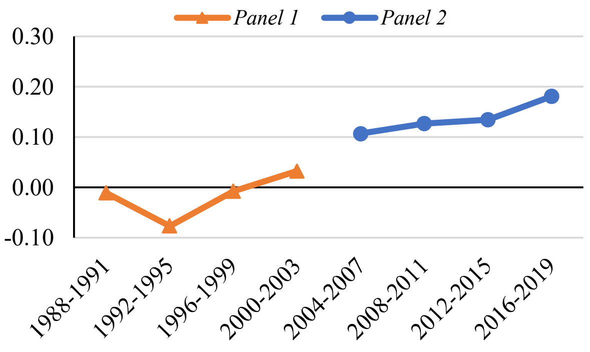

Chart F: Allocation of *CF* to *DIV*

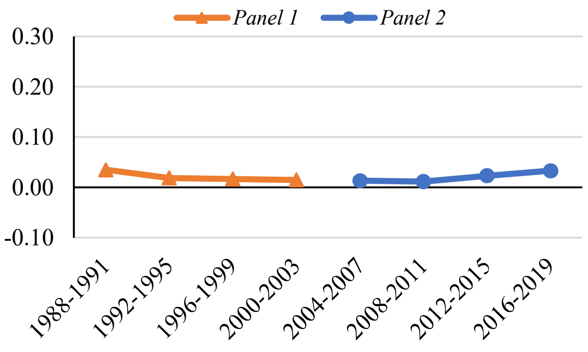

Figure A2. The allocation of cash flow: The cycle and trend components of cash flow

This figure depicts the allocation of components of cash flow (*CF*) to various uses of funds. We decompose CF into cycle and trend components using the Beveridege-Nelson approach. We require firms to have at least consecutive 8 years of annual cash flow for the decomposition. The rates of allocation are regression coefficients on the *Cycle* and *Trend* components of cash flow in equations (3) to (8) i.e., $\alpha^{INV}, \alpha^{\Delta CASH}, \alpha^{\Delta WC}, \alpha^{DIV}, \alpha^{\Delta D}$, and $\alpha^{\Delta E}$ respectively, estimated over eight consecutive periods (1988-1991, 1992-1995, 1996-1999, 2000-2003, 2004-2007, 2008-2011, 2012-2015, and 2016-2019). Uses of funds include investment (*INV*), the change in cash holdings *(ΔCASH*), the change in working capital (*ΔWC*), cash dividends (*Div*), net debt reduction (*ΔD*) and net equity reduction (*ΔE*). The variables are normalized by lagged total assets and variable definitions are provided in Exhibit 1. Control variables are the same as those defined in Figure 3.

