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Investor Protection and Resource Allocation: International Evidence

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Abstract

We use a multi-period equation system to examine how international manufacturing firms allocate internally generated operating cash flow to different uses. With one dollar increase in operating cash flow, firms use about half to reduce external financing and about a quarter to increase cash balances. Another quarter or so is spent on investment and only a tiny portion is paid out as dividends. Furthermore, firms in countries with strong investor protection save less out of operating cash flow and retire more external financing, especially the equity. Additional analysis reveals that the cost of equity capital is lower in firms retiring more external funds and/or saving less. Our study provides a new perspective to evaluate the fund allocation decisions of international firms.

Keywords: Fund allocation; Cash flow sensitivities; Investor protection; International finance

JEL Classification: G15, G32.

1. Introduction

A large volume of financial studies have examined international firms' financial policies. While the financial policies are critical to firms' long-term growth and sustainability, the pieces of documented empirical evidence are oftentimes mixed and not directly comparable.[1] The reason is that they were obtained from various settings with different research methodologies, which makes the evaluation of their economic impacts less straightforward. In this study, we examine firms' fund allocation decisions with a multi-period equation system developed by Gatchev, Pulvino and Tarhan (2010) and Dasgupta, Noe and Wang (2011). With this equation system, we examine how firms allocate their operating cash flow to different uses and how the strength of investor protection impacts the fund allocation decisions. To substantiate our findings, we also test the valuation implication of fund allocation decisions.

The equation system developed by Gatchev et al. (2010) and Dasgupta et al. (2011) is derived from the accounting identity that the utilizations of funds must equal the sources of funds. The equation system identifies four major uses of operating cash flow: cash saving, investment, the retirement of external financing,[2] and dividend payment. The estimated sensitivity of decisions to operating cash flow indicates how a dollar of operating cash flow will be allocated to each of the four uses. Consistent with Almeida, Campello and Weisbach (2004), this equation system recognizes the *interdependence* among different cash uses (i.e., liquidity, investment, and financing activities are determined jointly) and allows *intertemporal* allocation of internal funds (i.e., an increase in operating cash flow affects firms' financial decisions not only in the current period but also in subsequent periods).

[1] Financial policies mean the decisions on how to allocate internally generated cash flow to liquidity management, external financing and investment activity.

[2] We use retirement, reduction, repurchase and buy-back of external financing interchangeably in the following discussions.

We run the multi-period equation system on a sample of international manufacturing firms from 1993 to 2014. The estimated contemporaneous cash flow sensitivities indicate that with one dollar increase in operating cash flow, firms in our sample use 47.1¢ to retire external financing and allocate 36.9¢ to cash reserves. 11.3¢ is invested and only 2.2¢ is paid out to shareholders as cash dividends. Obviously, the dominant cash use is to reduce external financing, echoing the findings documented for U.S. firms (Dasgupta et al. 2011). In addition, cash flow clearly has a long-run impact on investment. The cumulative investment to cash flow sensitivity indicates that in the two years after the cash inflow, firms divert another 14.1¢ to investment, an amount comparable to the concurrent allocation of cash flow to investment (i.e., 11.3¢), and the investment in subsequent periods is mostly funded with cash savings.

We then examine how the fund allocation decisions differ among firms with varying governance quality. We divide the sample according to various proxies for investor protection strength, namely the anti-director rights index constructed by La Porta et al. (1998, 2006), the anti-self-dealing index developed by Djankov et al. (2008), and firms' cross-listing status. We find that in countries with strong investor protection, firms save less out of operating cash flow, reflecting a diminished precautionary saving motive and/or reduced private benefits of holding cash in jurisdictions with a strong investor protection portfolio (Dittmar et al. 2003; Harford, Mansi and Maxwell 2008; Kusnadi and Wei 2011).

We find that with an increase in operating cash flow, firms from countries with strong investor protection retire more external financing, especially the equity. We also find that firms in strong governance countries pay higher dividends on average, although the results are mixed with different proxies for investor protection strength used. Taken together, our findings on external

financing retirement (net of dividend payment) suggest that firms distribute more to investors when investor protection is stronger in their countries.

Earlier studies have documented a lower investment to cash flow sensitivity for firms located in countries with better financial reporting quality and/or governance quality (Biddle and Hilary 2006; Schleicher, Tahoun and Walker 2010; McLean, Zhang and Zhao 2012). However, our results on investment to cash flow sensitivities, in either the short or long term, suggest no reliable difference between firms in countries with strong and weak investor protection. This lack of difference may be attributed to the equation system we have adopted. The equation system considers the interdependent allocation of internal operating cash flow to different uses and the transmission of operating cash flow across periods. As a result, investment is funded not only with current operating cash flow but also with past cash flows, the raising of additional external financing, and/or the depletion of retained cash holdings. These features alleviate the sole reliance of investment on operating cash flow, leading to an insignificant difference in investment to cash flow sensitivity between the two subsamples concerned.

In the last part of our analysis, we assess the economic significance of our findings by examining how the estimated cash flow sensitivities are associated with the cost of equity capital. We compute the cost of equity capital as implied in the current stock price and analysts' earnings forecasts (Claus and Thomas 2001; Gebhardt, Lee and Swaminathan 2001; Gode and Mohanram 2003; Easton 2004; Ohlson and Juettner-Nauroth 2005). We find that the cost of equity capital is lower in firms having a lower propensity to save and/or a higher propensity to retire external financing.

This study is the first to adopt a multi-period equation system to analyze the resource allocation decisions of international firms. Although earlier studies have examined various

financial policies for firms with different governance environments, they usually investigate firms' liquidity management, financing, and investment activities in isolation (see, for instance, Blanchard, Lopez-de-Silanes and Shleifer 1994; Kim and Weisbach 2008). This study examines these financial decisions in a unified framework. With contemporaneous, alternative cash uses controlled, the sensitivity of each individual decision to cash flow is estimated, thus providing direct evidence on how the international firms allocate internal funds on average. This approach makes it easier to compare the financial decisions between countries with high and low investor protection quality.

Our findings indicate that firms' financial policies are relevant to investors, because fund allocation decisions are associated with the cost of equity capital. Specifically, when well-governed firms save less out of internally generated funds and/or retire more external financing, investors would perceive less misappropriation of internal funds by managers and demand a lower required rate of return. Our findings can be of interest to policymakers too. We find that the major uses of cash flows are to retire external financing and to increase cash balances. Thus, the economic easing policies promoted by governments (say tax or interest rate cuts) may not be as effective as expected, when firms do not divert a large portion of the government-injected funds to the investment projects that can actually boost the economy.

2. Related Literature

In this section, we discuss the main determinants of firms' decisions on cash saving, dividend payment, external financing, and investment, conditional on country-level institutional quality. We note that for each cash use, competing hypotheses are available in explaining how the country-level institutional quality affects the decision-making. Thus, it is not clear *ex ante* how investor

protection strength can impact each of the fund allocation decisions, and our research question is ultimately an empirical one.

2.1 Cash saving

Extant studies propose that firms have two incentives to save cash—the precautionary saving incentive and the agency incentive. Based on the precautionary saving incentive, external financing is more costly than internal funds because of information asymmetry between corporate insiders and outsiders and managerial moral hazard (Myers and Majluf 1984). Thus, firms will hoard cash to insure against future adverse shocks to internal funds, as they cannot access external financing freely. Dittmar, Mahrt-Smith and Servaes (2003) argue and document consistent evidence that if strong country-level investor protection lowers the external financing cost, the managers would have less incentive to hoard cash within the firms. Similarly, Kusnadi and Wei (2011) find that firms in strong governance jurisdictions have a lower propensity to save.

However, based on the agency incentive, it is less clear *ex ante* how the strength of investor protection affects corporate cash holdings. On one hand, the agency incentive motivates managers to hold more cash, because they can then divert it for their own private benefits. Kalcheva and Lins (2007) find that firms with entrenched managers hold more cash but that country-level investor protection reduces the propensity of entrenched management to hold cash. On the other hand, the agency incentive may drive managers to over-invest due to empire building motive, leaving firms with less cash. Consistent with this argument, Harford, Mansi and Maxwell (2008) find that firms with weak corporate governance structures have smaller cash reserves because these firms spend cash quickly on acquisitions and capital expenditures. Huang, Elkinawy and Jain (2013) find that

firms cross-listed on U.S. stock exchanges have higher cash holdings than their non-cross-listed peers, because the managers misappropriate internal resources less after the cross-listing.

Thus, the precautionary saving motive and the agency motive offer opposite predictions on how investor protection strength can affect firms' propensity to save. An empirical test is warranted to determine the net effect.

2.2 Dividend payment

Dividend payment is another cash use. La Porta, Lopez-de-Silanes, Shleifer and Vishny (2000) outline two competing hypotheses in explaining firms' dividend payment: an "outcome model" claiming that shareholders pressure corporate insiders to pay out higher dividends when investor protection is strong and a "substitute model" claiming that insiders substitute weak governance with dividend payment in order to attract investors. They find that dividends are higher in countries with better shareholder protection, supporting the "outcome model". Bae, El Ghoul, Guedhami and Zheng (2020) lend support to "outcome model" with the world-wide implementation of board reforms. Board reforms intend to strengthen boards by requiring independence of boards and audit committees (and auditors) and the separation of roles as CEOs and board chairmen. With an event study approach, Bae et al. (2020) find that firms pay higher dividends following the board reforms.

However, Hail, Tahoun and Wang (2014) argue that firms pay lower dividends after the mandatory adoption of International Financial Reporting Standards (IFRS) and/or initial enforcement of insider trading laws, two events commonly perceived to have improved firms' governance practices and information disclosure. They argue that improved governance provisions reduce the usefulness of dividends in mitigating managerial moral hazard and adverse selection by

external investors. This result is consistent with the "substitute model", opposite to the findings offered by La Porta et al. (2000) and Bae et al. (2020).

2.3 Retirement of external financing

Strong country-level investor protection mitigates the problems of information asymmetry and managerial moral hazard. An institutional environment that protects investors should increase the likelihood of firms' obtaining external funds and the amount of funds obtained. This is more so for equity financing than debt financing, as the former is more sensitive to information asymmetry and moral hazard. With an analytical model, Shleifer and Wolfenzon (2002) demonstrate that firms' financing size is determined by the country-wide legal environment under plausible conditions and that firms are more valuable and stock markets are more developed in countries that protect investors better. Thus, in countries with sound investor protection mechanisms, firms can access external funds more easily. Put differently, in these countries, firms resort more to external funds when they have lower cash inflow, and reduce external financing when they have higher cash inflow (La Porta et al. 1998; La Porta et al. 2006; Djankov et al. 2008; McLean et al. 2012).

2.4 Investment

In addition to cash saving, dividend payment, and retirement of external financing, firms also invest their cash. Fazzari, Hubbard, and Petersen (1988) argue that because of the wedge between internal and external financing costs, firms' investment relies on internal funds and this reliance will decline when firms can access external capital with greater ease. Following this argument, Lins, Strickland and Zenner (2005) find that the investment to cash flow sensitivity declines after

emerging market firms are cross-listed on a U.S. stock exchange. Similarly, Biddle and Hilary (2006) find that the investment to cash flow sensitivity is lower for firms from countries with better financial reporting quality. Schleicher et al. (2010) show that the investment to cash flow sensitivity reduces after the mandatory adoption of IFRS in European Union countries, an event that is believed to improve the informativeness of accounting numbers and governance practices. With a set of general country-level governance variables, McLean et al. (2012) find that investor protection is associated with a lower investment to cash flow sensitivity.

