Do Peer Firms Affect Corporate Cash Saving Decisions?*

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Abstract

I show that peer firms play an important role in determining U.S. corporate cash saving decisions. Using an instrument variable identification strategy, I find that one standard deviation change in peer firms average cash savings leads to a 2.63% same-direction change in firm's own cash savings, which exceeds the marginal effects of many previously identified determinants. The economic implications of such peer effects are large, which can significantly alter cash savings in an industry by 7.2%. In cross-sectional tests, I find that peer effects are stronger when the product market is highly competitive and when the economy is in recession. In addition, less powerful, smaller, and financially constrained firms respond more actively to their peers' cash saving decisions. Finally, I provide evidence that such peer effects are asymmetric—cash-rich firms, who already hold enough cash, are less likely to mimic peers' cash policies compared to cash-starved firms.

Keywords: Cash savings; Peer effects; Excess variance; Product market competition

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1. Introduction

Firms do not operate in isolation, studies have uncovered many roles for peer groups in affecting various corporate policies (i.e., Shue (2013), Leary and Roberts (2014), Popadak (2017)). A recent strand of literature emphasizing the "strategic" role of cash implies that peer effects may matter for corporate cash policies.[1] Cash can help firms to finance competitive strategies, signal the possibility of aggressive behaviors, and protect firms from predation risk induced by the rivals. Therefore, paying attention to peers' cash saving decisions would enable firms to better understand the potential opportunities and risks, and then adjust their own cash accordingly. In this paper, I examine whether firm's cash changing behavior is influenced by peer effects. I also study the economic forces that might explain the existence of such peer effects.

Fresard (2010) shows that large cash reserves will lead to future market share gains at the expense of industry rivals. Therefore, a firm will face greater predation risk in the product market when its peer firms increase their cash holdings. Such threat can also spur the firm to hold more cash, since Haushalter, Klasa, and Maxwell (2007) find evidence that the extent to which a firm is exposed to product market risk is positively associated with the amount of its cash holdings. On the other hand, when peer firms decrease their cash holdings, the firm may also find it optimal to hold less cash, because high level of extra cash is always related to the high opportunity cost and potential agency problems, it is inefficient for the firm to hold much more cash than that of peers.

The identification of peer effect is empirically challenging (see the "reflection problem" in Manski (1993)). Contextual and correlated effects are two economic forces that also induce firms to behave like their peers. *Contextual effects* are the propensity of an individual firm to change cash holdings in some way that varies with the exogenous characteristics of the industry peer group.

[1] See Haushalter, Klasa, and Maxwell (2007), Fresard (2010), Lyandres and Palazzo (2012), Hoberg, Phillips, and Prabhala (2014), and Lyandres and Palazzo (2015).

For example, cash saving tends to vary with the average investment expenditures or growth opportunities of other firms in the same peer groups. *Correlated effects* wherein individual firms in the same reference group tend to behave similarly when they have similar/correlated firm-specific characteristics or face common institutional environments. For example, correlated effect occurs when firms change their cash ratio together because of financial crisis. These alternative industry effects, endogenous selection, or spurious correlation cannot be interpreted as causal interactions.

To address identification problem, I use the lagged relative idiosyncratic stock volatility (firm's own idiosyncratic stock volatility minus industry median idiosyncratic stock volatility) of peer firms as an instrument for peer firms' cash savings. A valid instrument should be associated with the cash savings of peer firms, and it should not be driven by common factors (Angrist and Pischke (2008)). Existing studies document the relevance of lagged idiosyncratic stock volatility and firm cash savings (e.g., Riddick and Whited (2009), and Panousi and Papanikolaou (2009)). These studies find that an increase in uncertainty leads to an increase in corporate cash savings, which is consistent with precautionary motivation of holding cash. Similarly, when the average of the peer firms' idiosyncratic stock volatility increases, the average cash savings across peer firms should also increase. On the other hand, each firm's relative idiosyncratic stock volatility is unpredictable, distinct from industry stock volatility, and only captures firm-specific shocks. Consequently, other firms' relative idiosyncratic stock volatility cannot be directly linked to a firm's own cash saving decisions. This indirect relationship makes peers' lagged relative idiosyncratic stock volatility an ideal candidate for an instrumental variable because it likely satisfies the exclusion restriction. Taken together, my primary identification assumption is that, one-period-lagged relative idiosyncratic stock volatility across peer firms is correlated with their average cash savings, but it is orthogonal to common industry-wide and market-wide shocks, which cannot directly influence the firm's own cash savings.

Two-stage least square estimation (2SLS) shows that peer effects are statistically significant and economically meaningful in influencing corporate cash savings. The estimated marginal effect of peer influence is larger than many previously identified determinants, such as real size, market-to-book ratio, net equity issuance, net debt issuance, and the last period idiosyncratic stock volatility. Specifically, one standard deviation increase in the average cash savings of peer firms would lead to the 2.63% increase in a firm's own cash savings. The reverse is also true, that one standard deviation decrease in the peers' average cash savings would lead to the 2.63% decrease in a firm's own cash saving. In addition, the results continue to hold when I further control for cash mean-reverting dynamics, when I use an alternative definition of peer groups, and when I restrict the sample to the US domestic firms or the periods where cash trend disappears.

Having documented the existence, magnitude, and direction of the peer effect on cash savings decisions, I investigate the underlying mechanisms to better understand why peer effect matters for cash saving decisions. There are two theories related to the peer effects: rivalry-based theory and information-based theory. The rivalry-based theory regards imitation as a response designed to mitigate competitive rivalry or risk (see Lieberman and Asaba (2006)). A firm that imitates peers' cash policies could alleviate competitive risk from the aggressive actions of rivals, and hence maintain its relative position in the product market. On the other hand, imitating peers cash policies can not only make firms keeping their competitiveness, but at the same time make them avoid holding so much cash that is always related with high opportunity cost and potential agency problem. Therefore, if rivalry-based theory works for cash-saving peer effects, the learning behavior would be more pronounced in the competitive industries. The information-based theory explains peer effects from the aspects of social learning and reputation concern, where mimicking the cash policies of peer firms is an efficient approach when managers are unsure of the optimal amount of cash maintained within firms, or if direct analysis is difficult, costly, and time-consuming, or if a manager wants to avoid his/her bad reputation (see Banerjee (1992)). Therefore, some less powerful firms might be more likely to imitate peers' cash policies, or it is more likely to observe the peer effect in bad time, say, financial crisis periods.

I extend the instrumental variable analyses to test both theories by interacting the peer firms' average cash savings with dummy variables indicating economic status, product market competitiveness, and some firm-specific characteristics, such as firm market power and financial conditions. The interaction term is also endogenous and instrumented for the peer firms' lagged average relative idiosyncratic stock volatility interacted with the indicators. The cross-sectional tests suggest that rivalry-based and information-based mechanisms are both economically important. Firms facing a more competitive environment, with less market power, as well as smaller and financially constrained firms are more sensitive to the cash policies of peer firms. I also find that the peer effect is more pronounced during economic recessions, which further supports the information-based channel. As the increased uncertainty in bad times make it harder for managers to determine firms' cash policies, learning from peers might be an efficient way for them to do so. Furthermore, I find that peer effects in cash savings are not symmetric where cash-rich firms, who had already held enough cash, are less likely to mimic peers' cash policies compared to cash-insufficient firms.

Finally, I examine the economic implications of peer effects in cash savings. Peer effect is the economic externality whereby changes to one firm affect the outcomes of other firms. If only one manager in an industry mimic its competitors' cash saving decisions, then it is very likely that other forces will pull it back and force a correction. However, if peer learning is common in an industry, this may lead to significant changes in the industry overall cash savings. By using an excess-variance test pioneered by Graham (2008), I find that peer effects can explain some of the variations in cash savings observed across industries.[2] To understand the economic magnitude, consider an industry with an expected cash change by 2% under the assumption of no peer influence, the observed cash changes in that industry will be between 1.74% and 2.26% when peer effect exists.