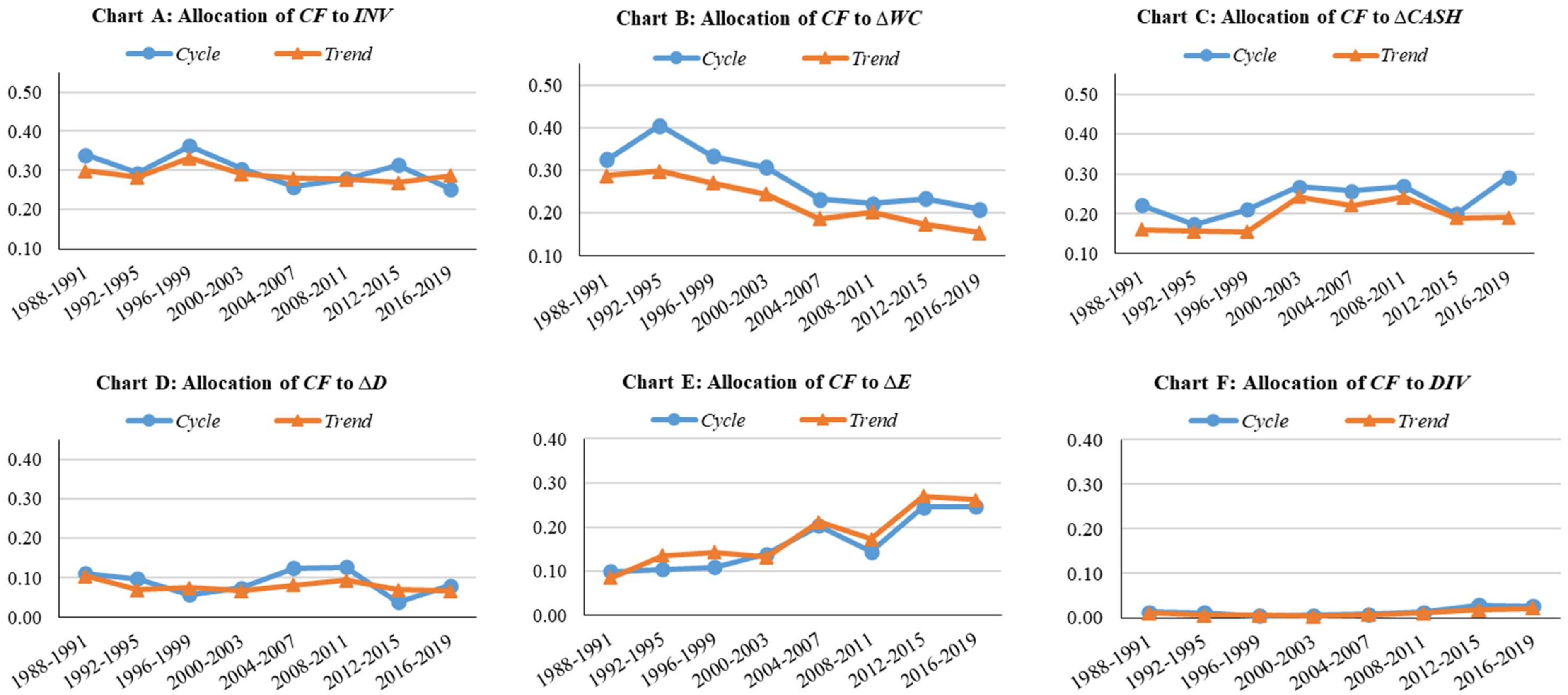

Figure A3. The allocation of cash flow: Impact of lagged cash flow variables

This figure depicts the allocation of cash flow (*CF*) to various uses of funds after controlling for two lags of CF. The rates of allocation are estimated regression coefficients on *CF* in equations (3) to (8) i.e., $\alpha^{INV}, \alpha^{\Delta CASH}, \alpha^{\Delta WC}, \alpha^{DIV}, \alpha^{\Delta D}$, and $\alpha^{\Delta E}$ respectively, estimated over eight consecutive periods (1988-1991, 1992-1995, 1996-1999, 2000-2003, 2004-2007, 2008-2011, 2012-2015, and 2016-2019). Uses of funds include investment (*INV*), the change in cash holdings *(ΔCASH*), the change in working capital (*ΔWC*), cash dividends (*Div*), net debt reduction (*ΔD*) and net equity reduction (*ΔE*). The variables are normalized by lagged total assets and variable definitions are provided in Exhibit 1. Control variables are the same as those defined in Figure 3.