However, another school of studies proposes a different view. Kaplan and Zingales (1997) demonstrate with a simple model that under general conditions, firms' investment to cash flow sensitivity may increase when firms can access external funds more easily, contrary to Fazzari et al. (1988). After considering the intertemporal and interdependent nature of cash uses, Dasgupta et al. (2011) and Chang et al. (2014) find that firms enjoying easier access to external funds exhibit a higher investment to cash flow sensitivity, when *cumulative* investment to cash flow sensitivity (i.e., the sensitivity of investment to both *current* and *past* cash flows) is concerned.

The studies discussed above examine different types of financial decisions and the impact of country-wide institutional quality on the financial decisions. However, these studies usually focus on one financial decision in the analysis. In this paper, we examine the various types of fund allocation decisions made by firms with the multi-period equation system. With this equation system, the relevant cash flow sensitivities can be jointly and explicitly computed. In addition, this equation system recognizes the persistent effect of current cash inflow and allows it to influence the financial decisions for at least three years.

3. Research Methodology

3.1 The equation system

A key feature of the research design by Gatchev et al. (2010) and Dasgupta et al. (2011) is that both consider the *interdependent* and *intertemporal* nature of firms' saving, investment, dividend, and financing decisions. Their equation system is derived from the accounting identity that the sources of cash must equal the uses of operating cash flow (OCF) (Tobin 1968), stated mathematically as follows:

$$\Delta CASH + INVEST - XFIN + DIV = OCF. \quad (1)$$

The left-hand side of Eq. (1) represents the major uses of cash, i.e., cash saving ($\Delta CASH$), investment ($INVEST$), (negative) external financing ($-XFIN$) and dividend payout (DIV). Note that we multiply external financing by negative one, thus $-XFIN$ indicates a reduction in external financing.[3] The right-hand side of the equation is the source of cash, i.e., operating cash flow.

On the basis of Eq. (1), we consider the following system of equations:

$$\begin{bmatrix} \Delta CASH_t \\ INVEST_t \\ -XFIN_t \\ DIV_t \end{bmatrix} = A + L_0[OCF_t] + L_1[OCF_{t-1}] + L_2[OCF_{t-2}] + MZ + \begin{bmatrix} e_t^{\Delta CASH} \\ e_t^{INVEST} \\ e_t^{-XFIN} \\ e_t^{DIV} \end{bmatrix}, \quad (2)$$

where $A = \left[a^{\Delta CASH}\ a^{INVEST}\ a^{-XFIN}\ a^{DIV}\right]'$ is the vector of firm-fixed effects for the four equations. $L_i = \left[b_i^{\Delta CASH}\ b_i^{INVEST}\ b_i^{-XFIN}\ b_i^{DIV}\right]'$ (i = 0, 1, 2) describes the sensitivities of decisions on cash saving, investment, the retirement of external financing, and dividend payment in period t to the operating cash flow of year $t–i$ (i.e., the cash flow sensitivities in the short and the long run).[4] Z is a vector of K control variables, i.e., $Z = (Z_1, Z_2, \ldots, Z_K)$. M is a $4\times K$ matrix that captures the coefficients on the control variables in the four equations; that is, $M =$

[3] External financing represents a source of funds. However, to ease the estimation of the sensitivity of decisions to cash flow, we move it to the left-hand side of Eq. (1) and refer to *–XFIN* as the retirement (or repurchase, reduction, or buy-back) of external financing.

[4] We follow Dasgupta et al. (2011) to include lagged operating cash flow in the last two periods in the regression.

$\begin{bmatrix} m_1^{\Delta CASH} & m_2^{\Delta CASH} & \dots & m_K^{\Delta CASH} \\ m_1^{INVEST} & m_2^{INVEST} & \dots & m_K^{INVEST} \\ m_1^{-XFIN} & m_2^{-XFIN} & \dots & m_K^{-XFIN} \\ m_1^{DIV} & m_2^{DIV} & \dots & m_K^{DIV} \end{bmatrix}$, where m_K^Y is the coefficient on control variable M_K in the regression with the dependent variable being *Y* (*Y* = Δ*CASH*, *INVEST*, *–XFIN* and *DIV*). Following Gatchev et al. (2010) and Dasgupta et al. (2011), we include the following control variables: Tobin's Q (*Tobin's Q*), firm size (*SIZE*), leverage (*Leverage*), Altman's Z-score (*Z-score*), stock return volatility (*Return volatility*), share turnover (*TURNOVER*) and stock price run-up (*Annual return*).

The *interdependent* nature of the financial decisions is captured by imposing the "sources must equal uses" constraint as follows:

$$b_0^{\Delta CASH} + b_0^{INVEST} + b_0^{-XFIN} + b_0^{DIV} = 1\,, \tag{3}$$

$$b_i^{\Delta CASH} + b_i^{INVEST} + b_i^{-XFIN} + b_i^{DIV} = 0\ (i = 1, 2), \tag{4}$$

$$m_k^{\Delta CASH} + m_k^{INVEST} + m_k^{-XFIN} + m_k^{DIV} = 0\ (k = 1, 2, \dots, 7). \tag{5}$$

Constraint (3) indicates that by virtue of accounting identity in Eq. (1), the operating cash flow in a period must be fully allocated to cash saving, investment, reduction of external financing, and dividend payment in the concurrent period. Thus the *contemporaneous* cash flow sensitivities must add up to unity. In addition, allocating more internal funds to one use implies allocating less funds to other uses. As a result, constraints (4) and (5) indicate that if a shock arises from a non-source variable, the shock must be entirely absorbed by all decisions.[5]

The *intertemporal* nature of the financial decisions is captured by including OCF_{t-1} and OCF_{t-2}. Literally, b_1^Y captures the effect of a shock to operating cash flow in period *t*-1 on financial decision *Y* in period *t*. Alternatively, it can also be interpreted as the effect of a shock to operating

[5] For example, if the past cash flow (or other control variables) has an impact on one decision (i.e., a non-zero coefficient on the decision), it must have an impact on other decisions (i.e., non-zero coefficients on other decisions).

cash flow in period *t* on the investment in period *t*+1. Thus, $b_0^Y + b_1^Y + b_2^Y$ captures the *cumulative* effect of a shock to operating cash flow (i.e., cumulative cash flow sensitivity) in period *t* on a financial decision in a three-year period.[6]

3.2 Proxies for investor protection strength

To compare the differences in fund allocation among countries with varying levels of governance quality, we classify firms into subsamples according to the proxies for country-level investor protection strength developed in earlier studies. We then augment Eq. (2) by multiplying OCF_t, OCF_{t-1}, and OCF_{t-2} by the proxies. We use three proxies for investor protection strength in the study, namely a composite investor protection index developed by La Porta et al. (2006), an anti-self-dealing index developed by Djankov et al. (2008),[7] and a binary variable indicating whether a firm is cross-listed in a country featuring a higher investor protection index than its home country.[8]

3.3 Decomposition of operating cash flow

A critique of interpreting coefficients on cash flow is that cash flow may contain information about firms' growth potential. When firm growth potential is not fully controlled for in the

[6] For example, if a firm saves more from the contemporaneous operating cash flow and draws down the cash holdings subsequently to finance investment, one should observe a higher $b_0^{\Delta CASH}$ and lower (or negative) $b_1^{\Delta CASH}$ and/or $b_2^{\Delta CASH}$. If a firm spends its contemporaneous operating cash flow to pay down external financing and then raise more external funds in the future, one should observe a more positive b_0^{-XFIN} and lower (or negative) b_1^{-XFIN} and/or b_2^{-XFIN}.

[7] La Porta et al. (1998) created an anti-director rights index in evaluating the governance practices in each country. However, this index is challenged by later studies because of its ad hoc nature and coding errors, and subsequently, La Porta et al. (2006) and Djankov et al. (2008) provide fine-tuned measures. Taking into account other aspects of governance practices (such as the disclosure requirement and strength of private enforcement), La Porta et al. (2006) propose a composite investor protection index that is a principal component of accounting disclosures, liability standards and anti-directors rights. Djankov et al. (2008) further revise this investor protection index by incorporating dimensions on how the law in a country regulates corporate self-dealing.

[8] As a robustness check, we compare the institutional quality between the home and host countries with the anti-self-dealing index. The results are qualitatively similar.

regression (say with *Tobin's Q*), cash flow bearing growth implication will be correlated with the regression residuals, and the estimation of coefficients on cash flow will be biased. To address this issue, we decompose operating cash flow into a trend component and a cycle component with the Hodrick–Prescott (1997) approach. The resulting trend component of cash flow contains information about future growth and is likely correlated with the error terms in the regression when growth opportunities are not properly controlled for. The cyclical component is less likely correlated with future growth and thus its coefficient is less subject to the endogeneity concern.[9]

4. Data, Construction of the Variables, and Summary Statistics

4.1 The data

To construct the sample for tests using the indices of investor protection strength, we retrieve data on worldwide manufacturing firms from the Worldscope database from 1993 to 2014. We require a country to have at least 30 firm-year observations to be included in the sample. We drop observations for firms that have total assets below US$1 million or a negative book value of equity. We compute the main variables on cash saving, investment, external financing, dividend payment, and cash flows from operations with Statement of Cash Flows data. All continuous variables are winsorized at the top and bottom 1% of the sample. Our final sample with the indices of investor protection strength contains 84,808 firm-year observations from 57 countries.

To construct the sample for tests using cross-listing firms, we retrieve cross-listing firms from the Osiris database from 45 countries between 1993 and 2014. A cross-listing firm is included in the sample only if it is cross-listed in a country whose institutional quality is better than that of

[9] Chang et al. (2014) employ the Beveridge and Nelson decomposition, which is not an orthogonal decomposition of a time series. The Hodrick-Prescott decomposition, however, generates orthogonal trend and cycle components of operating cash flow.

its home country, where the institutional quality is measured by the composite investor protection index (La Porta et al. 2006). To identify a sample of control firms, for each firm that is cross-listed in a year, we select a domestic firm from the same home country and the same industry (classified by the 2-digit SIC code) and whose size (measured by total assets) is closest to that of the cross-listing firm. We include both the cross-listing firms and their control firms in the cross-listing sample.

4.2 Summary of descriptive statistics

Table 1 presents the composition of the general sample with the indices of investor protection strength and that of the sample of the cross-listing firms (together with the control firms). We report the distribution of the sample firms by year in panel A of Table 1 and by country in panel B. We tabulate the investor protection index and the anti-self-dealing index for each country in panel B.

[Table 1 about here]

Table 2 reports the summary statistics for the main variables from the general sample.[10] The summary statistics are computed for the pooled sample and for the partitioned subsamples. For the pooled sample, the mean (median) of *Investment* is 0.1 (0.069) and the mean (median) of $\Delta Cash$ is 0.003 (0.001). The mean (median) of *Dividend* is 0.016 (0.008). In computing the summary statistics, we do not multiply the financing variables by minus one to ensure intuitive statistics. *External financing* has a mean (median) of 0.038 (0.004), indicating that firms in the sample on average borrow from external investors. *Debt financing* has a mean (median) of 0.051 (0.014) and *Equity financing* has a mean (median) of -0.014 (-0.014), indicating that firms on average borrow

[10] We do not present the descriptive statistics for the cross-listing sample for brevity. The results are available upon request.

debt while buying back equity. The mean of the cycle component of operating cash flow (*OCF_Cycle*) is close to zero, confirming that it has a zero-mean stationary process as its basic feature, while the trend component (*OCF_Trend*) has a mean of 0.083, close to the mean level of operating cash flow.