The primary contribution of this paper is to provide new insights on corporate cash saving decisions. A large volume of the current literature is dedicated to understanding a firm's cash savings from growth and precautionary aspects. Prominent examples of those types of studies include Almeida, Campello, and Weisbach (2004), Almeida and Campello (2007), Dasgupta, Noe, and Wang (2008), Riddick and Whited (2008), Palazzo (2012), and Fresard (2012). These studies support the evidence that a firm's saving decisions are driven by the managers' expectations of future investment opportunities and future cash flow risk. In this paper, I argue that a firm's cash saving decisions are not independently determined; rather, the cash policies of peer firms also play an important role.

My study also highlights the strategic role of corporate cash holdings by demonstrating that firms facing greater product market competition pressures respond more actively to the cash policies of peer firms. Keeping close look at the peers' cash holding decisions could neutralize the aggressive actions of its competitors and maintain its relative position. Fresard (2010) shows that cash reserves could lead to systematic future market share gains and affect industry rivals' entry or expansion. Haushalter, Klasa, and Maxwell (2007) and Hoberg, Phillips, and Prabhala (2014)

[2] I thank Professor Bryan S. Graham for making his sample code with regard to identifying social interactions through excess variance contrasts available online.

both indicate that a firm's cash holdings are significantly affected by predatory threats from rivals. Lyandres and Palazzo (2012) and Lyandres and Palazzo (2015) further stresses the importance of strategic considerations in shaping cash policies in innovative firms. Although the study by Lyandres and Palazzo (2015) provides some evidence regarding how two closest innovation firms' cash holding choices are interacted with each other, peer effect was not the purpose of their study. Considering the manifold uses of cash, I provide empirical evidence of general peer effect and find different results.

Last but not the least, this paper complements a growing body of literature that examines the peer effects in a number of corporate policies, such as capital structure decisions (Leary and Robert (2014) and Im and Kang (2015)), executive compensation and managerial decisions (Shue (2013), Bizjak, Lemmon, and Naveen (2008), and Lewellen (2013)), dividends and share repurchases (Yang (2009), Popadak (2014), and Massa, Rehman, and Vermaelen (2007)), firm investment decisions (Fracassi (2015) and Bustamante and Fresard (2016)), stock split decisions (Kaustia and Rantala (2014)), corporate disclosure (Seo (2016)), corporate governance (John and Kadyrzhanova (2008)), risk aversion and trust (Alern, Duchin, and Shumway (2014)), the adoption of corporate social responsibility (Cao, Liang, and Zhan (2015)), and changes in tax paying and reporting behaviors (Bird, Edwards, and Ruchti (2016)). I contribute to this line of studies by providing empirical evidence of peer effects in corporate cash savings.

The paper proceeds as follows. Section 2 discusses the sample and descriptive statistics; Section 3 details the instrumental variable identification strategy and shows the main results as well as robustness checks. Section 4 explores the underlying mechanisms of peer effects; Section 5 examines the economic implication of cash-saving peer effect by studying the total incidence of peer effects at the industry level, and Section 6 concludes.

2. Data and descriptive statistics

This paper analyzes the cash saving decisions of U.S. firms publicly traded on the New York Stock Exchange (NYSE), the American Stock Exchange (AMEX), and the NASDAQ. Firms' accounting data come from the Compustat database from the year 1980 through 2014. Stock return data for our sample of firms are obtained from the Center for Research in Security Prices (CRSP) daily stock price database. The data on lines of credit are from Capital IQ. Text-based network industry classification (TNIC), product market fluidity, and TNIC HHI (Herfindahl-Hirschman Index) are provided by Hoberg and Phillips in their website.[3] I exclude firms in financial industries (SIC code 6000-6999) and utilities industries (SIC code 4900-4999), as well as government entities (SIC code greater than or equal to 9000). To ensure consistency throughout primary analysis, I require each firm-year observation to have non-missing data for the explanatory variables in each empirical model. I detail all the variables definitions in Appendix. To reduce the effect of outliers, all ratios are winsorized at the first and ninety-ninth percentile.

Table 1 presents descriptive statistics for the main variables in the final sample of 94,085 firm-year observations (9419 distinct firms) for the empirical analyses. The number of observations varies in different tests depending on the availability of data. I define peer groups for the primary analyses based on three-digit SIC industry groups.[4] There are 202 industry groups in our sample. I also require each firm has at least five other peer firms in each year.[5] Below, I also employ, for robustness, text-based network industry classification (TNIC) peer group definition that relying on the similarity of product characteristics (Hoberg and Phillips (2010), and obtain qualitatively

[3] I thank Professor Gordon Phillips and Professor Gerard Hoberg for making their text-based network industry classification (TNIC) data, and product market data based on their industry classification available online.

[4] The choice of three-digit SIC industry group is a balance between minimizing the possibility of grouping firms in unrelated business, and ensuring a meaningful number of peers.

[5] The results are qualitatively and quantitatively similar if the number of peer firms are not restricted.

similar results. In Table 1, I report the summary statistics for both firm-specific and peer firms average characteristics. The peer firm average for each firm are constructed as the equally weighted average of characteristics across all its peers in the three-digit SIC group. Comparison between summary statistics for firm-specific and peer firms average characteristics indicates that the two groups have similar mean values for most variables. At the bottom of the table, I report the number of industries and the distribution of the number of peer firms per industry-year combination. Over the entire sample, the average and median number of firms in each industry-year (peer group) are approximately 23 and 14, respectively.

[Insert Table 1 about here]

3. Identification of causal peer effect

To test whether peer effects exist in cash saving decisions, I analyze the response of executives to peer influence based on the linear-in-model (Manski (1993)) and use the instrumental variable strategy to estimate the causal peer effect.

3.1. Linear-in-mean model

In this section, I first describe how linear-in-mean model is applicable to test cash saving peer effects and proceed to discuss the identification strategy. Manski (1993) provides an empirical framework in estimating marginal peer effects based on a "linear-in-mean" model. The model specification is as follows,

$$y = \alpha + \beta E(y|Z) + \gamma' E(X|Z) + \eta' X + \delta' Z + \varepsilon \tag{3}$$

where y is an outcome variable of interest, Z are attributes characterizing a reference group, X and ε are observed and unobserved firm-specific characteristics that directly affect y. Both β and γ represent social interactions: β represents the (endogenous) peer effects wherein the propensity of a firm to behave in some way varies with the behavior of the peer group, and γ represents contextual (exogenous) effects wherein the propensity of a firm to behave in some way varies with the exogenous characteristics of the peer group, respectively (Manski (1993)). The reason why it is called the linear-in-mean model is that the mean regression of *y* on *X* and *Z* has the linear form:

$$E(y|X,Z) = \alpha + \beta E(y|Z) + \gamma' E(X|Z) + \eta' X + \delta' Z \; . \tag{4}$$

I rewrite the equation (4) to apply it to peer effects (β) in corporate cash saving decisions, that is,

$$\Delta Cash_{ijt} = \alpha + \beta \overline{\Delta Cash}_{-ijt} + \eta \bar{X}_{-ijt} + \gamma X_{ijt} + \mu_i + \theta_t + \varepsilon_{ijt} \tag{5}$$

where $\Delta Cash_{ijt}$ represents cash savings for firm *i* in industry *j* in year *t*. The (endogenous) peer effect is captured by the effect of $\overline{\Delta Cash}_{-ijt}$, which is defined as the peer firms' average cash savings excluding firm *i* in industry *j* in year *t*. X_{ijt} and $\bar{X}_{-ijt}$ are vectors of firm-specific and peer firms average characteristics (i.e., common and contextual effects) that influence the changes in cash holdings. ε_{ijt} is the firm-year specific error component. Firm fixed effects μ_i is included to control for omitted firm-specific factors that potentially influence cash saving decisions, which also allows me to identify within-firm variation in cash saving decisions and mitigates the concern on the "sticky" cash. I also include year fixed effect, θ_t, to control for unmeasured macro shocks.[6] In the model, the peer firms average cash saving variable is measured contemporaneously, which makes the identification of causal peer effect more difficult because it limits the amount of time for firms to respond to one another. Also, the measurement mitigates the scope for possible confounding effects resulting from other changes related to the firm's cash saving decisions (Leary and Robert (2014)).