Chart A: Allocation of *CF* to *INV*

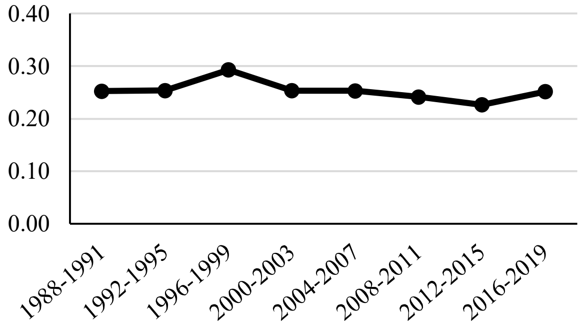

Chart B: Allocation of *CF* to Δ*WC*

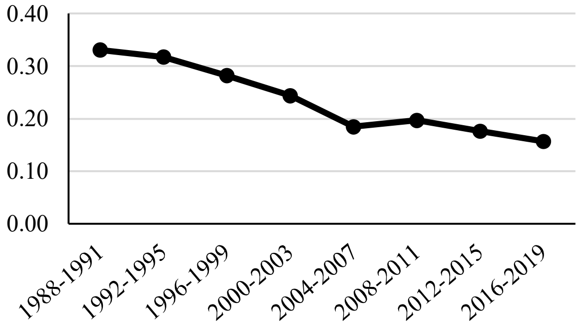

Chart C: Allocation of *CF* to Δ*CASH*

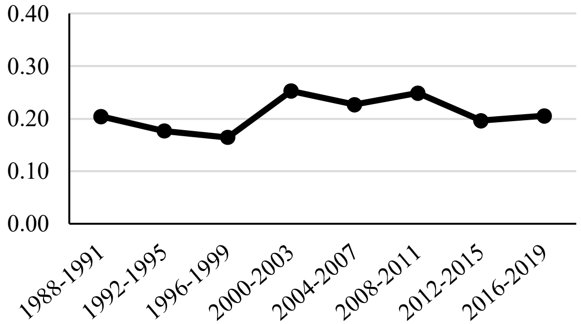

Chart D: Allocation of *CF* to Δ*D*

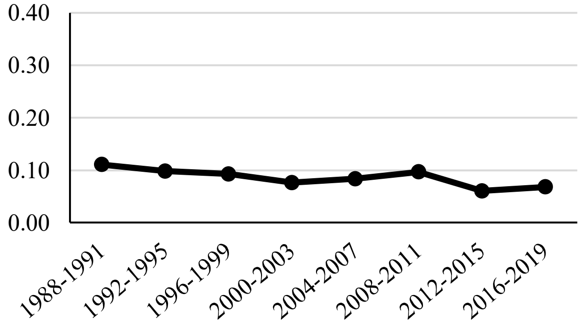

Chart E: Allocation of *CF* to Δ*E*

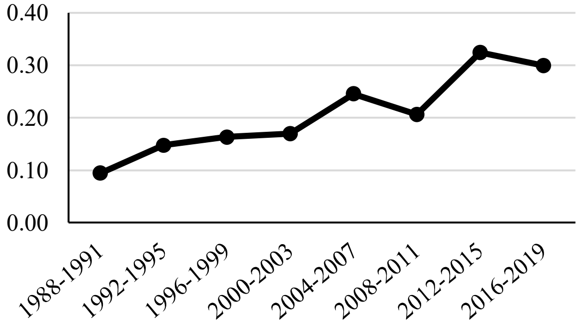

Chart F: Allocation of *CF* to *DIV*

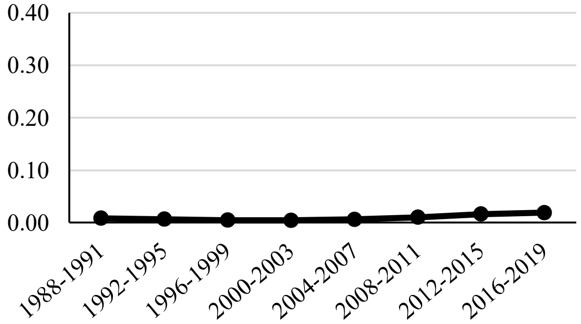

Figure A4. The allocation of cash flow: Impact of lagged dependent variables

This figure depicts the allocation of cash flow (*CF*) to various uses of funds after controlling for the lagged values of the uses of funds. The rates of allocation are estimated regression coefficients on *CF* in equations (3) to (8) i.e., $\alpha^{INV}, \alpha^{\Delta CASH}, \alpha^{\Delta WC}, \alpha^{DIV}, \alpha^{\Delta D}$, and $\alpha^{\Delta E}$ respectively, estimated over eight consecutive periods (1988-1991, 1992-1995, 1996-1999, 2000-2003, 2004-2007, 2008-2011, 2012-2015, and 2016-2019). Uses of funds include investment (*INV*), the change in cash holdings (*ΔCASH*), the change in working capital (*ΔWC*), cash dividends (*Div*), net debt reduction (*ΔD*) and net equity reduction (*ΔE*). The variables are normalized by lagged total assets and variable definitions are provided in Exhibit 1. Control variables are the same as those defined in Figure 3.