[Table 2 about here]

No reliable difference exists in *Investment* and Δ*Cash* between the partitioned subsamples. *Debt financing* has larger and positive mean and median values in countries with weak investor protection, implying that firms in these countries rely more on debt financing because debtors suffer less from information asymmetry and managerial moral hazard. *Equity financing* has more negative mean and median values in countries with strong investor protection when the subsamples are classified according to the investor protection index, implying that these firms repurchase equity more. In terms of total *External financing*, firms from countries with weak investor protection borrow more (via *Debt financing*). The mean and median of *Dividend* are higher in countries with strong shareholder rights. The descriptive statistics for other control variables are generally comparable to prior literature (Dittmar et al. 2003; Kusnadi and Wei 2011).

Panel B of Table 2 presents the Pearson correlation among variables used in the regressions. *Investment*, Δ*Cash*, and *Dividend* are all significantly positively correlated with *Operating cash flow*. *Equity financing* and *Debt financing*, as well as *External financing*, have negative coefficients of correlation with *Operating cash flow*, indicating that firms retire external financing with cash inflow. The correlation coefficient between *OCF_Trend* (*OCF_Cycle*) and *Operating cash flow* is 0.786 (0.589), while that between *OCF_Cycle* and *OCF_Trend* is a mere 0.03.

5. Empirical Results

5.1 Baseline regression results

Table 3 reports the full-sample regression results obtained using the equation system. We tabulate the regression results for both static (panel A) and dynamic (panel B) fund allocation decisions. In both panels, reducing external financing and increasing cash saving are the two major cash uses. In panel A, out of every dollar increase in internal cash flow, 47.1¢ is used to retire external financing and 36.5¢ is saved. This suggests that firms usually face constraints on accessing external financial markets, and when they have cash inflow, they will replace costlier external funds with internally generated cash flow. Only 11.9¢ is invested and 2.4¢ is paid out as dividends.

[Table 3 about here]

In panel B, we consider the intertemporal transmission of funds and include two additional cash flow variables OCF_{t-1} and OCF_{t-2}. The coefficients on lagged cash flow variables indicate how the fund allocation decisions change in response to the changes in past cash flows; alternatively, they can be interpreted as how the current cash flow shock induces a change in the fund allocation decisions in subsequent periods. The inclusion of these two cash flow variables does not change the short-term cash flow sensitivities dramatically. However, the significant coefficients on lagged cash flow variables indicate that cash flow shocks generate a long-term impact on investment, cash saving, retirement of financing, and dividend payment.

As reported in panel B, most internal funds are used to retire external financing. With a dollar increase in cash flow in the current year, the contemporaneous cash flow sensitivity is 0.471, indicating that firms replace external financing by 47.1¢. Furthermore, this additional dollar of cash flow induces firms to *raise* external finance two years later, albeit by 0.7¢ (= 0.5¢ −1.2¢),

resulting in a cumulative cash flow sensitivity of 0.464. Thus, a positive cash flow shock in a year enhances firms' financing capacity such that they can borrow more external funds in later years.

The second largest portion of internal funds is allocated to cash reserves. The contemporaneous cash to cash flow sensitivity is positive and significant; firms save 36.9¢ out of every dollar increase in cash inflow. Meanwhile, 9.9¢ (= 7.5¢ +2.4¢) of saved cash is depleted in the following two years. Over the three-year period, cumulative cash to cash flow sensitivity indicates that firms save 27¢ (= 36.9¢ -7.5¢ -2.4¢) in total out of every dollar of cash flow.

Firms immediately spend a modest 11.3¢ of internally generated cash flows on investment. Over the next two years, firms spend an additional 14.1¢ (= 8.9¢ +5.2¢) on investment following the increase in cash flow in the current period. The results suggest that the investment associated with the increase in internal funds is staged over time. Looking at the regression results on dividend payment, (retirement of) external financing, and cash saving, it seems that the investment is largely financed with cash reserves (9.9¢).

Dividend to cash flow sensitivities are very small. The contemporaneous dividend to cash flow sensitivity shows that when firms generate an additional dollar from operating activities, only 2.2¢ of that is paid out as current-period dividends. Although firms increase their dividend payout in the following two years, the overall magnitude is 4.7¢ (= 2.9¢ +1.8¢). Over the three years, 6.9¢ is paid out as cash dividends for every dollar increase in cash flow.

It is worthwhile to point out the differences between the short- and long-term effects of cash inflow on investment and cash saving (i.e., the difference between contemporaneous and cumulative cash flow sensitivity). Contemporaneous investment to cash flow sensitivity is modest, while the long-term effects show that firms make sizable investment with saved cash over the

three-year period (a contemporaneous investment of 11.3¢ vs. a cumulative investment of 25.4¢). The cash to cash flow sensitivities suggest that firms save cash in the short term while spending cash in subsequent years (a contemporaneous saving of 36.9¢ vs. a cumulative saving of 27¢).[11]

The coefficients on control variables are consistent with earlier studies. For example, *Tobin's Q* loads on a negative coefficient in the external financing regression, consistent with earlier studies finding that firms with more growth opportunities borrow more. *Tobin's Q* has a positive effect on investment, indicating firms invest when *Tobin's Q* increases. *Tobin's Q* is slightly negatively related to changes in cash, because firms save less when more growth opportunities are available to them. *Tobin's Q* is positively correlated with dividend payout. This is possibly because when high-growth firms (proxied by high *Tobin's Q*) in common-law countries (e.g. the U.S.) pay lower dividends, growth firms in civil-law countries (e.g. Germany, Japan and France) may pay higher dividends in order to attract investors (La Porta et al. 2000; Denis and Osobov 2008).[12] When *Leverage* increases, firms raise less external finance and cut down on investment, suggesting financial distress or debt overhang. Firms with higher *Leverage* also pay out lower dividends, possibly indicating the presence of dividend-restricting covenants. When the financial condition as measured by *Z-score* improves, firms add less to cash balances and pay out more. When *Return volatility* is large, firms invest less, cut dividends but add more to cash balances, indicating information asymmetry affects the use of funds.

[11] To mitigate the concern that firms' fund allocation decisions (e.g. the propensity to save cash or retire external financing with the cash inflow) are driven by certain economic sectors, we classify manufacturing firms further into the durable goods sector, the non-durable goods sector and the high-tech sector. We find that our results are not concentrated in certain sectors. These additional findings are available upon request. We thank a reviewer for suggesting the test.

[12] In a separate test, we test the relationship between dividend payment and *Tobin's Q*, conditional on a country's legal regime. We find that firms with high *Tobin's Q* in common-law countries pay lower dividends, while firms with high *Tobin's Q* in civil-law countries pay significantly higher dividends. The finding lends support to La Porta et al. (2000) and Denis and Osobov (2008) and suggests that dividends serve as a substitute for weaker governance.

The fact that cash flow contains information about future growth opportunities may bias the OLS coefficients in Table 3. To mitigate this concern, we use the Hodrick–Prescott approach to decompose operating cash flow into a trend component and a cycle component.[13] The results are reported in Table 4. As the trend component of cash flow contains more information about future growth, we find that in the static model, the coefficient on the trend component (32.2¢) in the investment equation is much larger than that on the cycle component (4.9¢). We also find that the main results on raw cash flow continue to hold for the cycle component. As suggested by cumulative cash flow sensitivities, firms use 55.5¢ (= 55.8¢ +3.1¢ −3.4¢) to reduce external financing, 23.8¢ (= 35¢ −9.7¢ −1.5¢) to increase cash balances, and 12.2¢ (= 6.2¢ +4¢ +2¢) to invest. Meanwhile, 4¢ (= 0.8¢ +2.1¢ +1.1¢) is paid out as dividends.

[Table 4 about here]

5.2 The role of investor protection

We now examine how the strength of investor protection affects the fund allocation decisions. To test our hypothesis, we introduce a dummy variable (*Dummy*) based on whether a firm is from a strong protection countries. *Dummy* equals one if a firm is from a country whose investor protection index (or anti-self-dealing index) is above the sample median and zero otherwise. *Dummy* is also set to one if a firm is cross-listed in a country with better institutional quality than its home country. We interact *Dummy* with OCF_t, OCF_{t-1}, and OCF_{t-2} in each equation in Eq. (2). Because we have documented an intertemporal pattern in the fund allocation decisions in our earlier tests, we focus on the dynamic equation system in this section.

[13] When implementing the Hodrick-Prescott decomposition, we require a firm to have at least six (years of) consecutive operating cash flow data. Thus, the sample with the non-missing cycle component of operating cash flow contains mostly large firms and the sample size is almost halved in this part of the analysis.

Table 5 reports the results on both raw cash flow and the cycle component of cash flow.[14] For ease of exposition, the results on control variables are omitted. The most important cash use is to retire external financing. We find that with a dollar increase in cash flow, firms located in countries with strong investor protection use more cash flows to retire external financing over a three-year period, and the reduction in external financing occurs mostly in the year when internal funds are generated. Take the regression results on subsamples partitioned by anti-self-dealing as an example. The contemporaneous external financing to cash flow sensitivity is 46.8¢ and the cumulative external financing to cash flow sensitivity is 42.4¢ (= 46.8¢ +1.1¢ −5.5¢) for firms with a low anti-self-dealing index, while the contemporaneous external financing to cash flow sensitivity is 49.9¢ (=46.8¢ +3.1¢) and the cumulative external financing to cash flow sensitivity is 49.4¢ (= 42.4¢ +3.1¢ −1.2¢ +5.1¢) for firms with a high anti-self-dealing index. The finding suggests that well-governed firms retire costlier external funds when cheaper internal funds are available.

[Table 5 about here]

The results for dividend payout across the two subsamples are somewhat mixed with different indices of investor protection strength used. We find that well-governed firms classified with the investor protection index or cross-listed firms pay higher dividends, in both the short and the long run. However, well-governed firms classified with the anti-self-dealing index pay higher dividends in response to concurrent cash inflow, while paying lower dividends over the three years.

The findings suggest that firms in countries with strong investor protection retire more external financing, net of dividends.

[14] Because of the reduced sample size after we decompose the operating cash flow, we interpret the results obtained with the raw cash flow variable.

Regarding cash saving, the second largest use of internal funds, firms save cash in the year when internal funds are generated and use cash in the subsequent periods. Again, take the results with the anti-self-dealing index as an example. The cumulative cash to cash flow sensitivity is 28.2¢ (= 40¢ −8.9¢ −2.9¢) for firms with a low anti-self-dealing index and 26.3¢ (= 28.2¢ −4.2¢ +1.7¢ +0.6¢) for firms with a high anti-self-dealing index. Both the short-term and cumulative cash to cash flow sensitivities suggest that firms have a lower propensity to save in jurisdictions with stronger shareholder rights, possibly reflecting a weaker precautionary saving motive and/or fewer private benefits of holding cash in these jurisdictions (Kusnadi and Wei 2011; Dittmar et al. 2003).