[6] If I include industry fixed effects and year fixed effects, the results are quantitatively and qualitatively similar.

3.2. *Identification strategy: Peer firm relative idiosyncratic stock volatility*

As mentioned in the introduction part, the main identification problem arises when I try to infer whether the average behavior in reference group influences the behavior of individual members that comprise the group. It is called the "reflection problem" in Manski (1993), as he explains that "the reflection problem is similar to that of interpreting the almost simultaneous movements of a person and his reflection in a mirror". Thus, an OLS regression could not provide the evidence of (endogenous) peer effects (Manski (1993), Angrist and Pischke (2008), and Angrist (2013)).

To address the identification problem, I use the lagged relative idiosyncratic stock volatility across peer firms as a source of exogenous variation in peer firms average cash savings. According to the cash saving literature, idiosyncratic stock volatility is a determinant of changes in cash holdings. For example, Riddick and Whited (2009) shows that firms facing more uncertainty have a higher marginal propensity to save from their operating income. In addition, by regressing changes in cash on the last period idiosyncratic stock volatility, Panousi and Papanikolaou (2009) also finds that an increase in uncertainty leads to an increase in corporate cash savings, which is consistent with precautionary motivation of holding cash. Similarly, when the average of the peer firms' idiosyncratic stock volatility increases, the average cash savings across peer firms should also increase.

Although the average value of idiosyncratic stock volatility across peer firms satisfies the correlation condition, i.e., correlates with the peer firms' average cash savings, a firm's own idiosyncratic stock volatility and peers average idiosyncratic stock volatility is likely to move together and contain some common industry information, this would go against the exclusion restriction. For example, the competition within an industry would lead to the increasing idiosyncratic stock volatility for the competitors in this industry (see Irvine and Pontiff (2009) and Philippon (2003)). Irvine and Pontiff (2009) envision a type of competition in which consumers shift their demand from firm A to firm B within an industry and induce more idiosyncratic stock volatility for these two firms. Therefore, the firm A's idiosyncratic stock volatility and firm A's peers (including firm B) average idiosyncratic stock volatility contain common factors—demand variation, which will drive the firm A's cash saving and the average cash savings across firm A's peer firms varying simultaneously, thus the identification of causal peer effects by using peers average idiosyncratic stock volatility as instrument would fail. To mitigate such concern, I construct a measure of relative peer idiosyncratic stock volatility based on the innovation in stock prices. I follow a simple two-step procedure. First, for each firm *i* in industry *j*, I construct its relative $RELIdioVol_{ijt}$ in year *t* as its actual idiosyncratic stock volatility $IdioVol_{ijt}$ minus the industry median idiosyncratic stock volatility $Median\_IdioVol_{jt}$. That is, $RELIdioVol_{ijt}$ measures for each firm in innovation in its own idiosyncratic stock volatility conditional on the industry and year. Next, I construct a relative peer idiosyncratic stock volatility measure for each firm, denoted as $P\_RELIdioVol_{-ijt}$, as the equally weighted average of $RELIdioVol_{ijt}$ across all its peers in the three-digit SIC group that the firm belongs. In other words, it measures for each firm the average innovation in idiosyncratic stock volatility among its peer firms. I lag this shock innovation one year $P\_RELIdioVol_{-ijt-1}$ and use it as the source of exogenous variation (instrument) for peer firms average cash savings $P\_\Delta Cash_{ijt}$.

To measure idiosyncratic stock volatility of an individual stock $IdioVol_{ijt}$, I firstly estimate equation (6) for each firm on a rolling month basis using daily returns in the past 12 months,

$$r_{ij\tau} = R_{ij\tau} - rf_\tau = \alpha_{ijt} + \beta_{ijt}^{M}(R_{m\tau} - rf_\tau) + \beta_{ijt}^{IND}(\bar{R}_{-ij\tau} - rf_\tau) + \varepsilon_{ij\tau} \quad (6)$$

where τ is the subscript for the day and *t* is the subscript for the month, $R_{ij\tau}$ is the total return for firm *i* in industry *j* for the day τ, $\tau \in t$. $(R_{m\tau} - rf_\tau)$ is the daily excess return of market portfolio, and $(\bar{R}_{-ij\tau} - rf_{\tau})$ is the daily excess return of equal-weighted industry portfolio excluding firm i's return.[7,8] Then, the idiosyncratic return for each individual stock is computed as follows: [9]

$$\widehat{\varepsilon_{ij\tau}} = r_{ij\tau} - \widehat{r_{ij\tau}} = r_{ij\tau} - (\widehat{\alpha_{ijt}} + \hat{\beta}^{M}_{ijt}(R_{m\tau} - rf_{\tau}) + \hat{\beta}^{IND}_{ijt}(\bar{R}_{-ij\tau} - rf_{\tau})). \tag{7}$$

Next, the monthly idiosyncratic stock volatility is calculated as the standard deviation of the daily idiosyncratic stock return in that month and multiply the square root of the number of trading days in the month.[10] Moreover, to maintain consistency with the periodicity of the accounting data, I average the monthly idiosyncratic stock volatility in each fiscal year to get the annualized idiosyncratic stock volatility $IdioVol_{ijt}$.

3.3. Instrumental variable validity

Although the exclusion restriction of instrument variable cannot be verifiable from the data, several arguments support the plausibility of satisfying the restriction. First, the instrument's construction ensures it to be orthogonal to market risk and industry risk, and unique to the specific peer firms. To further bolster this argument, I control for the industry competition and industry cash flow volatility in the following estimations, as well as the firm's own idiosyncratic stock volatility that is suggested by Leary and Roberts (2014) to absorb the remaining correlation. Second, the inclusion of a firm's own and peers average characteristics, as well as firm fixed effects and year fixed effect in the empirical regression would further mitigate the concern that peers

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[7] As explained in Leary and Robert (2014), "the last industry factor is to remove any variation in returns that is common across firms in the industry peer group, but not a priced risk factor".

[8] Consistent with the definition of peer groups in this paper, industries are defined by three-digit SIC code.

[9] For example, to construct daily idiosyncratic returns in February 1985, I estimate the equation (6) using daily returns from February 1984 to January 1985. Then using the estimated coefficients and the daily factor returns in February 1985 to compute the daily estimated residual (idiosyncratic stock return) in February 1985. To obtain daily idiosyncratic returns in March 1985, I repeat the process by updating the estimation sample from March 1984 to February 1985 and using daily factor returns during March 1985. I require at least 150 trading days in each regression. The trading days per year in my sample ranges from 150 to 255 days.

[10] I require a minimum of 15 trading days in a month. A similar procedure is used by French, Schwert, and Stambaugh (1987), Schwert (1989) and Fu (2009).

relative idiosyncratic stock return affects corporate cash savings through its correlation with some omitted yet common factors rather than through its relevance for peer firms cash saving decisions.

Table 2 examines the partial correlations between peer firms' average relative idiosyncratic stock volatility and firm characteristics, to determine whether instrument contains some information about firm fundamental characteristics. The reason why it is necessary because "economically large correlation between the instrument and observable firm characteristics would raise concerns about the extent to which instrument may be correlated with unobservable factors" (Leary and Roberts (2014)). The results in Table 2 indicate that the economic magnitudes of the estimated coefficients are all tiny. For the only statistically significant coefficient, cash flow, a one standard deviation increase in this factor will lead to 1.63 base point increase in lagged average of peer firms relative idiosyncratic stock volatility. Such change in instrument is about 0.009 standard deviations. Thus, to some extent, the lagged peer firms average relative idiosyncratic stock volatility contains no economically significant information related to firm's next period cash saving determinants. In addition, the correlation between firm's relative idiosyncratic stock volatility and peers average relative idiosyncratic stock volatility is -0.03, while the correlation between firm's idiosyncratic stock volatility and peers average idiosyncratic stock volatility is 0.4. The decline suggests that the method purges most of the intra-industry correlation in idiosyncratic stock volatility.