Chart A: Allocation of *CF* to *INV*

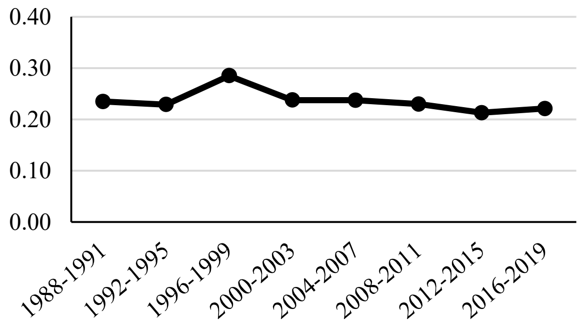

Chart B: Allocation of *CF* to Δ*WC*

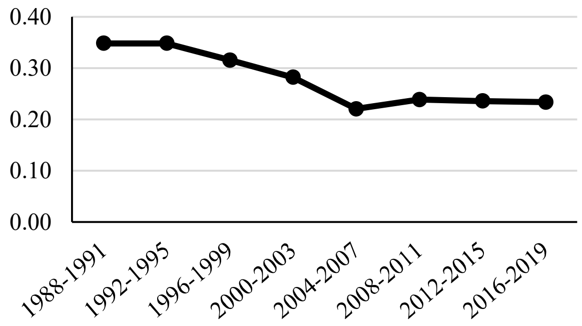

Chart C: Allocation of *CF* to Δ*CASH*

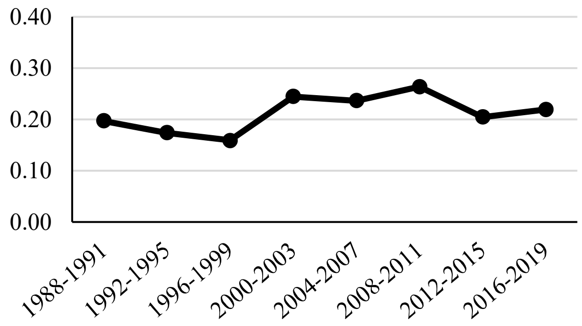

Chart D: Allocation of *CF* to Δ*D*

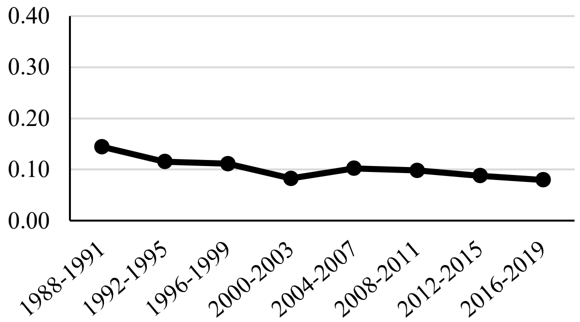

Chart E: Allocation of *CF* to Δ*E*

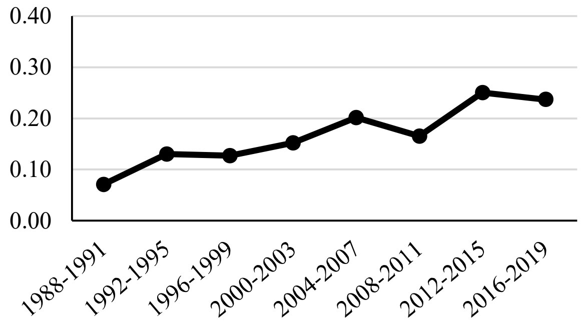

Chart F: Allocation of *CF* to *DIV*

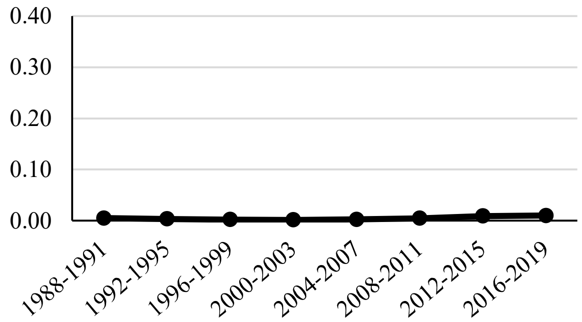

Figure A5. The allocation of cash flow from 1967 to 2019 based on the methodology of Chen and Chen (2012)

This figure replicates Figure 2 of Chen and Chen (2012) and depicts, by year, the investment-cash flow sensitivity of our sample firms. That is, it plots the estimated coefficients on cash flow with respect to the annual regressions of investment on Tobin's q and cash flow. Following Chen and Chen (2012), we define investment as the firm's capital expenditure, deflated by its beginning-of-period net property, plant, and equipment; we define cash flow as the firm's internal cash flow, which is income before extraordinary items plus depreciation and amortization, also deflated by its beginning-of-period net property, plant, and equipment. All variables are demeaned by firm to remove firm fixed effects.

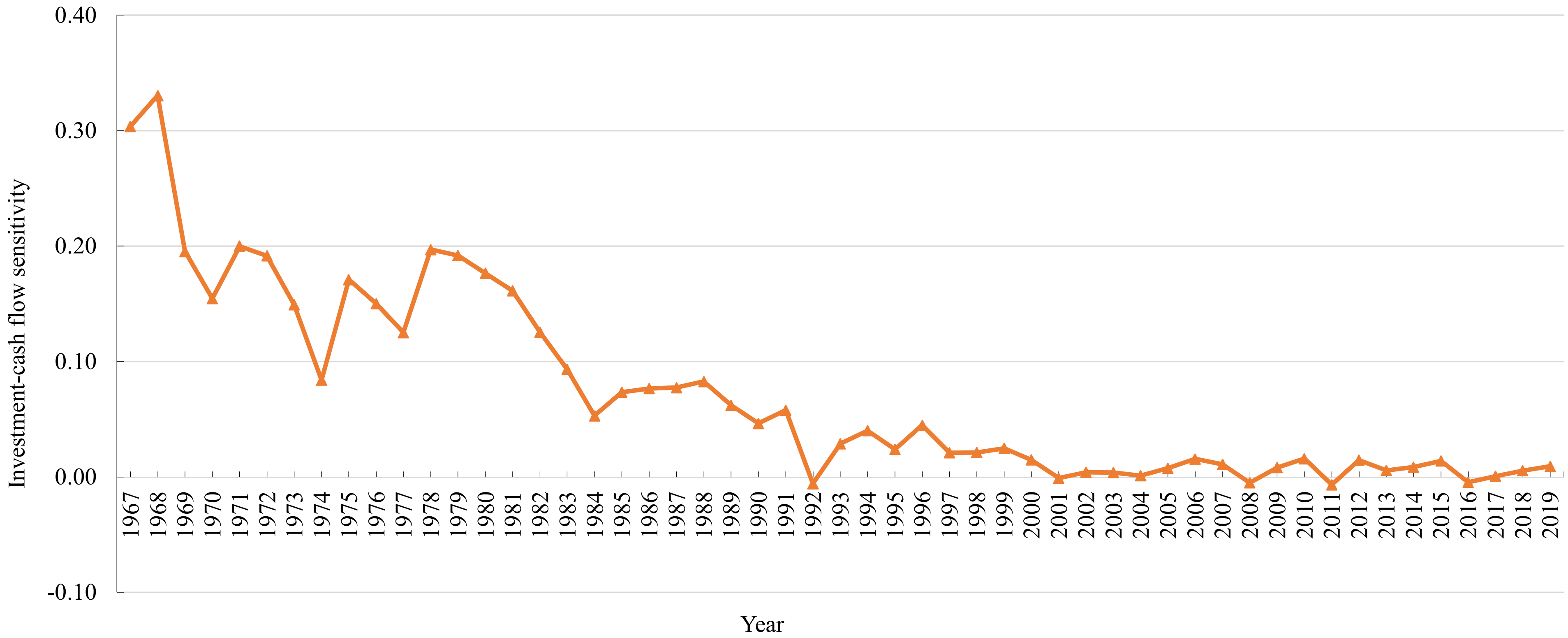

Figure A6. The allocation of cash flow: Financially constrained versus unconstrained firms