We do not find a reliable difference in investment to cash flow sensitivities between the subsamples. No matter how we classify the subsamples, in countries with strong (weak) investor protection, neither the contemporaneous investment to cash flow sensitivity nor the cumulative investment to cash flow sensitivity is significantly different. Lins et al. (2005), Biddle and Hilary (2006), and Schleicher et al. (2010) have argued that investment to cash flow sensitivity should be lower for firms having less information asymmetry and moral hazard problems. However, as far as the interdependent and intertemporal nature of fund allocation decisions is concerned, firms can delay the investment to a future point in time; and their investment can be funded with cash holdings and/or extra external capital, instead of operating cash flow alone. Thus, the differences in investment to cash flow sensitivities between firms having strong and weak investor protection are no longer significant.

We redo the tests with operating cash flow decomposed and tabulate the results on the cycle component in panel B. We note that the comparison on cash saving between the subsamples with strong and weak investor protection is no longer statistically significant when the subsamples are

classified by the anti-self-dealing index. However, our main conclusions—well-governed firms retire external financing (net of dividends) more and save less in countries with strong investor protection mechanisms—by and large hold with the modification to the cash flow measure.

Overall, results in Table 5 suggest that firms in countries with strong investor protection use most of their cash flow to retire external financing and save less. At the same time, we find no systematic difference in investment to cash flow sensitivities between firms with strong and weak governance.

5.3 Equity financing versus debt financing

As firms allocate most of their cash inflow to the retirement of external financing, it is natural for us to examine how firms adjust their debt and equity in response to the cash flow shock, i.e., whether the retirement of equity or of debt takes precedence. Equity financing is more costly than debt financing because it is more sensitive to the problems of information asymmetry and moral hazard. Thus, firms may have stronger incentives to reduce the magnitude of equity financing when they have cash inflows, in order to reduce the financing cost. However, if mitigating the debt overhang problem (i.e., underinvestment by firms) or liquidity risk is among the main reasons for firms to reduce external financing, debt financing may be the driving force behind the finding on retirement of external financing. We further divide debt financing into short-term and long-term debt financing because the difference in debt maturity imposes liquidity risks on firms at the end of different horizons.

Table 6 reports the results with external financing separated into equity and debt financing. Panel A reports the results for the pooled sample and panels B and C those for the partitioned subsamples. It is evident from panel A that firms reduce equity financing to a greater extent.

Regarding the retirement of debt, short-term debt takes precedence over long-term debt. Most short-term debt is paid down in the year of the cash flow shock. The significant reduction in short-term debt, rather than long-term debt, with an increase in cash inflow suggests that firms would cut short-term debt to avoid failure in meeting their debt obligation in the near term while maintaining long-term debt to capture interest tax shields.

[Table 6 about here]

Panels B and C provide a comparison between investor protection subsamples, focusing on raw cash flow and the cycle component of cash flow, respectively. The results suggest that the repurchase of equity is mainly driven by firms from countries with a portfolio of strong investor protection mechanisms.

6. Valuation Implication of Fund Allocation Decisions

In the last part of the analysis, we evaluate the economic significance of our findings derived from the equation system. Specifically, we examine how each of the four cash flow sensitivities is associated with a firm's cost of equity capital, which reflects the shareholders' perceived risks embedded in their investment in different firms.

Cateris paribus, if firms employ less external financing, they may bear a lower financing cost. Meanwhile, if firms save less internal funds, shareholders may charge a lower required rate of return, because investors perceive that managers are less likely to expropriate internal funds for private benefits. We therefore expect the cost of equity capital to be lower for firms that retire external financing more and/or save less.

However, it is not clear *ex ante* how the investment to cash flow sensitivity should be associated with the cost of equity capital. In the static model (Kaplan and Zingales1997, 2000;

Cleary 1999; Biddle and Hilary 2006), firms that can access external funds at a lower cost exhibit a lower investment to cash flow sensitivity, because they can easily resort to contemporaneous external funds (the only alternative to internal fund) to finance their investment. This rationale indicates a positive relationship between the cost of capital and the investment to cash flow sensitivity. On the other hand, Dasgupta et al. (2011) and Chang et al. (2014) show that this positive relationship may not always hold in the multi-period model. They show that firms having easy access to external funds delay a large portion of investment to the future (a feature overlooked in the conventional model), and the investment can be fueled by the internal funds accumulated from past years, rather than resorting to external funds. Thus, the cost of equity capital and the investment to cash flow sensitivity can be unrelated (when external financing is not a concern) or even negatively correlated. In sum, the relationship between the cost of capital and investment to cash flow sensitivity is not unambiguous because it is determined by the extent to how firms stage their investment over time and how firms use external funds, internal funds, and dividend cut/termination (or combinations of these resources) in financing the investment.

To test how the cash flow sensitivities are related to the cost of equity capital, we estimate the cash flow sensitivities for each firm in each year by estimating Eq. (2) over past five years. We then regress the cost of equity capital on individual cash flow sensitivity for each firm-year.[15] Following the literature, we estimate the cost of equity capital as implied in the current stock price and analysts' earnings forecasts based on four different models (Gebhardt et al. (2001); Claus and Thomas (2001); Ohlson and Juettner-Nauroth (2005) implemented by Gode and Mohanram (2003);

[15] To obtain a reasonable sample size to more accurately and timely estimate the cash flow sensitivities for each firm in this test, we estimate cash flow sensitivities by running each of the four financial decisions on *contemporaneous, raw* operating cash flow with a rolling window of past five years.

Easton (2004)). We use the average estimates from these models as our measure of the cost of equity capital to mitigate the measurement errors associated with one particular model.

Table 7 reports the results on the relationship between the cost of equity capital and each of the cash flow sensitivities. In panel A, we tabulate the descriptive statistics of the cost of equity capital estimates for our sample firms. In panel B, we regress the implied cost of equity capital on individual cash flow sensitivity. The regression results reveal a negative association between the cost of equity capital and the external financing to cash flow sensitivity, which indicates that firms retiring more external financing (i.e., borrowing less from external investors) show a lower cost of equity capital. We find a positive association between the cost of equity capital and the cash to cash flow sensitivity, suggesting that when firms have a lower cost of equity capital, they save less out of internally generated funds. We do not find a reliable relationship between the cost of equity capital and the investment to cash flow sensitivity. The relationship between the cost of equity capital and the dividend to cash flow sensitivity is also insignificant in our sample, possibly because the magnitude of dividend is quite small.

[Table 7 about here]

When implementing the tests on the implied cost of equity capital, we control for additional variables that may affect the cost of equity capital following prior studies, such as beta and analyst forecast biases (Chen, Chen and Wei 2011; El Ghoul et al. 2011). The signs on the control variables are consistent with earlier studies.

Overall, the results indicate that cash flow sensitivities estimated from the simultaneous equation system have a valuation impact. A larger external financing (measured as $-XFIN$ in our setting) to cash flow sensitivity and/or a smaller cash to cash flow sensitivity is associated with a lower cost of equity capital. The findings help explain the financing cost difference between

countries with high and low investor protection quality, which shows a significant difference in the retirement of external financing and cash saving.

7. Conclusion

This study investigates the fund allocation decisions of manufacturing firms in an international sample from 1993 to 2014. Using the multi-period equation system, we find that firms in our sample spend almost half of the internally generated cash flows to reduce external financing, one quarter to boost investment and another quarter to increase cash reserves. Dividend payment makes up a very small amount of the newly added cash flows.

After partitioning the sample according to the strength of investor protection in each country, we find that well-governed firms save less and retire more external financing, and the retirement of external financing in well-governed firms is mostly driven by the reduction of equity, the more costly financing option. However, we find no reliable difference in the investment to cash flow sensitivities between subsamples of firms partitioned by the strength of investor protection. Consistent with the notion that investors charge the required rate of return according to the riskiness of their investment, we find a lower cost of equity capital in firms that save less and/or retire more external financing, possibly because the investors perceive a lower likelihood of expropriation of internal funds by managers.

Overall, with the multi-period equation system on fund allocation decisions, we provide a new perspective for researchers and practitioners to understand the financial policies in an international setting.

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Appendix A. Variable definitions

Variables	Definitions	Sources
Main Variables		
Investment	Sum of capital expenditure (WC04601), additions to other assets (WC04651), increase in investment (WC04760), other uses-investing (WC04795), net assets from acquisition (WC04355) and sale of fixed assets (WC04351), scaled by lagged total assets (WC02999)	Worldscope
ΔCash	Change in cash and short-term investments (WC04851), scaled by lagged total assets (WC02999)	Worldscope
External financing	Sum of net equity issuance and net debt issuance, scaled by lagged total assets (WC02999)	Worldscope
Debt financing	Sum of long-term borrowings (WC04401) and short-term borrowings (WC04821), scaled by lagged total assets (WC02999)	Worldscope
Equity financing	Sum of net cash flow from financing (WC04890) and the sale of common and preferred stock (WC04251) minus the purchase of common and preferred stock (WC04751), scaled by lagged total assets (WC02999)	Worldscope
Dividend	Total cash dividend paid (WC04551), scaled by lagged total assets (WC02999)	Worldscope
Operating cash flow (OCF)	Sum of earnings before extra item (WC04001) and depreciation and amortization (WC04051) minus working capital accruals, scaled by lagged total assets. Working capital accruals are defined following Bushman, Smith and Zhang (2011).	Worldscope
OCF_Cycle	The cycle component of operating cash flow decomposed with the Hodrick-Prescott approach	Worldscope
OCF_Trend	The trend component of operating cash flow decomposed with the Hodrick-Prescott approach	Worldscope
R_{AVG}	The average of four cost of equity capital estimates following earlier studies (Easton 2004; Ohlson and Juettner-Nauroth 2005; Gode and Mohanram 2003; Gebhardt, Lee and Swaminathan 2001; Claus and Thomas 2001)	I/B/E/S
Control Variables		
Turnover	Median monthly volume (VO) over a fiscal year divided by average shares outstanding (NOSH) over a fiscal year	Datastream
Leverage	Sum of long-term debt (WC03251) and debt in current liabilities (WC03051), scaled by total assets (WC02999)	Worldscope
Z-score	1.2*[current assets (WC02201)−current liabilities (WC03101)]/total assets (WC02999)+1.4*retained earnings (WC03495)/total assets +3.3*[pretax income (WC01401)+ interest expense (WC01075)]/total assets + 0.6*[market value of equity (WC08001)/book value of liabilities (WC03351)]+ sales (WC01001)/total assets	Worldscope
Size	Natural logarithm of total assets in million US dollars (WC07230)	Worldscope
Tobin's Q	[Total assets (WC02999) + market capitalization (WC08001) − common equity (WC03501)]/Total assets (WC02999)	Worldscope
Annual return	Compounded monthly stock returns from eight months before the fiscal year-end to four months after the fiscal year-end. Monthly stock returns are calculated from the monthly return index (RI).	Datastream

Return volatility	Standard deviation of monthly stock returns from eight months before the fiscal year-end to four months after the fiscal year-end. Monthly stock returns are calculated from the monthly return index (RI).	Datastream
BTM	Book value of common equity (WC03501)/market value of equity (WC08001)	Worldscope
Beta	Market beta estimated by the market model using monthly returns in the previous 60 (at least 24) months	Datastream
Fbias	Analyst earnings forecast bias, defined as forecasted EPS minus actual EPS from I/B/E/S, scaled by price. When an actual EPS is missing, we use the actual EPS reported in Worldscope	I/B/E/S and Worldscope
FLTG	Median value of analyst forecasts of long-term earnings growth rate. When the forecast is missing, we use the growth rate implied in the short-term analyst earnings forecastss	I/B/E/S
Partitioning Variables		
CrList	A dummy variable indicating if a firm is cross-listed in a country whose institutional quality is better than its home country	Osiris
Investor protection index	The investor protection index developed by La Porta et al. (1998, 2006), which is a principal component of indices on disclosures, liability standards and anti-director rights, with a higher value indicating higher institutional quality.	La Porta et al. (1998, 2006)
Anti-self-dealing index	The anti-self-dealing index developed by Djankov et al. (2008), with a higher value indicating higher institutional quality.	Djankov et al. (2008)

Appendix B. Estimation of the implied cost of equity

We define the variables used in estimation models of implied cost of equity capital as follows,

P_t	=	Stock price at the end of month +10 after the end of fiscal year t
B_t	=	Book value of equity per share from the most recent available financial statement at year t
$FEPS_{t+i}$	=	Median forecasted EPS from I/B/E/S or derived EPS forecasts for next *i*th year in month +10 after the end of year t
DIV_t	=	Dividend payout ratio, defined as the ratio of annual dividends to earnings. If the earnings is negative, we assume a return of assets of 6% to calculate earnings. It is winsorized between 0 and 1.