[Insert Table 2 about here]

3.4. Main results: IV estimation of peer effects in cash saving decisions

In this section, I document the estimation results from the two-stage least square (2SLS) regression where the endogenous variable is the peer firms' average cash savings, and the associated instrument variable is the equal-weighted average of relative idiosyncratic stock return across peer firms in the last year $P\_RELIdioVol_{-ijt-1}$. The 2SLS regression includes firm-specific, industry-specific, and peer firms' average covariates as well as firm fixed effects and year fixed effects. The firm-specific covariates include firm size, cash flow, market-to-book ratio, as well as the sources and usage of funds from financing and investing activities in year *t*, i.e. the net equity issuance, the net debt issuance, and the net investment (Almeida, Campello, and Weisbach (2004) and Palazzo (2014)). These help to control for other factors that drive changes in cash holdings. The industry-specific covariates that associate with firm cash savings include industry competitiveness and industry cash flow volatility, which help to control for other industry dynamics that may cause changes in cash holdings. The results are presented in the Table 3 and reveal that peer effects in cash saving decision exist.

From the coefficients of the first-stage instrumental variable regressions reported at the bottom of Table 3, we can see that the instrument is strongly and positively associated with the peers average cash savings, this is consistent with the theoretical arguments on the precautionary motivation for holding cash. Statistically speaking, *Kleibergen-Paap rk wald F statistics* from the first-stage regression exceed the requisite 10 to reject the weak instrument null hypothesis (Stock and Yogo (2005)).

In terms of the second-stage results, the significantly positive coefficient of the instrumented peer firms' average cash savings in each specification supports the existence of peer effects in corporate saving decisions. To ease interpretation of magnitudes, all the independent variables included in the 2SLS regressions are standardized. Thus, the coefficient of $P\_\Delta Cash_{ijt}$ in column (1) is interpreted as follows: one standard deviation increase (decrease) in instrumented peer firms' average cash savings leads to 2.63% increase (decrease) in firm's cash savings on average. Interestingly, the peer effect for cash savings is economically meaningful and larger than many previously identified cash saving determinants. For example, a standard deviation increase in firm size only leads to cash saving increasing by 0.66%, compared to the 2.63% induced by such an increase in peer influence. This indicates that peer influence is at least as important an economic determinant of cash savings as other standard firm-specific covariates.[11]

Although the instrument variable—peers relative idiosyncratic stock volatility has already removed the common trend of idiosyncratic volatility, I further control for the industry-specific covariates that may still influence the instrument variable and the dependent variable simultaneously, such as industry competition and industry risk. Industry competition is proxied by Herfindahl-Hirschman Index (HHI) and industry risk is measured by the industry average cash flow volatility.[12] From the results in column (2) to column (4), I find that the results are quite robust, where the estimated coefficients of peer firms' average cash savings are little affected by the inclusion of HHI and industry risk.

Opler, Pinkowitz, Stulz and Williamson (1999) show that firms have target cash levels and cash holdings revert to the mean. If a firm held less cash than its target cash levels in the last year, and meanwhile its peer firms increase cash savings on average this year, it is possible that the peer effect inducing the firm to save more cash would be confounded by the firm's mean-reverting adjustment of their cash holdings to its own target cash ratio. Therefore, I further control for the firm prior-year cash savings in column (5), as well as the peer firms prior-year cash savings in column (6). The significantly negative coefficients of lagged cash savings support the mean reverting dynamics of cash holdings, and interestingly, the effect from peer firms average cash savings is still robust and become even stronger.

[11] The results are quite similar if I control for industry fixed effects instead of firm fixed effects.

[12] The industry average cash flow volatility is calculated by following Bates, Kahle and Stulz (2009), the detailed definition can be found in Appendix.

In contrast to the peer influence, other peer firm characteristics are less important for firm cash saving decisions and are sometimes statistically indistinguishable from zero. This suggests that cash saving peer effects are not simply the repackaging of peer effects associated with some other corporate policies, such as, leverage, financing, and investment. I also control for the fraction of peer firms who pay dividends in the year *t*, to exclude the possibility that the result of cash saving peer effect is the consequence of learning peers in dividend policy (see Popadak (2017)). The unreported results show that peer effect of cash savings is quite robust and is not influenced by the dividend peer effects.

Overall, the estimation results in Table 3 reveal the importance of peer effects in corporate cash saving decisions, these effects are economically large, significantly larger than many other cash-saving determinants.

[Insert Table 3 about here]

3.5. Robustness checks

In this section, I check the robustness of the main results to some changes under the instrument test specification, including an alternative construction of peer groups based on the product market, two subsample tests to exclude the confounding effects of foreign cash and the trend of cash ratios, as well as a placebo test involving randomly selected peers. The results of these tests are included in Table 4, and it reveals that cash saving peer effects remain economically meaningful except for the pseudo peers in placebo test.

3.5.1. Text-based network industry classification (TNIC) peer group definition

I consider an alternative definition of the peer group by using the Text-based Network Industry Classification (TNIC) developed by Hoberg and Phillips (2010), which is based on firms' products description (from 10K filings). Specifically, they calculate firm-by-firm similarity measures based on the number of words that two firms' product description have in common. Using this similarity measure, they define each firm *i*'s industry to include all firm *j*s with pairwise similarities relative to firm *i* above a pre-specified minimum similarity threshold. These firm *j*s are TNIC peers of firm *i* in year *t*. Such peer groups change over time and are firm-specific. The TNIC peers are available from 1996 through 2013 because TNIC industries are based on the availability of 10-K annual filings in electronically readable format.

To perform the sensitivity tests, the peer firms average cash savings, the average relative idiosyncratic stock volatility, as well as the peer firms' covariate averages and industry characteristics are all recalculated based on the TNIC peer groups. Then, I re-estimate the 2SLS estimation for the effect of TNIC peers, and find that the peer effects in cash saving decisions are not sensitive to the definition of peer group. From the estimation results reported in the column (1) of Table 4, we can see that TNIC peer influence is larger than the three-SIC peer influence—one standard deviation increase in TNIC peers average cash savings leads to the 3.15% increase in firm's cash savings. The results remain statistically significant and economically meaningful.

3.5.2. Domestic and multinational firms

Foley, Hartzell, Titman, and Twite (2007) document that US multinational firms hold vast volume of cash overseas to defer the taxation of foreign cash. To alleviate the concern that the mimicking behavior of cash savings might be due to the wave of multinationalism in an industry and stockpiling foreign cash overseas simultaneously, I re-estimate the linear-in-mean model of cash savings only for U.S. domestic firms. As suggested by Foley, Hartzell, Titman, and Twite (2007), Pinkowize, Williamson, and Stulz (2012), Yang (2014) and Harford, Wang, and Zhang (2015), the identification of domestic or multinational firms is based on whether foreign tax income (TXFO) or foreign pretax income is zero or not. Dyreng and Lindsey (2009) claim that

"Visual inspection of several 10-K filings reveals that many of the missing values for tax-related and pretax-related variables in Compustat should be coded as zero". Therefore, I firstly replace some missing values as suggested in Dyreng and Lindsey (2009), and then identify domestic firm-years as the periods before the existence of the first nonzero value of TXFO or PIFO, or the firms who never report TXFO or PIFO in the whole sample period. Imposing these requirements on the data translate into a sample of 47081 firm-year observations. The estimated coefficients are illustrated in the column (2) of Table 4, suggesting that peer effects still exist for domestic firms.

3.5.3. The trend in cash holdings

Considerable attention has been payed to the growing cash holdings in U.S. firms. Bates, Kahle and Stulz (2009) shows that time *t* has a significantly positive coefficient on average cash-to-assets ratio from 1980 to 2006. The peer effects may be mixed with the cash holding trend since it is difficult to explicitly isolate the trend from peer effects tests. To address this problem, I firstly draw the line of average cash ratios for U.S. firms from 1980 through 2014 in Figure 1. I find that the trend of cash holdings in U.S. firms disappears since the year of 2004. Then, I re-estimate the peer effects in the period spanning from 2004 through 2014. The estimate coefficients in column (3) of Table 4 are similar with those in main results, which indicate that the existence of peer effect in cash saving decisions is not driven by the cash holding trend in U.S. firms.