This figure depicts the allocation of cash flow (*CF*) to various uses of funds for financially constrained and unconstrained firms. Each year, a firm is classified as being financially constrained (unconstrained) if its score of the Hadlock and Piece (2010) (*HP*) Index is above the 70th (below the 30th) percentile. The rates of allocation are regression coefficients on *CF* in equations (3) to (8) i.e., $\alpha^{INV}, \alpha^{\Delta WC}, \alpha^{\Delta CASH}, \alpha^{\Delta D}$, $\alpha^{\Delta E}$, and α^{DIV} respectively, estimated over eight consecutive periods. Uses of funds include investment (*INV*), the change in working capital (*ΔWC*), the change in cash holdings (*ΔCASH*), net debt reduction (*ΔD*), net equity reduction (*ΔE*) and cash dividends (*Div*). The variables are normalized by lagged total assets and variable definitions are provided in Exhibit 1. Control variables are the same as those defined in Figure 3.

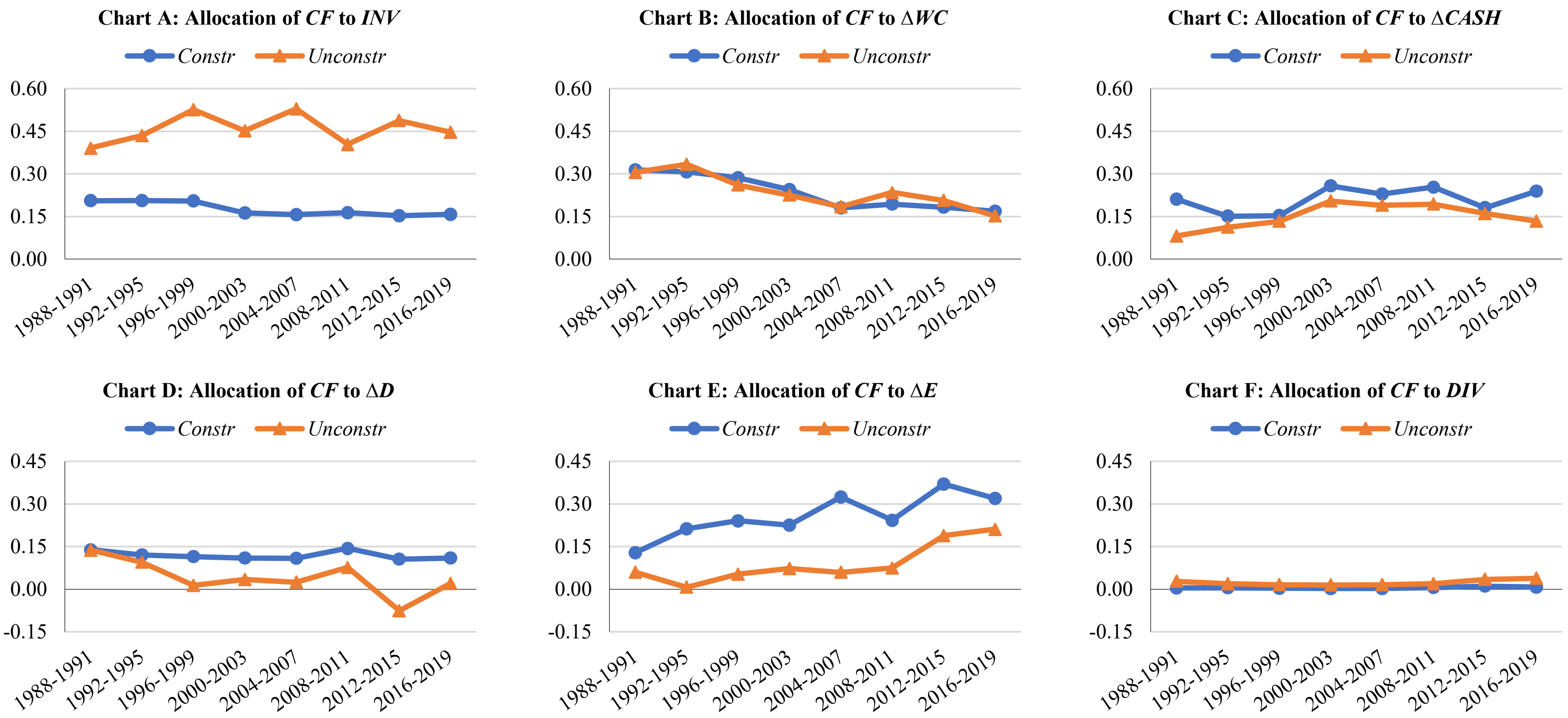

Figure A7. The allocation of cash flow: Alternative definition of cash flow

This figure depicts the allocation of cash flow net of working capital (*CF-ΔWC*) to various uses of funds for our sample fimrs. The rates of allocation are regression coefficients on *CF- ΔWC* (*CF* minus the change in working capital *ΔWC*), estimated over eight consecutive periods (1988-1991, 1992-1995, 1996-1999, 2000-2003, 2004-2007, 2008-2011, 2012-2015, and 2016-2019). The estimates of allocation of cash flow (*CF*) to various uses of funds are also included for comparison. Uses of funds include investment (*INV*), the change in cash holdings *(ΔCASH*), cash dividends (*Div*), net debt reduction (*ΔD*) and net equity reduction (*ΔE*). The variables are normalized by lagged total assets and variable definitions are provided in Exhibit 1. Control variables are the same as those defined in Figure 3.