***1. r = R_{GLS}* (Gebhardt et al. 2001)**

$$P_t = B_t + \sum_{i=1}^{T-1} \frac{(froe_t - r)B_{t+i-1}}{(1+r)^i} + \frac{(froe_{t+T} - r)B_{t+T-1}}{r(1+r)^{T-1}} \quad \text{(B-1)}$$

where $froe_t = FEPS_t/B_{t-1}$. We use I/B/E/S analyst earnings forecast to proxy for the market expectation of a firm's $froe_t$ for t = 1, 2, 3. From the 4th year to the 12th year, we measure the market earnings expectation by assuming that the future *roe* declines linearly to the historical, 10-year median *roe* in the Fama-French 48 industries. *roe* is defined as income available for common shareholders (#*ibcom*) scaled by lagged book value of equity (#*ceq*). B_t is derived by assuming clean surplus relation, i.e., $B_t = B_{t-1} + FEPS_t(1\text{-}DIV_t)$. We assume T=12. We use numerical approximation to solve for r that equates both sides of (B-1) within a difference of \$0.001.

2. r = R_{CT} (Claus and Thomas 2001)

$$P_t = B_t + \sum_{i=1}^{5} \frac{(FEPS_{t+i} - r \times B_{t+i-1})}{(1+r)^i} + \frac{(FEPS_5 - rB_4)}{(r - g_L)(1+r)^5} \quad \text{(B-2)}$$

We use the I/B/E/S earnings forecast to derive the abnormal earnings for the next 5 years. $FEPS_4$ and $FEPS_5$ are derived from earnings forecasts for $FEPS_3$ and the long-term earnings growth rate reoprted in I/B/E/S. If long-term earnings growth rate is missing in I/B/E/S, an implied growth rate is computed with $FEPS_2$ and $FEPS_1$. g_L is the perpetual growth rate, computed as contemporaneous risk-free rate (the yield on 10-year treasury bonds) minus 3%. B_t (t = 1 to 4) is derived by assuming clean surplus relation, i.e., $B_t = B_{t-1} + FEPS_t(1 - DIV_t)$. We use numerical approximation to solve for r that equates both sides of (B-2) within a difference of \$0.001.

3. r = R_{OJ} (Ohlson and Juettner-Nauroth (2005) implemented by Gode and Mohanram (2003))

$$P_t = \frac{FEPS_1}{r} + \frac{FEPS_1(g_S - r(1 - DIV_t))}{r(r - g_L)} \quad \text{(B-3)}$$

The estimation of this model requires $FEPS_2 > 0$ and $FEPS_1 > 0$. g_S is the short-term earnings growth rate computed as $(FEPS_2 - FEPS_1)/FEPS_1$. g_L is the perpetual growth rate, computed as contemporaneous risk-free rate (the yield on 10-year treasury bonds) minus 3%. We use numerical approximation to solve for r that equates both sides of (B-3) within a difference of \$0.001.

***4. r = R_{PEG}* (the modififed PEG model in Easton (2004))**

$$P_t = \frac{FEPS_1}{r} + \frac{FEPS_1(g_S - r(1 - DIV_t))}{r^2} \quad \text{(B-4)}$$

We use numerical approximation to solve for r that equates both sides of (B-4) within a difference of \$0.001.

Table 1 Sample distribution

This table reports the composition of samples used in the analysis. Two samples are used: one general sample containing international manufacturing firms available in Worldscope between 1993 and 2014, and a cross-listing firm sample used for tests when investor protection strength is proxied by firms' cross-listing status. Panel A reports the distribution of firms by year. Panel B reports the distribution of firms by country. The investor protection index (Le Porta et al. 2006) and anti-self-dealing index (Djankov et al. 2008) are also presented.

Panel A: Distribution by year

	General sample		Cross-listing sample	
Year	Frequency	Percent	Frequency	Percent
1993	790	0.93	2	0.02
1994	1,422	1.68	8	0.10
1995	1,573	1.85	10	0.12
1996	1,681	1.98	8	0.10
1997	2,000	2.36	10	0.12
1998	2,170	2.56	12	0.15
1999	2,634	3.11	20	0.25
2000	2,640	3.11	22	0.27
2001	3,161	3.73	28	0.35
2002	3,662	4.32	38	0.47
2003	3,958	4.67	64	0.80
2004	4,269	5.03	228	2.83
2005	4,383	5.17	286	3.56
2006	4,512	5.32	406	5.05
2007	4,531	5.34	496	6.17
2008	4,743	5.59	572	7.11
2009	4,968	5.86	628	7.81
2010	4,862	5.73	714	8.88
2011	4,932	5.82	790	9.82
2012	6,427	7.58	1,026	12.75
2013	7,678	9.05	1,270	15.79
2014	7,812	9.21	1,406	17.48
Total	84,808	100	8,044	100

Panel B: Distribution by country

	General sample		Cross-listing sample					General sample		Cross-listing sample			
Country	Frequency	Percent	Frequency	Percent	Investor protection index	Anti-self dealing index	Country	Frequency	Percent	Frequency	Percent	Investor protection index	Anti-self dealing index
AUSTRALIA	1,280	1.51	144	1.79	0.78	0.76	MEXICO	467	0.55	84	1.04	0.1	0.17
AUSTRIA	435	0.51	72	0.9	0.1	0.21	NETHERLANDS	376	0.44	68	0.85	0.54	0.2
BELGIUM	238	0.28	94	1.17	0.07	0.54	NEW ZEALAND	147	0.17	44	0.55	0.46	0.95
BERMUDA	33	0.04	N/A	N/A	N/A	N/A	NIGERIA	40	0.05	N/A	N/A	0.36	0.43
BRAZIL	442	0.52	56	0.7	0.44	0.27	NORWAY	222	0.26	44	0.55	0.44	0.42
CANADA	1,511	1.78	220	2.74	0.96	0.64	OMAN	42	0.05	4	0.05	N/A	N/A
CHILE	472	0.56	14	0.17	0.61	0.63	PAKISTAN	393	0.46	10	0.12	0.63	0.41
CHINA	4,919	5.8	406	5.05	N/A	N/A	PERU	143	0.17	16	0.2	0.66	0.45
COLOMBIA	142	0.17	12	0.15	0.35	0.57	PHILIPPINES	376	0.44	20	0.25	0.81	0.22
CROATIA	56	0.07	N/A	N/A	N/A	0.25	POLAND	580	0.68	56	0.7	N/A	0.29
DENMARK	612	0.72	194	2.41	0.36	0.46	QATAR	47	0.06	N/A	N/A	N/A	N/A
EGYPT	185	0.22	40	0.5	0.2	0.2	RUSSIA	195	0.23	40	0.5	N/A	0.44
FINLAND	600	0.71	128	1.59	0.47	0.46	SAUDI ARABIA	247	0.29	N/A	N/A	N/A	N/A
FRANCE	1,585	1.87	140	1.74	0.47	0.38	SINGAPORE	1,692	2	246	3.06	0.77	1
GERMANY	2,118	2.5	312	3.88	0	0.28	SLOVAKIA	30	0.04	N/A	N/A	N/A	0.29
GREECE	482	0.57	98	1.22	0.32	0.22	SLOVENIA	48	0.06	12	0.15	N/A	N/A
HONG KONG	2,628	3.1	62	0.77	0.85	0.96	SOUTH AFRICA	715	0.84	172	2.14	0.6	0.81
HUNGARY	121	0.14	10	0.12	N/A	0.18	SPAIN	309	0.36	20	0.25	0.55	0.37
INDIA	904	1.07	12	0.15	0.77	0.58	SRI LANKA	176	0.21	N/A	N/A	0.4	0.39
INDONESIA	251	0.3	2	0.02	0.51	0.65	SWEDEN	983	1.16	106	1.32	0.39	0.33
IRELAND	308	0.36	36	0.45	0.48	0.79	SWITZERLAND	1,323	1.56	90	1.12	0.3	0.27
ISRAEL	523	0.62	66	0.82	0.59	0.73	TAIWAN	5,835	6.88	1,002	12.46	0.55	0.56
ITALY	1,077	1.27	152	1.89	0.2	0.42	THAILAND	655	0.77	120	1.49	0.37	0.81
JAPAN	14,648	17.27	1,890	23.5	0.42	0.5	TURKEY	912	1.08	302	3.76	0.34	0.43
JORDAN	79	0.09	N/A	N/A	0.24	0.16	UNITED KINGDOM	4,653	5.49	338	4.2	0.78	0.95
KOREA (SOUTH)	5,913	6.97	824	10.25	0.36	0.47	UNITED STATES	19,241	22.69	N/A	N/A	1	0.65
KUWAIT	84	0.1	N/A	N/A	N/A	N/A	VENEZUELA	73	0.09	62	0.77	0.22	0.09
LUXEMBOURG	77	0.09	6	0.07	N/A	0.28	VIETNAM	231	0.27	N/A	N/A	N/A	N/A
MALAYSIA	2,934	3.46	196	2.44	0.73	0.95							

Table 2 Descriptive statistics for the full sample

This table reports the summary statistics for the variables used in the analysis (panel A) and Pearson correlation coefficients among variables (panel B). In both panel A and panel B, we do not multiply the external financing variables by minus one to ensure intuitive statistics. The correlation coefficients are mostly significant at the 10 percent (or above) level except those marked with #.