3.5.4. Placebo test: Pseudo peers

If the peer effect really matters for corporate cash savings, I should expect that firm's cash saving decision is not sensitive to the cash policies of unrelated firms. To this end, I artificially generate the "pseudo" peers. Specifically, each year, for each firm in the sample, I randomly select firms from outside of the firm's industry and let the number of "pseudo" peers matches the number of the true peers.[13] I recalculate the peers cash savings, instrument variable and peers average covariates based on the pseudo peers. The estimation results are illustrated in the column (4) and Table 4. Given that a peer group composed of randomly selected firms has no economic links, the estimated coefficient of instrumented peer firms average cash savings cannot influence firm cash savings. In addition, pseudo peer firms' other characteristics have no impact on firm's cash saving decisions either.

4. Economic mechanisms of peer effects in cash saving decisions

Having established that peer effects in cash saving decisions exist, I next explore the economic reasons to understand the origins and dynamics of peer effects. There are two broad theories of business imitation: (1) rivalry-based theories, where firms imitate others to maintain competitive parity or to neutralize the aggressive actions of rivals, and (2) information-based theories, where firms follow others that are perceived as having superior information (see Lieberman and Asaba (2006)). These reasons represent the potential mechanisms underlying the peer effects in cash savings.

4.1. Hypotheses

Cash holding is regarded as a preemptive device to gain market share and affect industry rivals' entry (Fresard (2010) and Haushalter, Klasa, and Maxwell (2007)), managers not only independently determine their optimal level of cash holdings, it is important for them to pay attention to that of peers, since lower cash holdings compared to peers high cash levels may impair firms competitiveness in product market (Fresard (2010)), such as losing out the investment opportunities to competitors. This is especially so in a competitive industry, where firms are exposed to higher risks from rivals and prices and profits are easily eroded. Since pursuing a

[13] I require that the pseudo peers industry should be different from the firm's industry at the one-digit SIC level.

differentiation strategy is often costly, difficult and risky, firms cannot be certain whether the new position will be superior. Given this, firms therefore often choose to pursue homogeneous strategies, where they match the behavior of rivals to ease the intensity of competition. Although holding enough cash can protect firm from predation risk, it does not mean that holding much more cash than peers is an insurance and it is not an efficient way to do so, as high level of extra cash holdings is always related to the high opportunity cost and potential agency problems. Therefore, it would be beneficial for firms to learn from their peers' cash policies and avoid holding too little or too much. I predict that *peer effect in cash savings is more pronounced if firms face greater competition pressures.*

Information-based theories explain mimicking behavior from "social learning" and "reputation concerns" aspects. It occurs when a manager is unsure about the optimal amount of cash maintained within firms, or the direct analysis is difficult, costly and time-consuming (see Banerjee (1992)). Then, imitating cash holding policies of the industry peers without regard to his own information would become optimal. Sometimes, managers want to avoid their negative reputations and signal their "qualities" through mimicking peers financial policies, because they are afraid of proving to be wrong and suffering a loss or reputation. These situations are more likely to happen in relatively weak firms. Therefore, I expect that *firms with less market power, smaller firms, growing firms, and financially constrained firms would be more sensitive to the peer firms' cash holding decisions*.

In addition, it is acknowledged that in recessions and crisis (periods I call "bad times", Loh and Sultz (2016)), firms will experience greater uncertainty and volatility, which leads to the larger pressures, difficulties and cost for managers to make plans. Therefore, based on the information-based theory, I predict that *the peer effects would be more pronounced in bad times than in other times*.

4.2. Evidence on the economic mechanisms

To examine the economic channels, I extend the instrumental variable identification strategy wherein the endogenous variables are the peer firm average cash savings interacted with indicator variables, and the instruments are the lagged peer firms average relative idiosyncratic stock volatility interacted with the same indicator variables. I also include a dummy variable indicating that the characteristic that proxies for the economic channels.

4.2.1. Rivalry-based mechanism

Table 5 assesses rivalry-based mechanism for peer effects. To examine this channel, I begin with the Herfindahl-Hirschman Index (HHI) to measure industry competitiveness, which is constructed for each three digit-SIC industry classification and for each fiscal year using all available firms in the Compustat database. Then I turn to the text-based network industry classification (TNIC) HHI developed by Hoberg and Phillips (2011). Compared to the Compustat HHI, TNIC HHI might be more accurate to measure product market competition as it is based on firms' products description. In terms of HHI measures, the lower the value of HHI, the higher competition within the industry. The third proxy for product market competition is excess price-cost margin (EPCM). Following Gaspar and Massa (2006) and Peress (2010), I subtract the industry average price-cost margin to control for heterogeneities across industries unrelated to the degree of competition. A larger excess price-cost margin indicates weaker competition since the closer to perfect competition, the greater extent that price will approximate the marginal cost. I also use cash flow volatility to proxy for the competition intensity, as prior studies show that "intense product market interactions increase fundamental cash flow volatilities because of the increasing sensitivity of firm performance to rival's behaviors" (Seo (2016), Irvine and Pontiff (2009), and Peress (2010)). Last but not the least, I use "product market fluidity" to proxy the product market threats. This measure is constructed by Hoberg, Phillips and Prabhala (2014) capturing how rivals are changing the product words that overlap with individual firm's vocabulary. The larger of this measure, the greater product market threat that firm would face. If rivalry-based peer effects channel exists, firms who face higher product market threat will be more sensitive to the peers' cash holding decisions.

In the tests, firms are sorted into terciles based on the values of these competition proxies in each year, the indicator variable D_{low} is equal to one if firms are ranked into the bottom tercile and zero if the firms are at the top tercile. Just the reverse, D_{high} is equal to one if firms are ranked into the top tercile and zero for bottom tercile. The results in Table 5 are consistent with my prediction, where the coefficients of the interaction term with high competition indicators are larger than that of the interaction variable with low competition indicator. In column (1), column (2) and column (4), the peer effects are only significant for firms who face high competition environment, but insignificant for those firms facing relative low-level competition.

[Insert Table 5 about here]

4.2.2. Information-based mechanism

Table 6 assesses the information-based mechanism for peer effects on cash savings. In Panel A, for each industry-year combination, I rank firms into terciles based on the firm-specific measures of market share, gross margin, market cap, book size, market-to-book ratio, and firm age. Similarly, the D_{low} equals to one for firms at the bottom tercile and zero for firms at the top tercile. To the contrary, D_{high} equals to one for top tercile firms and zero for bottom tercile firms. The results in the Panel A of Table 6 show that firms with lower product market power (market share), smaller firms (market cap and book size), growing and young firms (market-to-book ratio and firm age) are more sensitive to their peers' cash policies than their counterparts.

In Panel B, I identify financially constrained firms by firstly using indirect proxies, such as whether firms have bond rating, pay dividend, or lines of credit. Sufi (2009) provides evidence that lack of access to lines of credit is a more statistically powerful measure of financial constraints than other traditional measures used in the literature. Secondly, I use direct proxies constructed as linear combinations of observable firm characteristics, such as Hadlock-Pierce (2010) and Whited-Wu (2006) indices. Following convention, firms are ranked into terciles based on their index values in the preceding year. Firms in the top tercile are regarded as constrained firms (D_1) and those in the bottom tercile are unconstrained firms (D_2). The results in Panel B of Table 6 exhibit that more financially constrained firms respond more to the peer effects than less financially constrained firms. It is well-known that financially constrained firms rely more on internal financial resources, such as cash holdings and cash flows. If they hold less cash than that of peers, it is more likely for them to lose when a new investment opportunity arrives. Therefore, imitating peer firms cash policies can help them keep a "safe" position in the competition. Overall, the results in Table 6 are consistent with my prediction, they suggest that mimicking behavior is more pronounced among those firms with the greater learning motivation and perhaps the greater need to build reputation.