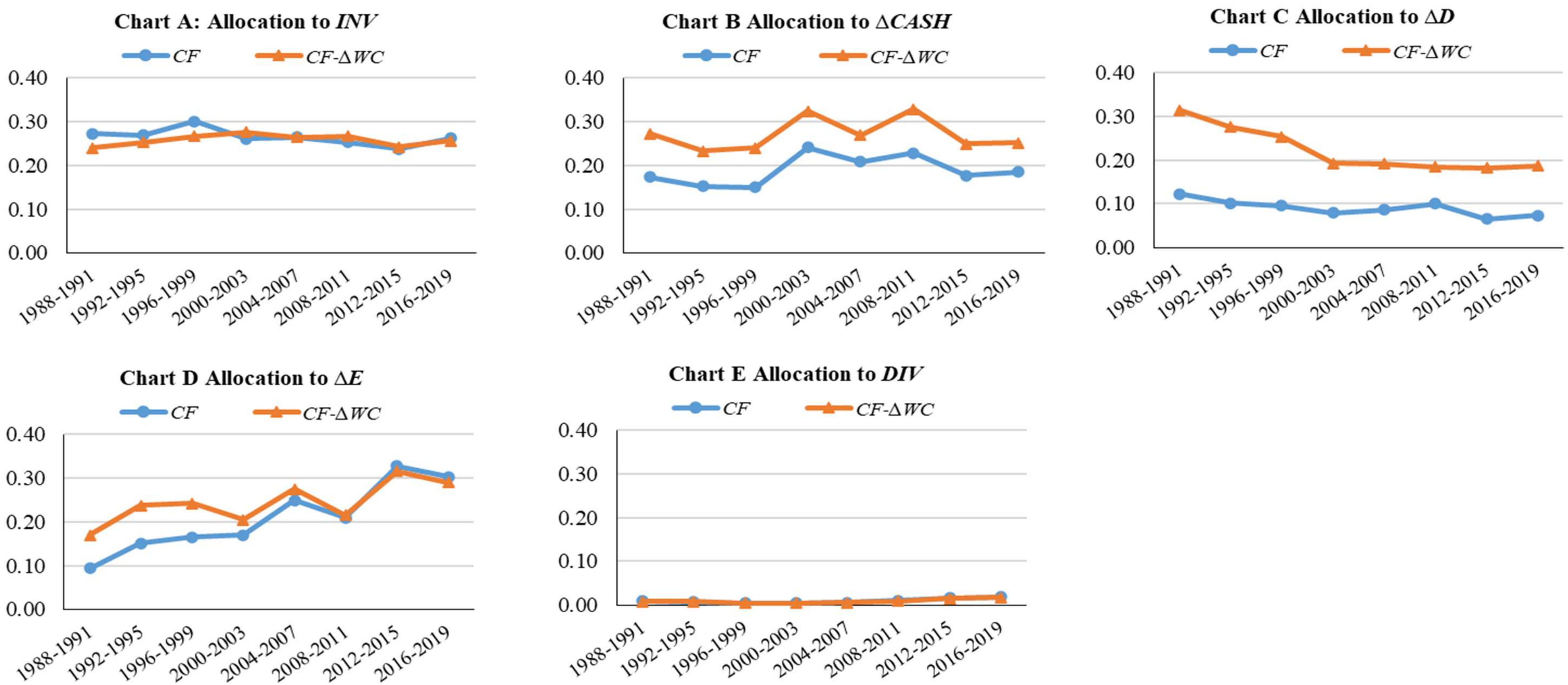

Figure A8. The allocation of cash flow: R&D as a component of investment

This figure depicts the allocation of adjusted cash flow (*CF_ADJ*) to various uses of funds for our sample firms. The rates of allocation are s regression coefficients on *CF_ADJ* (CF plus R&D expenses), estimated over eight consecutive periods (1988-1991, 1992-1995, 1996-1999, 2000-2003, 2004-2007, 2008-2011, 2012-2015, and 2016-2019). Uses of funds include investment plus R&D expenses (*INV+*), the change in working capital (*ΔWC*), the change in cash holdings *(ΔCASH*), net debt reduction (*ΔD*), net equity reduction (*ΔE*), and cash dividends (*Div*). The variables are normalized by lagged total assets and variable definitions are provided in Exhibit 1. Control variables are the same as those defined in Figure 3.