Panel A: Summary statistics

	Pooled sample (N = 84,808)			Investor protection index					Anti-self dealing index				
				Low (N =40,572)		High (N = 44,236)			Low (N = 40,679)		High (N =44,129)		
Variables	Mean	Median	Std. Dev.	Mean	Median	Mean	Median	T test of mean difference	Mean	Median	Mean	Median	T test of mean difference
Investment	0.1	0.069	0.099	0.105	0.078	0.102	0.069	1.53	0.105	0.072	0.103	0.07	1.44
ΔCash	0.003	0.001	0.061	0.005	0.002	0.004	0.002	1.32	0.004	0.001	0.004	0.002	-0.32
External financing	0.038	0.004	0.145	0.042	0.002	0.033	0.002	3.56***	0.038	0.006	0.029	0.001	6.23***
Debt financing	0.051	0.014	0.095	0.053	0.017	0.05	0.014	8.99***	0.054	0.023	0.043	0.01	13.22***
Equity financing	-0.014	-0.014	0.085	-0.01	-0.01	-0.018	-0.019	10.58***	-0.015	-0.015	-0.014	-0.014	-1.02
Dividend	0.016	0.008	0.024	0.014	0.007	0.018	0.008	-15.23***	0.013	0.007	0.015	0.007	-3.04***
Operating cash flow	0.076	0.073	0.084	0.079	0.078	0.08	0.08	-0.63	0.08	0.075	0.076	0.073	4.33***
OCF_Cycle	0.001	0.000	0.047	0.000	0.000	0.001	0.000	-0.96	0.001	0.000	0.001	0.000	0.10
OCF_Trend	0.083	0.076	0.061	0.076	0.07	0.089	0.083	-21.65***	0.088	0.083	0.083	0.076	6.24***
Turnover	0.091	0.04	0.14	0.085	0.036	0.083	0.04	1.23	0.048	0.018	0.09	0.044	-35.69***
Leverage	0.237	0.22	0.165	0.249	0.236	0.23	0.214	15.66***	0.246	0.238	0.236	0.217	6.03***
Z score	1.649	1.705	1.098	1.68	1.702	1.66	1.775	1.34	1.668	1.663	1.666	1.743	0.33
Size	5.98	5.866	1.83	6.223	6.1	5.708	5.542	34.88***	6.206	5.998	5.936	5.837	21.96***
Tobin's Q	1.406	1.143	0.854	1.232	1.135	1.498	1.223	-40.23***	1.312	1.062	1.373	1.118	-2.55**
Annual return	0.162	0.063	0.554	0.146	0.06	0.15	0.059	-0.98	0.155	0.064	0.146	0.058	1.69*
Return volatility	0.119	0.1	0.072	0.118	0.094	0.125	0.104	-6.28***	0.102	0.09	0.12	0.101	-23.45***

Panel B: Pearson correlation for the pooled sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Investment (1)	**1**	**-0.107**	**0.083**	**0.043**	**0.094**	**0.072**	**0.202**	**0.028**	**0.295**	**0.142**	**-0.1**	**0.064**	**0.085**	**0.194**	0.005#	**-0.018**
ΔCash (2)		**1**	**0.068**	**-0.007**	**0.115**	**0.012**	**0.401**	**0.328**	**0.208**	**0.009**	**-0.017**	**0.085**	**0.047**	**0.041**	**0.127**	**-0.041**
External financing (3)			**1**	**0.8**	**0.759**	**-0.159**	**-0.271**	**0.194**	**0.193**	**0.092**	**0.133**	**-0.103**	0.004#	**-0.052**	**-0.029**	**0.082**
Debt financing (4)				**1**	**0.23**	**0.025**	**-0.085**	**0.149**	**-0.006**	**0.093**	**0.17**	**-0.016**	0.068#	**0.018**	**0.006**	**0.01**
Equity financing (5)					**1**	**-0.293**	**-0.356**	**0.181**	**0.305**	**0.051**	**0.033**	**-0.149**	**-0.063**	**-0.11**	**-0.056**	**0.121**
Dividend (6)						**1**	**0.352**	**0.01**	**0.458**	**-0.056**	**-0.188**	**0.277**	**0.077**	**0.313**	**0.017**	**-0.22**
Operating cash flow (7)							**1**	**0.589**	**0.786**	**0.021**	**-0.062**	**0.267**	**0.152**	**0.275**	**0.145**	**-0.166**
OCF_Cycle(8)								**1**	**0.03**	**0.029**	-0.005#	**-0.025**	**-0.023**	**0.037**	**0.071**	**0.024**
OCF_Trend (9)									**1**	**0.095**	**-0.118**	**0.314**	**0.17**	**0.526**	**0.144**	**-0.167**
Turnover (10)										**1**	**0.059**	**-0.061**	**0.106**	**0.195**	**0.15**	**0.19**
Leverage (11)											**1**	**-0.333**	**0.117**	**-0.088**	0.004#	**0.087**
Z score (12)												**1**	**0.111**	**0.036**	**0.009**	**-0.234**
Size (13)													**1**	**0.049**	**-0.015**	**-0.285**
Tobin's Q (14)														**1**	**0.203**	**-0.019**
Annual return (15)															**1**	**0.156**
Return volatility (16)																**1**

Table 3 Fund allocation decisions: static vs. dynamic models in the pooled sample

This table reports the regression results of applying the equation system to the pooled sample. All variables are defined in Appendix A. The dependent variables and operating cash flow (*OCF*) variables are constructed with Statement of Cash Flow data. CUM_CFS is the cumulative cash flow sensitivity (i.e. the sum of coefficients on cash flows over three years). SUM is the sum of coefficients from the regressions on investment, cash saving, the retirement of external finance and dividend payout. All regressions control for firm and time fixed effects. The *t*-statistics are adjusted using a robust estimator allowing within-firm clusters to avoid potential heteroskedasticity and serial correlation. *, ** and *** indicate statistical significance at the 0.1, 0.05 and 0.01 levels, respectively.

Panel A: Static model						Panel B: Dynamic model				
	Investment	ΔCash	-External financing	Dividend	SUM	Investment	ΔCash	-External financing	Dividend	SUM
OCF_t	0.119***	0.365***	0.471***	0.024***	0.979	0.113***	0.369***	0.471***	0.022***	0.975
	(19.23)	(68.56)	(48.26)	(18.15)		(18.69)	(69.08)	(48.22)	(17.38)	
OCF_{t-1}						0.089***	-0.075***	0.005	0.029***	0.048
						(17.87)	(-19.15)	(0.67)	(25.98)	
OCF_{t-2}						0.052***	-0.024***	-0.012	0.018***	0.034
						(11.12)	(-6.84)	(-1.64)	(19.39)	
Tobin's Q	0.012***	-0.003***	-0.010***	0.005***	0.004	0.009***	-0.001*	-0.010***	0.004***	0.002
	(11.69)	(-4.51)	(-8.44)	(19.57)		(9.55)	(-1.82)	(-8.39)	(17.83)	
Size	0.010***	0.006***	-0.036***	0	-0.02	0.009***	0.007***	-0.036***	0	-0.02
	(7.84)	(9.21)	(-19.74)	(0.26)		(6.97)	(10.86)	(-19.70)	(-1.45)	
Leverage	-0.046***	-0.009***	0.049***	-0.009***	-0.015	-0.051***	-0.006**	0.049***	-0.011***	-0.019
	(-9.99)	(-3.33)	(7.56)	(-9.29)		(-11.04)	(-2.12)	(7.58)	(-11.10)	
Z-score	0.003***	-0.004***	0.001	0.002***	0.002	0.002**	-0.003***	0.001	0.002***	0.002
	(4.11)	(-7.15)	(1.10)	(14.47)		(2.20)	(-5.39)	(1.30)	(11.46)	
Return volatility	-0.044***	0.013***	-0.016	-0.013***	-0.06	-0.034***	0.006	-0.016*	-0.010***	-0.054
	(-7.06)	(3.03)	(-1.61)	(-11.26)		(-5.53)	(1.43)	(-1.65)	(-8.67)	
Turnover	0.038***	0.007**	-0.028***	-0.004***	0.013	0.036***	0.009***	-0.028***	-0.005***	0.012
	(6.86)	(2.39)	(-3.90)	(-5.49)		(6.55)	(2.90)	(-3.90)	(-6.24)	
Annual return	-0.004***	0.007***	0.006***	-0.002***	0.007	-0.004***	0.007***	0.006***	-0.001***	0.005
	(-6.63)	(14.63)	(5.84)	(-13.04)		(-5.69)	(13.76)	(5.81)	(-11.68)	
Constant	0.042***	-0.049***	0.093***	0.007***		0.045***	-0.051***	0.093***	0.008***	
	(5.09)	(-11.97)	(8.36)	(4.49)		(5.46)	(-12.60)	(8.33)	(5.11)	
CUM_CFS						0.254	0.27	0.464	0.069	
Firm and year fixed effects	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	
N	84,808	84,808	84,808	84,808		84,808	84,808	84,808	84,808	
Adj-R^2	0.054	0.173	0.084	0.084		0.063	0.182	0.084	0.115	

Table 4 Fund allocation decisions with operating cash flow decomposed into a trend and a cycle component: static vs. dynamic models in the pooled sample

This table reports the regression results of applying the equation system to the pooled sample, with operating cash flow decomposed into a trend and a cycle component via the Hodrick–Prescott approach. All variables are defined in Appendix A. The dependent variables and operating cash flow (*OCF*) variables are constructed with Statement of Cash Flow data. All regressions control for firm and time fixed effects. The *t*-statistics are adjusted using a robust estimator allowing within-firm clusters to avoid potential heteroskedasticity and serial correlation. *, ** and *** indicate statistical significance at the 0.1, 0.05 and 0.01 levels, respectively.

Panel A: Static model						Panel B: Dynamic model				
	Investment	ΔCash	-External financing	Dividend	SUM	Investment	ΔCash	-External financing	Dividend	SUM
OCF_Cycle $_t$	0.049***	0.382***	0.545***	-0.001	0.975	0.062***	0.350***	0.558***	0.008***	0.978
	(4.65)	(37.67)	(28.95)	(-0.41)		(5.47)	(33.45)	(27.30)	(4.28)	
OCF_Cyclet-1						0.040***	-0.097***	0.031*	0.021***	-0.005
						(3.74)	(-12.12)	(1.84)	(9.96)	
OCF_Cyclet-2						0.020**	-0.015**	-0.034**	0.011***	-0.018
						(2.16)	(-2.08)	(-2.38)	(5.60)	
OCF_Trend $_t$	0.322***	0.287***	0.221***	0.083***	0.913	0.100***	0.401***	0.519***	0.038***	1.058
	(14.74)	(24.30)	(7.90)	(16.23)		(3.02)	(16.99)	(4.14)	(6.27)	
OCF_Trendt-1						0.291***	-0.075**	-0.260***	0.028***	-0.016
						(6.49)	(-2.35)	(-3.60)	(3.71)	
OCF_Trendt-2						-0.015	-0.090***	0.071***	0.042***	0.008
						(-0.48)	(-4.17)	(8.04)	(6.31)	
Tobin's Q	0.004***	-0.002*	0.001	0.005***	0.008	0.003**	-0.001	0.000	0.004***	0.006
	(3.21)	(-1.75)	(0.50)	(12.21)		(2.47)	(-0.89)	(0.19)	(11.73)	
Size	0.015***	0.008***	-0.044***	0.001***	-0.02	0.013***	0.010***	-0.046***	0.000	-0.023
	(7.54)	(7.81)	(-14.72)	(2.79)		(6.37)	(9.90)	(-15.58)	(0.71)	
Leverage	-0.063***	-0.006*	0.090***	-0.015***	0.006	-0.062***	-0.008**	0.102***	-0.014***	0.018
	(-8.71)	(-1.67)	(8.62)	(-9.26)		(-8.34)	(-1.99)	(9.46)	(-8.76)	
Z-score	0.004***	-0.003***	0.001	0.002***	0.004	0.002*	-0.002***	-0.002	0.002***	0
	(2.85)	(-4.09)	(0.54)	(9.58)		(1.85)	(-2.59)	(-1.16)	(7.08)	
Return volatility	-0.028***	0.011*	-0.055***	-0.011***	-0.083	-0.025***	0.007	-0.053***	-0.010***	-0.081
	(-3.26)	(1.74)	(-3.70)	(-6.43)		(-2.91)	(1.20)	(-3.61)	(-5.87)	
Turnover	0.034***	0.007*	-0.029***	-0.003***	0.009	0.033***	0.009**	-0.030***	-0.004***	0.008
	(4.15)	(1.74)	(-2.62)	(-2.71)		(3.94)	(2.05)	(-2.66)	(-3.11)	
Annual return	-0.004***	0.008***	0.006***	-0.002***	0.008	-0.003***	0.007***	0.007***	-0.002***	0.015
	(-4.83)	(11.96)	(4.01)	(-11.99)		(-3.30)	(9.97)	(4.67)	(-9.33)	
Constant	0.007	-0.060***	0.171***	-0.002		0.019	-0.072***	0.182***	0.002	
	(0.54)	(-9.28)	(9.27)	(-0.73)		(1.46)	(-11.00)	(9.86)	(0.95)	
CUM_CFS						0.122	0.238	0.555	0.04	
Firm and year fixed effects	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	
N	43,220	43,220	43,220	43,220		43,220	43,220	43,220	43,220	
Adj-R^2	0.065	0.166	0.083	0.121		0.07	0.177	0.086	0.139	