[Insert Table 6 about here]

Table 7 assesses whether peer effects is stronger in bad times. The first definition of "bad times" uses NBER-defined recessions, which are the periods January-July 1980, July 1981-November 1982, July1990-March 1991, March-November 2001, and December 2007-June 2009. Second, considering that the last period recession is especially sharp, I separate this period as "Subprime

Mortgage Crisis". The third definition uses *Crisis* defined in Loh and Sultz (2016) which are the periods September-November 1987 (1987 crisis), August-December 1998 (LTCM crisis), and July 2007-March 2009 (Credit crisis). I identify a fiscal year as a "bad year", if at least a half period of bad times is included in one fiscal year, except for 1987 crisis and LTCM crisis as these two crisis periods are quite short. Thus, I require that these two crises should completely fall into one fiscal year, then that year could be identified as "bad year". The results in Table 7 are consistent with the prediction, that firms are more sensitive to peer firms' behavior during bad times, which provide another evidence on the information-based channel.

[Insert Table 7 about here]

4.3. Is peer effect on cash saving decisions symmetric?

After showing the economic channels underlying the cash saving peer effects, I find that such peer effect is not symmetric. Table 8 shows the evidence that cash-rich firms respond less to peer firms' cash policies than other firms. At the beginning of the tests, it is necessary to clarify the definition of "cash-rich". (1) I sort firms based on their last period cash holding levels within each year, and identify the upper and lower third as "cash-rich" firms and "cash-insufficient" firms, respectively; (2) Referring to Harford (1999), "cash-rich firm-years are years in which a firm's cash holdings are more than 1.5 standard deviations above the predicted cash holdings, where the standard deviation used is the time series standard deviation of the firm's cash holdings." According to the definition, there are 10095 cash-rich firm years, compared them to the rest of 65616 firm-year observations.[14] (3) To make sure the results are robust, I put a more stringent constraint on cash-rich definition, that firms whose cash holdings are more than 2 standard deviations above the predicated cash holdings can be regarded as *cash-rich* firms. Column (1) of

[14] In Harford (1999), he identifies 1821 cash-rich firm-year observations and compares it to the other 21675 firm-years in the periods spanning from 1972 to 1994.

Table 8 presents the cross-sectional estimation results when using the first definition of "cash-rich". Although the results are not very significant, the smaller and insignificant coefficient of the peer firms average cash savings interacted with the cash-rich indicator variables (D_{rich}) informs that cash-rich firms are insensitive to the peer firms' cash saving behaviors. In column (2) and column (3), when using Harford (1999) "cash-rich" definition, it becomes clearer that cash-rich firms respond less to the peer firms cash saving behaviors than other firms.

[Insert Table 8 about here]

5. Economic implications of peer effects in cash savings

An important implication of peer effects is the economic externality whereby changes to one firm affect the outcomes of other firms. If only one manager in an industry mimics its competitors' cash saving decisions, then it is very likely that other forces will pull it back and force a correction. However, if peer learning is common in an industry, this may lead to significant changes in the industry overall cash savings. In this section, I evaluate whether peer influence is important enough to impact aggregate cash savings at the industry level.

5.1. Excess-variance identification strategy

To identify the total economic impact stemming from peer-influenced cash saving decisions at the industry level, I use an excess variance identification strategy pioneered by Graham (2008), which proposes an approach for identifying the existence and magnitude of social interactions based on the conditional variance restrictions. If firms within the same industry learn from one another on cash saving decisions, then individual firm cash savings will covary positively within an industry and display excess variation across industries. Thus, the ratio of between-industry variance over within-industry should be larger than one when peer effect exists. However, there is another explanation for excess variance—industry-level heterogeneity (i.e., the distribution of observed and unobserved industry and firm characteristics might vary across industries). Therefore, the unconditional between-group variance of cash savings is the sum of three terms: (1) the variance of any industry-level heterogeneity, (2) the between-industry variance of any firm-level heterogeneity, and (3) the strength of any social interactions. When identifying the peer effect component of excess variance, Graham (2008) compares the within- and between-group variances across large and small groups. The distribution of group-level heterogeneity is the same across large groups or across small groups, while the distribution of peer effect differs. The key identifying assumption for the excess variance method is that after controlling for observables, being in a small or large industry only affects the between-group variance in outcome variable via peer effects. To apply it in cash saving peer influence, the identification logic is as follows.

In large industries, clusters of firms with high cash savings are typically offset by corresponding clusters of firms with low cash savings, resulting in little variation in average cash savings across large industries, that is, the mean levels of cash savings are similar across large industries. In small industries, however, through learning from each other, the composition of firms with mostly above or below average cash savings are more frequently observed than that in large industries, because there are not enough firms in small industry to derive offsetting effect. That is to say, the variance of cash savings is greater across small industries than that across large industries in the presence of peer effects. The strengths of peer effects are different across small and large industries, while the variance of industry heterogeneity across large industries and that across small industries should be similar.[15] Thus, a ratio of the difference in between-group variance across small and large industries to the difference in within-group variance across small and large industries

[15] "Even if there is some variable that is unaccounted for that is correlated with industry size and outcome variable as long as it does not systematically inflate the observed variance in small industries across all observations over sample period, then the identification holds." See Popadak (2014).

provides a measure of the existence and strength of peer effects.[16] This is described as "ratio-in-differences" in Popadak (2014).

Following Graham (2008) and Popadak (2014), the econometric specification of excess-variance test of cash saving decisions is given by:

$$\Delta Cash_{ij} = \alpha_j + (\gamma - 1)\bar{\varepsilon}_j + \varepsilon_{ij} \quad (1)$$

where α_j represents industry-level heterogeneity, ε_{ij} represents firm-level heterogeneity, and $\bar{\varepsilon}_j$ is the industry mean of ε_{ij}. γ represents the peer influence parameter and is dependent on $\bar{\varepsilon}_j$. In the absence of peer effect, the γ will be one. If peer effect exists, γ is greater than one, then cash saving decisions are influenced by the $\bar{\varepsilon}_j$ which involves the decisions of peer firms and moreover the characteristics of the peers. The greater the strength of peer effect, the greater γ will be. However, the γ cannot be directly identified because the presence of $\bar{\varepsilon}_j$ leads to a matrix that is not of full rank. Graham (2008) provides a way of estimating the square of peer influence, γ^2, which results from a ratio of actual (observed) difference in between-group variances across small and large industries to the corresponding difference in within-group variance.[17]

$$\gamma^2 = \frac{E(c_j^b | S_j = 1) - E(c_j^b | S_j = 0)}{E(c_j^w | S_j = 1) - E(c_j^w | S_j = 0)} \quad (2)$$

where $c_j^b = (\overline{\Delta C}_{j.} - \overline{\overline{\Delta C}}_s)^2$ is between-industry sum of squares for the vector of cash savings ΔC, with $\overline{\Delta C}_{j.}$ the mean cash savings in industry j and $\overline{\overline{\Delta C}}_s$ the grand mean cash savings in small or large industries. $c_j^w = \frac{1}{N_j}\frac{1}{N_j - 1}\sum_{i=1}^{N_j}\left[\Delta C_{ij} - \overline{\Delta C}_{j.}\right]^2$ is within-industry sum of squares with ΔC_{ij} the

[16] Some industries may have no peer effects, so their cash savings would exhibit no clustering regardless of whether they are small or large industries. However, by evaluating all the three-digit SIC industries over more than 30 years, it is possible to statistically detect the difference in the excess variance when conditional on small and large industries, and that is the evidence of peer effects.

[17] The mathematical derivations are detailed in Graham (2008) and Popadak (2014).

cash savings for firm i in industry j and N_j is the number of firms in industry j. S_j is an indicator for industry type, which equals to one for small industry and zero for large industry.

In order to reduce the amount of firm level and industry level heterogeneity, I orthogonalize the cash savings with respect to many explanatory variables such as firm size, cash flow, Tobin's Q, net equity issuance, net debt issuance, net investment, as well as industry-specific factors including industry competitiveness and industry cash flow volatility, and use the residuals $\hat{u}_{ij}$ to compute c_j^b = $\bar{\hat{u}}_{j.}{}^2$, and c_j^w=$\frac{1}{N_j}\frac{1}{N_j-1}\sum_{i=1}^{N_j}\left[\hat{u}_{ij}-\bar{\hat{u}}_{j.}\right]^2$.