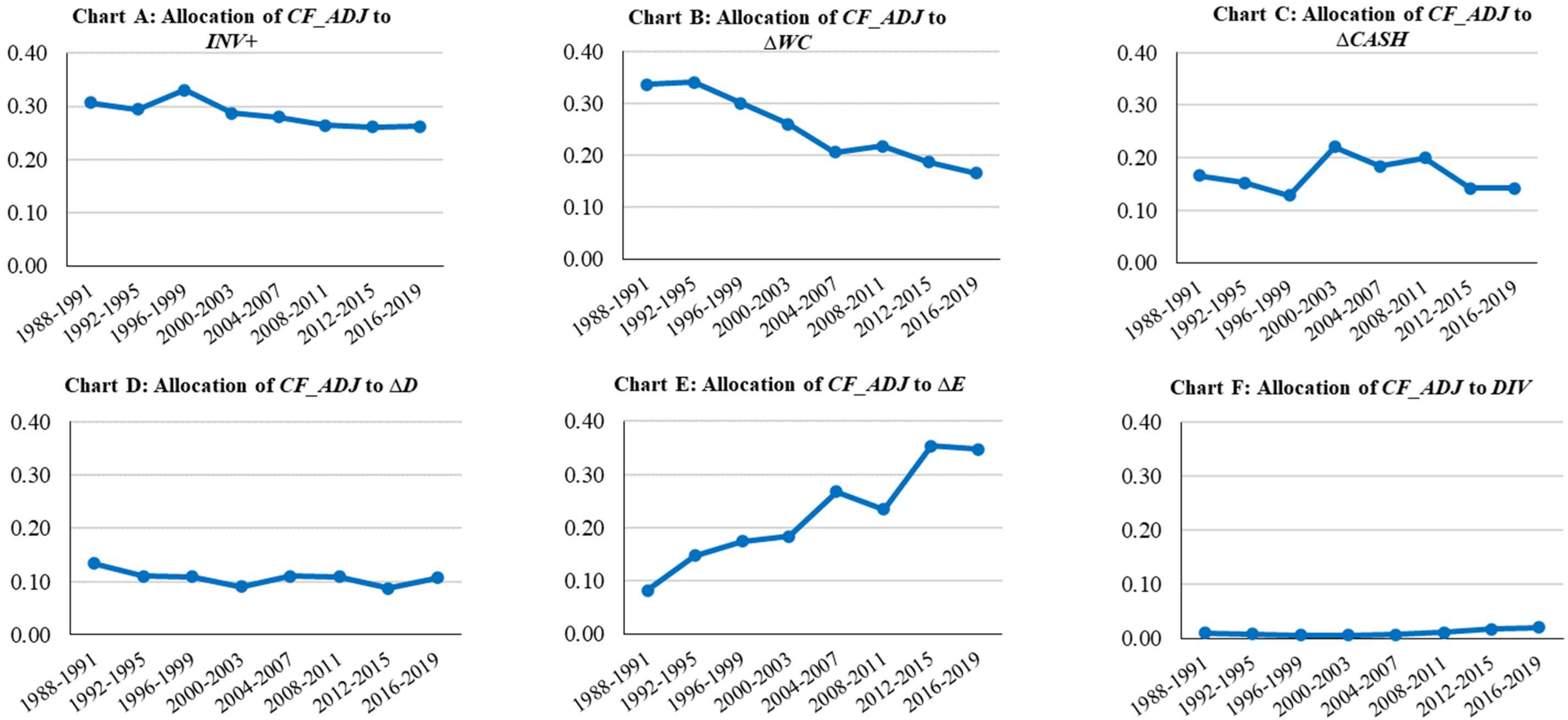

Table A1. Additional analysis: Control for the lagged cash flow variables

This table reports the results of panel regressions investigating intertemporal allocation of cash flow to various uses of cash flow for the period 1988 to 2019 by including two lags of cash flow (CF) as additional controls. The cash flow allocation is captured by the regression coefficients on *CF* in equations (3)-(8) ($\alpha^{INV}, \alpha^{\Delta WC}, \alpha^{\Delta CASH}$, $\alpha^{\Delta D}$, $\alpha^{\Delta E}$, and α^{DIV}). Uses of cash flow include investment (*INV*), the change in working capital (*ΔWC*), the change in cash holdings (*ΔCASH*), net debt reduction (*ΔD*), net equity reduction (*ΔE*), and cash dividends (*Div*). The variables are defined in Exhibit 1. Control variables include the market-to-book ratio (*MB*), the natural log of the book value of assets (*Ln*(*Assets*)), the annual sales growth rate (*SalesG*), the net property, plant, and equipment-to-assets ratio (*PPE*/*Assets*), and the leverage ratio (*Leverage*). Firm and year fixed effects are included, and the standard errors are clustered at the firm level. Coefficients significant at the 10%, 5%, and 1% levels are indicated by *, **, and ***, respectively. The *t*-statistics are presented in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variables	INV_t	ΔWC_t	$\Delta CASH_t$	ΔD_t	ΔE_t	DIV_t
CF_t	0.247***	0.296***	0.227***	0.104***	0.118***	0.007***
	(29.06)	(42.81)	(26.27)	(13.67)	(10.98)	(10.90)
CF_{t-1}	0.090***	-0.072***	-0.046***	-0.036***	0.060***	0.006***
	(10.40)	(-10.70)	(-5.65)	(-5.20)	(6.07)	(8.89)
CF_{t-2}	0.061***	-0.032***	-0.027***	-0.029***	0.024***	0.003***
	(8.35)	(-5.62)	(-4.02)	(-4.63)	(3.13)	(3.95)
MB_{t-1}	0.015***	0.004***	0.003***	-0.006***	-0.017***	0.001***
	(15.16)	(6.32)	(4.30)	(-9.01)	(-15.33)	(8.11)
$SalesG_{t-1}$	0.023***	0.008***	0.007***	-0.014***	-0.021***	-0.003***
	(7.52)	(4.36)	(3.21)	(-5.69)	(-8.05)	(-10.93)
$Ln(Assets)_{t-1}$	-0.018***	-0.005***	-0.009***	0.009***	0.023***	0.001***
	(-14.01)	(-6.27)	(-11.72)	(7.41)	(20.39)	(4.07)
$Leverage_{t-1}$	-0.115***	-0.025***	0.014***	0.189***	-0.054***	-0.009***
	(-21.66)	(-7.88)	(4.27)	(35.08)	(-13.20)	(-10.08)
$PPE/Assets_{t-1}$	0.025***	-0.009**	0.075***	-0.062***	-0.028***	-0.001
	(2.90)	(-2.21)	(14.95)	(-8.32)	(-4.59)	(-0.54)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	72,005	72,005	72,005	72,005	72,005	72,005
Adjusted *R*-squared	0.301	0.235	0.069	0.122	0.338	0.683