Table 5 Dynamic fund allocation decisions in subsamples partitioned by indices of investor protection strength

This table reports the regression results of applying the equation system to the subsamples partitioned by three indices of investor protection strength: the investor protection index (La Porta et al. 2006), the anti-self-dealing index (Djankov et al. 2008) and a cross-listing status indicator. *Dummy* equals one if a firm is from a country whose investor protection index (or anti-self-dealing index) is above the sample median and zero otherwise. *Dummy* is also set to one if a firm is cross-listed in a country with better institutional quality than its home country. All variables are defined in Appendix A. The dependent variables and operating cash flow (*OCF*) variables are constructed with Statement of Cash Flow data. All regressions control for firm and time fixed effects. The *t*-statistics are adjusted using a robust estimator allowing within-firm clusters to avoid potential heteroskedasticity and serial correlation. *, ** and *** indicate statistical significance at the 0.1, 0.05 and 0.01 levels, respectively.

Panel A: Raw operating cash flow

	partitioning variable = Investor protection index				partitioning variable = Anti-self-dealing index				partitioning variable = Cross-listing status			
	Investment	ΔCash	-External financing	Dividend	Investment	ΔCash	-External financing	Dividend	Investment	ΔCash	-External financing	Dividend
OCF_t	0.111***	0.386***	0.457***	0.025***	0.113***	0.400***	0.468***	0.018***	0.103**	0.363***	0.488***	0.021***
	(10.47)	(52.33)	(28.39)	(9.45)	(8.52)	(28.79)	(20.84)	(8.00)	(2.38)	(11.48)	(8.24)	(2.93)
OCF_{t-1}	0.070***	-0.081***	0.031**	0.017***	0.080***	-0.089***	0.011	0.045***	0.087**	-0.055*	0.014	0.038***
	(8.60)	(-5.42)	(2.57)	(13.14)	(8.10)	(-9.32)	(0.56)	(13.10)	(2.23)	(-1.90)	(0.26)	(4.96)
OCF_{t-2}	0.048***	-0.023***	-0.047***	0.020***	0.042***	-0.029***	-0.055***	0.029***	0.024	0.049**	-0.048	0.011*
	(5.49)	(-3.87)	(-3.74)	(11.91)	(4.54)	(-3.31)	(-3.13)	(10.05)	(0.72)	(1.98)	(-0.87)	(1.94)
OCF_t*Dummy	**-0.000**	**-0.061*** **	**0.042*** **	**0.003**	**-0.003**	**-0.042*** **	**0.031*** **	**0.011*** **	**0.009**	**-0.023*** **	**0.002** **	**0.009**
	(-0.04)	**(-5.42)**	**(3.79)**	**(1.13)**	**(-0.17)**	**(-2.69)**	**(3.54)**	**(3.02)**	**(0.17)**	**(-2.62)**	**(2.03)**	**(0.93)**
OCF_{t-1}*Dummy	**0.019***	**0.005**	**-0.046*** **	**0.003**	**0.012**	**0.017***	**-0.012**	**-0.019*** **	**0.006**	**-0.038**	**0.042**	**0.006**
	(1.71)	**(0.64)**	**(-2.96)**	**(1.19)**	**(1.04)**	**(1.66)**	**(-0.57)**	**(-5.07)**	**(0.13)**	**(-1.16)**	**(0.66)**	**(0.58)**
OCF_{t-2}*Dummy	**0.002**	**-0.002**	**0.049*** **	**-0.002**	**0.009**	**0.006**	**0.051*** **	**-0.012*** **	**0.032**	**-0.071** **	**-0.011**	**0.020*** **
	(0.18)	**(-0.30)**	**(3.20)**	**(-1.03)**	**(0.81)**	**(0.59)**	**(2.61)**	**(-3.85)**	**(0.82)**	**(-2.49)**	**(-0.17)**	**(2.65)**
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Joint significance test of (OCF_t*Dummy, OCF_{t-1}*Dummy, OCF_{t-2}*Dummy)												
p-value	[0.3697]	[0.0000]	[0.0000]	[0.0258]	[0.6551]	[0.0285]	[0.0172]	[0.0000]	[0.1762]	[0.0557]	[0.0131]	[0.0582]
Firm and year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	78,098	78,098	78,098	78,098	79,157	79,157	79,157	79,157	8,044	8,044	8,044	8,044
Adj-R^2	0.064	0.184	0.088	0.119	0.065	0.183	0.087	0.122	0.058	0.18	0.10	0.127

Panel B: The cycle component of cash flow

	partitioning variable = Investor protection index				partitioning variable = Anti-self-dealing index				partitioning variable = Cross-listing status			
	Investment	ΔCash	-External financing	Dividend	Investment	ΔCash	-External financing	Dividend	Investment	ΔCash	-External financing	Dividend
OCF_Cycle_t	0.084***	0.280***	0.546***	0.010***	0.108***	0.375***	0.635***	0.019***	0.109**	0.331***	0.522***	0.008
	(3.92)	(15.57)	(18.71)	(3.79)	(3.40)	(13.26)	(12.93)	(2.93)	(2.14)	(6.59)	(10.56)	(0.39)
OCF_Cycle_{t-1}	0.051***	-0.113***	0.067***	0.015***	0.053**	-0.113***	0.073*	0.036***	0.049***	-0.107***	-0.039	0.018
	(2.74)	(-9.38)	(2.84)	(5.02)	(2.36)	(-5.35)	(1.83)	(5.44)	(2.60)	(-2.86)	(-1.02)	(0.67)
OCF_Cycle_{t-2}	0.023	-0.026**	-0.003	0.011***	0.006	-0.017	-0.046	0.026***	-0.082	0.123	-0.035*	-0.007
	(1.42)	(-2.19)	(-0.15)	(4.31)	(0.31)	(-0.89)	(-1.19)	(4.61)	(-0.65)	(1.09)	(-1.91)	(-0.18)
$\boldsymbol{OCF\_Cycle_t*Dummy}$	**-0.032**	**-0.102*****	**0.040****	**-0.001**	**-0.051**	**-0.031****	**0.074****	**0.011***	**0.020**	**-0.078****	**0.032***	**0.026*****
	(-1.29)	**(-4.72)**	**(2.04)**	**(-0.21)**	**(-1.49)**	**(-2.03)**	**(2.38)**	**(1.68)**	**(0.13)**	**(-2.44)**	**(1.87)**	**(3.14)**
$\boldsymbol{OCF\_Cycle_{t-1}*Dummy}$	**-0.010**	**0.025**	**-0.049**	**0.009****	**-0.013**	**0.022**	**-0.044**	**-0.017****	**-0.102**	**0.075**	**0.004**	**0.025**
	(-0.45)	**(1.59)**	**(-1.59)**	**(2.18)**	**(-0.52)**	**(0.96)**	**(-1.00)**	**(-2.47)**	**(-0.40)**	**(0.38)**	**(1.26)**	**(0.88)**
$\boldsymbol{OCF\_Cycle_{t-2}*Dummy}$	**-0.001**	**0.014**	**0.042**	**0.002**	**0.018**	**0.002**	**0.018**	**-0.016*****	**0.076**	**-0.112**	**0.017***	**0.028**
	(-0.05)	**(0.93)**	**(1.47)**	**(0.43)**	**(0.83)**	**(0.10)**	**(0.42)**	**(-2.72)**	**(0.58)**	**(-0.96)**	**(1.78)**	**(0.71)**
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Joint significance test of ($OCF\_Cycle_t*Dummy$, $OCF\_Cycle_{t-1}*Dummy$, $OCF\_Cycle_{t-2}*Dummy$)												
p-value	[0.6134]	[0.0000]	[0.0988]	[0.0362]	[0.1927]	[0.5165]	[0.0871]	[0.0401]	[0.5665]	[0.0138]	[0.0095]	[0.0517]
Firm and year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	41,187	41,187	41,187	41,187	41,646	41,646	41,646	41,646	3,508	3,508	3,508	3,508
Adj-R^2	0.071	0.178	0.089	0.142	0.071	0.176	0.088	0.142	0.066	0.178	0.114	0.174

Table 6 Dynamic fund allocation decisions: financing components

We divide *External financing* into equity financing and debt financing and re-estimate Eq. (2). The models are specified as follows:

$$\begin{bmatrix} -\,Equity\ Financing_t \\ -\,Debt\ Financing_t \end{bmatrix} = A + L_0\left[OCF_{i,t}\right] + L_1\left[OCF_{i,t-1}\right] + L_2\left[OCF_{i,t-2}\right] + M \cdot Z + \begin{bmatrix} e_{i,t}^{Equity} \\ e_{i,t}^{Debt} \end{bmatrix}$$

Debt financing is further decomposed into short-term and long-term borrowings. The models are estimated for the pooled sample and for samples partitioned by the indicators of investor protection strength, namely the investor protection index developed by La Porta et al. (2006), the anti-self-dealing index developed by Djankov et al. (2008) and a cross-listing status indicator. Dummy equals one if a firm is from a country whose investor protection index (or anti-self-dealing index) is above the sample median and zero otherwise. Dummy is also set to one if a firm is cross-listed in a country with better institutional quality than its home country. All variables are defined in Appendix A. The dependent variables and operating cash flow (*OCF*) variables are constructed with Statement of Cash Flow data. All regressions control for firm and time fixed effects. The *t*-statistics are adjusted using a robust estimator allowing within-firm clusters to avoid potential heteroskedasticity and serial correlation. *, ** and *** indicate statistical significance at the 0.1, 0.05 and 0.01 levels, respectively. For simplicity, we omitted the results on control variables.