5.2. Results of excess-variance tests

To determine whether excess variance is coming from peer effects, I compare the excess variance across different sizes of peer groups defined by the number of firms in the industry. In each year, I rank industry peer groups from the largest to the smallest number of firms in the industry, and then the lower third industry groups are defined as small industries, while the middle and top third industry groups are regarded as large industries.[18] Estimation results are illustrated in Table 9. Column (1) conditions on observable firm-level and industry-level heterogeneity including firm-specific and industry-specific characteristics. Column (2) further conditions on peer firm average characteristics. The estimates of the square of peer effect parameter γ^2 is 1.832 given firm- and industry-specific variables which suggesting a peer effect multiplier of 1.354, and the related Chi-squared statistics is 7.76 indicating a rejection of no peer effects hypothesis at the 99% significance level. When further controlling for peer firms' average variables, the estimate changes little.

[18] If I classify the industry group as small and large by cutting at the median number of firms across industry peer group, the results are qualitatively similar.

To interpret the economic significance of the peer effect multiplier, I estimate the relative cash changes due to peer effects in small and large industries, respectively. It shows that peer effects lead managers to enlarge or shrink cash savings by 12.8% in small industries and 6.18% in large industries.[19] To put these results into perspective, consider a small industry with an expected cash changes by 2% under the assumption of no peer influence, the results suggest that observed cash changes will be between 1.74% and 2.26%. Since the average cash level of sample firms is 200 million, and the average total asset is 2026 million, the peer effect in cash savings (0.26%) could result in substantial changes. Overall, the results of the excess variance-based tests for peer effects strongly support the hypothesis that peer effects significantly alter cash savings in an industry.

[Insert Table 9 about here]

6. Conclusions

This paper provides evidence that corporate cash saving decisions are influenced in a meaningful way by the peer firms cash policies. Using instrumental variable identification approach to estimate the causal peer effect, I show that one standard deviation increase (decrease) in instrumented peer firms' average cash savings leads to 2.63% increase (decrease) in firm's cash savings on average. Such peer effect is economically meaningful and larger than many previously identified cash saving determinants. In addition, I also find that cash saving peer effects are important enough to impact total cash savings at the industry level.

After examining the existence of peer effects in cash saving decisions, I also perform several cross-sectional tests to examine whether rivalry-based mechanism and (or) information-based mechanism could explain the peer effect in cash saving decisions. The sets of tests suggest that

[19] Graham (2008) provides a rough sense of the magnitude of the implied social multiplier, see Page 656-657. Such relative change is given by $(\gamma - 1)/\sqrt{N_j}$.

cash saving peer effects originate from both channels: (1) firms are more sensitive to peers' cash holding decisions when they face greater competitive pressures; (2) less powerful firms (with lower market share), smaller firms, young firms, and financially constrained firms respond more actively to the peers cash policies; (3) peer effects on cash savings is more pronounced in bad times. Furthermore, I find that peer effect is asymmetric where cash-rich firms are less sensitive to peer firms cash policies than other firms.

Overall, this paper provides a positive answer that firms' cash saving decisions are remarkably influenced by peer firms' cash policies, and the peer effect is more important than many other determinants of cash savings. There is another related question: whether mimicking behavior in cash saving decisions could increase firm values. I believe this could provide an interesting avenue for future research.

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Appendix

Bond Rating Indicator	Dummy variable which equals to one in firm-years where the firm has a bond rating when they report positive debt, and equals to zero if firm-years in which the firm does not have a bond rating but reports positive amounts of debt.
Cash	Cash and short-term investment (CHE) scaled by total assets (AT).
Cash Flow	The ratio of income before extraordinary (IB) over total assets (AT).
Cash Flow Volatility	The standard deviation of cash flow to assets for the previous ten years. Cash flow is defined as the ratio of earnings before extraordinary items and depreciation to total assets.
Dividend Payment Indicator	Dummy variable which equals to 1 in years where a firm pays a common dividend (DVC), otherwise, the dummy equals 0.
Excess Price-cost Margin	This variable is defined as the firm's price-cost margin minus the industry equally weighted average price-cost margin. The price-cost margin is operating profits before depreciation, interest, special items and taxes (OIBDP) over sales (SALE).
Firm Age	This variable is computed as the current year minus the year in which the company was first listed on CRSP.
Gross Margin	The ratio of sales (SALE) minus cost of goods sold (COGS) and selling, general, and administrative expenses (XSGA) over sales (SALE).
HHI	The index is calculated as the sum of the squared market shares of firms in the industry, where industries are defined using 3-digit SIC codes.
HP Index	The index is constructed following Hadlock and Pierce (2010), as -0.737*Size + 0.043*(squared Size)-0.04*Age, where Size is the real size defined as above, and Age is the number of years the firm is listed with a nonmissing stock price on Compustat. In computing HP index, I follow Hadlock and Pierce and cap Size at the log of 4.5 billion and Age at 37 years.
Industry Cash Flow Volatility	This variable is defined as the average of the firm cash flow standard deviations in each year across each three-digit SIC code.
Lines of Credit Indicator	Dummy variable which equals to one in years where a firm reports non-missing and non-zero total lines of credit. The total lines of credit is the sum of the used portion and undrawn credit portion of revolving credit.
Market Share	This variable is defined as the sales is divided by the total industry sales, where industries are defined using three-digit SIC codes.
Market-to-book Ratio (MB)	This variable is constructed as the market value divided by the book value of assets. Market value of assets is book value of asset mines book value of equity and plus market value of equity. Book value of equity is equal to stockholder equity (SEQ) plus balance sheet deferred taxes and investment tax credit (TXDITC), minus the book value of preferred stock. Preferred stock is equal to item PSTKRV, or item PSTKL, or item PSTK. If SEQ is missing, stockholder equity is equal to the book value of common equity (CEQ) plus the par value of preferred stock (PSTKL). If item SEQ and item CEQ are both missing, then stockholder equity is evaluated as total assets (AT) minus total liabilities (LT). Market equity is the fiscal year-end equity price (PRCC_F) multiplied by the number of common shares outstanding (CSHO).

Net Debt	The ratio of net debt issuance over total assets (AT). Net debt issuance is defined as long-term debt issuance (DLTIS) net of long-term debt reduction (DLTR).
Net Equity	The ratio of net equity issuance over total assets (AT). Net equity issuance is defined as the sale of common and preferred stocks (SCSTKC) net of cash dividend (DV) and purchase of common and preferred stocks (PRSTKC).
Net Invest	The ratio of net investment over total assets (AT). Net investment is the sum of capital expenditures (CAPX) plus acquisitions (AQC) net of sales of property (SPPE). For the last three variables, data are collected whenever available.
Real Size	The natural logarithm of total assets (AT), and adjusted by CPI (FY2014 = 100).
WW Index	This index is constructed following Whited and Wu (2006) and Hennessy and Whited (2007) as - 0.091*((IB+DP)/AT) - 0.062*(indictor equal to 1 is DVC + DVP is positive, and 0 otherwise) + 0.021*(DLTT/AT) - 0.044*(log(AT)) + 0.102*(average industry sales growth, estimated for each 3-digit SIC industry and each year)-0.035*(sales growth), where Sales growth is the annual percentage changes in sales (SALE).

Figure 1: Trend of cash ratio from 1980 to 2014

The sample includes all Compustat firm-year observations from 1980 to 2014 with positive total assets and sales for firms incorporated in the United States and publicly traded on the NYSE, AMEX and NASDAQ. Financial firms (SIC code 6000-6999), utilities (SIC code 4900-4999) and government entities (SIC code greater than or equal to 9000) are excluded from the sample. Cash ratio is cash and short-term investment scaled by total assets. The aggregate cash ratio is the sum of cash divided by the sum of assets for all sample firms.