Table A2. Time trends of the cash-flow allocation: Alternative definition of cash flow

This table reports the estimated time trends in the allocations of cash flow to the six uses. The time trends are estimated using the Augmented Dickey-Fuller (ADF) model specified in equation (11). The dependent variable in each column is ΔY_t and the independent variables include a time trend variable (*Trend*), Y_{t-1} and ΔY_{t-1}. Y stands for estimated coefficients on *CF* in equations (3)-(8) ($\alpha^{INV}, \alpha^{\Delta WC}, \alpha^{\Delta CASH}, \alpha^{\Delta D}, \alpha^{\Delta E}$ and α^{DIV}). Uses of cash flow include investment (*INV*), the change in working capital (*ΔWC*), the change in cash holdings (*ΔCASH*), net debt reduction (*ΔD*), net equity reduction (*ΔE*), and cash dividends (*Div*). Panel A reports the results for the allocation of cash flow (*CF*). Panel B reports the results for the allocation of cash flow net of the change in working capital (*CF-ΔWC*). ADF unit root test statistics are reported in each panel and MacKinnon approximate *p*-values are based on the interpolated critical values from the table of values in Fuller (1996). *t*-statistics are reported in parentheses. Statistical significance at the 1%, 5%, or 10% level is marked by ***, **, and *, respectively.

Panel A: Cash flow

Dependent Variables	(1) $\Delta\alpha^{INV}$	(2) $\Delta\,\alpha^{\Delta WC}$	(3) $\Delta\,\alpha^{\Delta CASH}$	(4) $\Delta\alpha^{\Delta D}$	(5) $\Delta\alpha^{\Delta E}$	(6) $\Delta\alpha^{DIV}$
Trend	-0.001	-0.004**	0.0002	-0.001	0.008***	0.0001**
	(-1.47)	(-2.44)	(0.24)	(-1.68)	(3.91)	(2.09)
Lagged α	-1.028***	-0.564**	-0.369*	-0.875***	-0.967***	-0.187
	(-3.47)	(-2.58)	(-1.80)	(-3.58)	(-4.32)	(-1.54)
Lagged Δα	-0.118	-0.135	-0.367*	0.096	0.361*	-0.468**
	(-0.62)	(-0.72)	(-1.87)	(0.48)	(1.88)	(-2.63)
ADF test statistics	-3.47	-2.58	-1.80	-3.58	-4.32	-1.54
MacKinnon approximate *p*-value	0.043	0.291	0.703	0.031	0.003	0.814
Observations	30	30	30	30	30	30
Adjusted *R*-squared	0.543	0.252	0.284	0.339	0.362	0.263

Panel B. Cash flow net of the change in working capital

Dependent Variables	(1) $\Delta\alpha^{INV}$	(2) $\Delta\,\alpha^{\Delta CASH}$	(3) $\Delta\alpha^{\Delta D}$	(4) $\Delta\alpha^{\Delta E}$	(5) $\Delta\alpha^{DIV}$
Trend	0.0002	0.0001	-0.002	0.003**	0.0001
	(0.34)	(0.15)	(-1.48)	(2.08)	(1.70)
Lagged α	-1.056***	-0.435**	-0.477**	-0.847***	-0.174
	(-3.57)	(-2.23)	(-2.53)	(-3.69)	(-1.38)
Lagged Δα	0.039	-0.108	-0.116	0.111	-0.293
	(0.20)	(-0.43)	(-0.56)	(0.68)	(-1.46)
ADF test statistics	-3.57	-2.23	-2.53	-3.69	-1.38
MacKinnon approximate *p*-value	0.033	0.470	0.312	0.023	0.866
Observations	30	30	30	30	30
Adjusted *R*-squared	0.443	0.163	0.261	0.332	0.126