Panel A: Pooled sample

	-Equity issuance	-Debt issuance	-Short-term borrowings	-Long-term borrowings	-Equity issuance	-Debt issuance	-Short-term borrowings	-Long-term borrowings
OCF_t	0.311***	0.160***	0.145***	0.043***				
	(49.89)	(29.40)	(35.15)	(9.52)				
OCF_{t-1}	0.020***	-0.015***	-0.047***	0.021***				
	(4.15)	(-3.44)	(-15.96)	(5.38)				
OCF_{t-2}	-0.002	-0.009**	-0.021***	0.006*				
	(-0.50)	(-2.19)	(-7.45)	(1.65)				
OCF_Cycle_t					0.320***	0.195***	0.149***	0.047***
					(26.47)	(19.97)	(21.45)	(9.28)
OCF_Cycle_{t-1}					0.040***	-0.012	0.027***	-0.043***
					(3.65)	(-1.19)	(3.31)	(-7.42)
OCF_Cycle_{t-2}					-0.021**	-0.016*	0.014*	-0.033***
					(-2.18)	(-1.83)	(1.87)	(-5.78)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	84,808	84,808	84,808	84,808	43,220	43,220	43,220	43,220
Adj-R^2	0.093	0.038	0.083	0.015	0.086	0.056	0.016	0.089

Panel B: Partitioned subsamples: Raw cash flow

	partitioning variable = Investor protection index				partitioning variable = Anti-self-dealing index				partitioning variable = Cross-listing status			
	-Equity issuance	-Debt issuance	-Short-term borrowing	-Long-term borrowing	-Equity issuance	-Debt issuance	-Short-term borrowing	-Long-term borrowing	-Equity issuance	-Debt issuance	-Short-term borrowing	-Long-term borrowing
OCF_t	0.288***	0.187***	0.154***	0.044***	0.282***	0.180***	0.152***	0.036***	0.293***	0.199***	0.151***	0.040*
	(28.02)	(20.52)	(21.85)	(7.36)	(28.71)	(21.36)	(21.43)	(5.57)	(10.66)	(5.47)	(7.47)	(1.90)
OCF_{t-1}	0.031***	-0.011	-0.028***	0.021***	0.031***	-0.029***	-0.040***	0.022***	0.022	-0.097***	-0.079***	0.012
	(3.91)	(-1.51)	(-5.35)	(3.67)	(2.62)	(-4.75)	(-6.30)	(4.22)	(0.98)	(-2.97)	(-4.19)	(0.52)
OCF_{t-2}	-0.027***	-0.018**	-0.035***	0.000	-0.027**	-0.018***	-0.040***	0.011	-0.064***	-0.068***	-0.043**	-0.030
	(-3.45)	(-2.38)	(-6.28)	(0.11)	(-2.46)	(-2.62)	(-4.20)	(1.16)	(-2.63)	(-2.69)	(-2.47)	(-1.48)
OCF_t*Dummy	**0.037*** **	**-0.004**	**-0.011** **	**0.002**	**0.044** **	**0.008**	**-0.008**	**0.013*** **	**0.010**	**0.010**	**-0.017*** **	**0.024**
	(2.83)	**(-0.32)**	**(-2.22)**	**(0.17)**	**(2.50)**	**(1.46)**	**(-0.57)**	**(2.82)**	**(0.26)**	**(0.25)**	**(-1.74)**	**(0.88)**
OCF_{t-1}*Dummy	**-0.015**	**-0.026*** **	**-0.027*** **	**-0.005**	**-0.010**	**-0.003**	**-0.014**	**-0.002**	**0.034**	**-0.090** **	**0.049** **	**0.014**
	(-1.50)	**(-2.84)**	**(-4.28)**	**(-0.71)**	**(-0.80)**	**(-0.78)**	**(-1.42)**	**(-1.55)**	**(1.19)**	**(-2.44)**	**(2.21)**	**(0.52)**
OCF_{t-2}*Dummy	**0.038*** **	**0.003**	**0.020*** **	**0.003**	**0.032*** **	**0.004**	**0.021** **	**0.001**	**0.039**	**-0.041**	**0.004**	**0.042**
	(3.87)	**(0.31)**	**(3.18)**	**(1.44)**	**(3.62)**	**(1.58)**	**(2.13)**	**(0.73)**	**(1.37)**	**(-1.36)**	**(0.19)**	**(1.61)**
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Joint significance test of (*OCFt*Dummy, OCFt-1*Dummy, OCFt-2*Dummy*)												
p-value	[0.0000]	[0.0000]	[0.8958]	[0.0000]	[0.0052]	[0.0197]	[0.0005]	[0.1450]	[0.0570]	[0.1559]	[0.0474]	[0.3212]
Firm and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	78,098	78,098	78,098	78,098	79,157	79,157	79,157	79,157	8,044	8,044	8,044	8,044
Adj-R^2	0.093	0.049	0.084	0.015	0.093	0.049	0.083	0.015	0.115	0.076	0.086	0.037

Panel C: Partitioned subsamples: the cycle component of cash flow

	partitioning variable = Investor protection index				partitioning variable = Anti-self-dealing index				partitioning variable = Cross-listing status			
	-Equity issuance	-Debt issuance	-Short-term borrowing	-Long-term borrowing	-Equity issuance	-Debt issuance	-Short-term borrowing	-Long-term borrowing	-Equity issuance	-Debt issuance	-Short-term borrowing	-Long-term borrowing
OCF_Cyclet	0.329***	0.227***	0.160***	0.061***	0.364***	0.278***	0.172***	0.104***	0.335***	0.192***	0.130***	0.061*
	(19.48)	(13.89)	(12.29)	(7.41)	(12.93)	(6.78)	(7.07)	(5.21)	(7.75)	(5.07)	(5.27)	(1.78)
OCF_Cycle_{t-1}	0.067***	0.008	0.023**	-0.020**	0.092***	-0.045	0.018	-0.068***	0.023	-0.038	-0.038	0.012
	(3.95)	(0.62)	(2.19)	(-1.99)	(3.39)	(-1.53)	(0.84)	(-3.66)	(0.50)	(-0.87)	(-1.12)	(0.35)
OCF_Cycle_{t-2}	0.003	0.010	0.026**	-0.037***	-0.016	-0.008	0.022	-0.076***	-0.037	-0.045	-0.067***	-0.001
	(0.18)	(0.74)	(2.31)	(-3.82)	(-0.64)	(-0.26)	(1.05)	(-3.81)	(-1.09)	(-1.36)	(-2.67)	(-0.05)
OCF_Cycle_t*Dummy	**0.048**	**0.020**	**-0.002**	**0.014**	**-0.050**	**-0.042**	**-0.105*** **	**0.032**	**-0.040**	**0.036**	**-0.040**	**0.040**
	(0.93)	**(0.90)**	**(-0.12)**	**(0.86)**	**(-1.51)**	**(-0.98)**	**(-4.10)**	**(1.16)**	**(-0.60)**	**(0.51)**	**(-0.70)**	**(0.94)**
OCF_Cycle_{t-1}*Dummy	**-0.02**	**-0.032***	**0.007**	**-0.037*** **	**-0.054***	**0.036**	**0.012**	**0.027**	**0.028**	**-0.104***	**0.036**	**0.034**
	(-0.88)	**(-1.75)**	**(0.49)**	**(-3.08)**	**(-1.86)**	**(1.16)**	**(0.54)**	**(1.38)**	**(0.48)**	**(-1.89)**	**(0.86)**	**(0.82)**
OCF_Cycle_{t-2}*Dummy	**-0.02**	**-0.039****	**-0.019**	**0.006**	**-0.001**	**-0.008**	**-0.010**	**0.048****	**0.038**	**-0.097****	**0.031**	**0.046**
	(-0.96)	**(-2.24)**	**(-1.35)**	**(0.54)**	**(-0.04)**	**(-0.27)**	**(-0.45)**	**(2.32)**	**(0.87)**	**(-2.07)**	**(0.95)**	**(1.26)**
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Joint significance test of (OCF_Cycle_t*Dummy, OCF_Cycle_{t-1}*Dummy, OCF_Cycle_{t-2}*Dummy)												
p-value	[0.0421]	[0.0332]	[0.2236]	[0.0012]	[0.0497]	[0.0424]	[0.0006]	[0.0473]	[0.0823]	[0.0662]	[0.1002]	[0.1723]
Firm and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	41,187	41,187	41,187	41,187	41,646	41,646	41,646	41,646	3,508	3,508	3,508	3,508
Adj-R^2	0.088	0.059	0.016	0.092	0.087	0.058	0.017	0.090	0.119	0.106	0.093	0.10

Table 7 Cost of equity capital and fund allocation decisions

This table reports the regression results of the cost of equity capital on fund allocation decisions, as reflected by cash flow sensitivities. Panel A reports the summary statistics of the cost of equity capital estimated with four approaches. Panel B reports the regression results of the cost of equity capital on fund allocation decisions. To mitigate the impact of measurement errors of a particular model, we use the average of four cost of equity capital estimates as our dependent variable in Panel B. For ease of exposition, we multiply the regression coefficients by 100. The *t*-statistics are adjusted using a robust estimator allowing within-firm clusters to avoid potential heteroskedasticity and serial correlation. *, ** and *** indicate statistical significance at the 0.1, 0.05 and 0.01 levels, respectively.

Panel A: Summary statistics of cost of capital measures

	N	Mean	Std. Dev.	25%	50%	75%
R_{AVG}	69,594	0.111	0.085	0.069	0.106	0.125
R_{GLS}	69,594	0.097	0.067	0.053	0.093	0.106
R_{CT}	69,594	0.119	0.108	0.079	0.108	0.126
R_{OJ}	69,594	0.107	0.052	0.055	0.104	0.118
R_{PEG}	69,594	0.120	0.112	0.088	0.117	0.149

Panel B: Regression results

	Investment to cash flow sensitivity	Cash to cash flow sensitivity	External financing to cash flow sensitivity	Dividend to cash flow sensitivity
	(1)	(2)	(3)	(4)
OCF_t	**0.100**	**0.010****	**-0.029*****	**-0.885**
	(1.43)	**(2.21)**	**(-3.51)**	**(-0.93)**
Beta	0.002	0.001	0.001	0.002
	(0.25)	(0.23)	(0.25)	(0.22)
BTM	0.864***	0.866***	0.865***	0.865***
	(7.65)	(7.65)	(7.64)	(7.65)
Size	-0.040**	-0.042**	-0.042**	-0.041**
	(-2.05)	(-2.06)	(-2.07)	(-2.06)
Leverage	0.331	0.330	0.331	0.330
	(1.15)	(1.16)	(1.15)	(1.15)
Z-score	-0.968**	-0.970**	-0.969**	-0.969**
	(-2.26)	(-2.26)	(-2.25)	(-2.23)
Return volatility	1.613***	1.615***	1.615***	1.616***
	(4.41)	(4.40)	(4.44)	(4.40)
Turnover	0.071	0.070	0.069	0.070
	(1.62)	(1.64)	(1.60)	(1.64)
Annual return	-0.097**	-0.097**	-0.098**	-0.097**
	(-2.02)	(-2.01)	(-2.00)	(-2.00)
FLTG	1.250***	1.249***	1.251***	1.250***
	(3.61)	(3.63)	(3.62)	(3.63)
Fbias	0.185***	0.182***	0.181***	0.184***
	(4.46)	(4.44)	(4.43)	(4.44)
Constant	4.178***	4.167***	4.166***	4.165***
	(14.98)	(14.79)	(14.75)	(14.79)
Firm and Year fixed effects	Yes	Yes	Yes	Yes
N	69,594	69,594	69,594	69,594
Adj-R^2	0.066	0.066	0.066	0.066