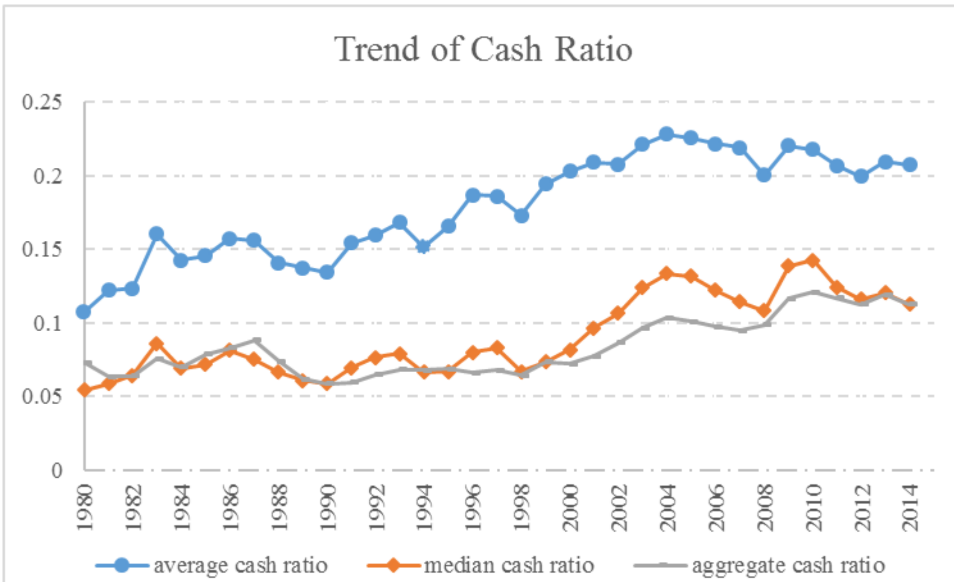

Table 1: Descriptive statistics

The sample includes all Compustat firm-year observations from 1980 to 2014 with positive total assets and sales for firms incorporated in the United States and publicly traded on the NYSE, AMEX and NASDAQ. Financial firms (SIC code 6000-6999), utilities (SIC code 4900-4999) and government entities (SIC code greater than or equal to 9000) are excluded from the sample. Peer firms' average characteristics denote variables constructed as the average of all firms within an industry-year combination, excluding the i^{th} observations. Industries are defined by three-digit SIC code. The specific definitions of variables are in Appendix.

	Mean	Median	SD	P1	P99
Firm-specific characteristics					
$\Delta Cash_t$	-0.00349	-0.000491	0.0933	-0.379	0.316
$Real\ Size_t$	5.508	5.398	2.077	1.170	10.611
$Cash\ Flow_t$	-0.0344	0.0320	0.237	-1.426	0.244
MB_t	1.889	1.393	1.513	0.578	10.358
$Net\ Equity_t$	-0.0228	-0.00275	0.0457	-0.279	0
$Net\ Debt_t$	0.00903	0	0.0911	-0.289	0.403
$Net\ Invest_t$	0.0759	0.0503	0.0838	-0.0591	0.445
$IdioVol_{t-1}$	0.152	0.129	0.0902	0.0376	0.492
Peer firms' average characteristics					
$P\_\Delta Cash_t$	-0.00749	-0.00647	0.0235	-0.0749	0.0539
$P\_Real\ Size_t$	5.420	5.292	1.0675	3.343	8.370
$P\_Cash\ Flow_t$	-0.0592	-0.0265	0.124	-0.649	0.112
P_MB_t	2	1.801	0.786	0.886	5.047
$P\_Net\ Equity_t$	-0.0242	-0.0194	0.0173	-0.111	0
$P\_Net\ Debt_t$	0.0100	0.00854	0.0292	-0.0824	0.127
$P\_Net\ Invest_t$	0.0770	0.0679	0.0379	0.00732	0.244
$P\_RELIdioVol_{t-1}$ (IV)	0.0199	0.0172	0.0163	-0.0126	0.0778
Industry Characteristics					
# Firms per industry-year	23.89	14	36.202		
# Industries	202				
#Obs.	94085				
#Firms	9419				

Table 2: Instrument variable validity

The table reports partial correlations between the instrument and firm-specific fundamentals. The sample includes all Compustat firm-year observations from 1980 to 2014 with positive total assets and sales for firms incorporated in the United States and publicly traded on the NYSE, AMEX and NASDAQ. Financial firms (SIC code 6000-6999), utilities (SIC code 4900-4999) and government entities (SIC code greater than or equal to 9000) are excluded from the sample. The dependent variable is the average of peer firm relative idiosyncratic stock volatility in the last year. Peer firm average factors are peer firm averages of the same variables listed under firm-specific factors in the table: firm size, cash flow, market-to-book ratio, net equity issuance, net debt issuance, and net investment. Peer firm averages are constructed as the average of all firms within an industry-year combination, excluding the i^{th} observations. Industries are defined by three-digit SIC code. All the variables are winsorized at 1% and 99% level. The specific definitions of variables are in Appendix. Column (1) include firm-specific and peer firms' average characteristics, and column (2) further control for industry characteristics: industry concentration and industry cash flow volatility. All test statistics are computed using standard errors that are robust to within-firm correlation and heteroscedasticity. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.

	$P\_RELIdioVol_{t-1}$	
	(1)	(2)
Firm-specific characteristics		
$Real\ Size_t$	-0.000100	-0.000104
	(-0.82)	(-0.86)
MB_t	-0.0000350	-0.0000327
	(-0.72)	(-0.67)
$Cash\ Flow_t$	0.000637**	0.000633**
	(2.23)	(2.22)
$Net\ Equity_t$	-0.00159	-0.00151
	(-1.26)	(-1.20)
$Net\ Debt_t$	0.00000835	0.0000186
	(0.01)	(0.03)
$Net\ Invest_t$	0.000328	0.000321
	(0.44)	(0.43)
Peer firms' average characteristics	Yes	Yes
Firm *i*'s *IdioVol*	Yes	Yes
Industry characteristics	No	Yes
Year Fixed Effect	Yes	Yes
Firm Fixed Effect	Yes	Yes
Adj. R^2	0.229	0.230
#Obs.	94085	94085

Table 3: 2SLS estimation of linear-in-mean model

This table presents 2SLS estimated coefficients scaled by the corresponding variable's standard deviation, where the instrument is the lagged average of peer firms relative idiosyncratic stock volatility, relative idiosyncratic stock volatility is the difference between firm's idiosyncratic stock volatility and industry median idiosyncratic stock volatility. The endogenous variable is the peer firms average cash savings. The sample includes all Compustat firm-year observations from 1980 to 2014 with positive total assets and sales for firms incorporated in the United States and publicly traded on the NYSE, AMEX and NASDAQ. Financial firms (SIC code 6000-6999), utilities (SIC code 4900-4999) and government entities (SIC code greater than or equal to 9000) are excluded from the sample. Peer firms' average characteristics denote variables constructed as the average of all firms within an industry-year combination, excluding the i^{th} observations. Industries are defined by three-digit SIC code. All the variables are winsorized at 1% and 99% level. The specific definitions of variables are in Appendix. All test statistics are computed using standard errors that are robust to within-firm correlation and heteroscedasticity. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively. *K-P rk Wald F statistics* significance implying less than 15% or 10% size distortion is denoted by ** and ***, respectively.

Dependent variable: $\Delta Cash_t$		Including industry characteristics			Including lagged cash savings	
	(1)	(2)	(3)	(4)	(5)	(6)
$P\_\Delta Cash_t$	0.0263**	0.0264**	0.0264**	0.0265**	0.0321***	0.0269***
	(2.23)	(2.24)	(2.23)	(2.24)	(2.66)	(2.61)
$\Delta Cash_{t-1}$					-0.0242***	-0.0244***
					(-50.76)	(-50.90)
Firm-specific characteristics						
$Real\ Size_t$	0.00662***	0.00662***	0.00667***	0.00667***	0.00643***	0.00642***
	(4.86)	(4.86)	(4.90)	(4.90)	(4.37)	(4.36)
$Cash\ Flow_t$	0.0341***	0.0341***	0.0341***	0.0341***	0.0385***	0.0386***
	(12.91)	(12.91)	(12.91)	(12.91)	(14.50)	(14.54)
MB_t	0.0116***	0.0116***	0.0116***	0.0116***	0.0120***	0.0120***
	(11.01)	(11.00)	(10.99)	(10.99)	(10.98)	(11.10)
$Net\ Equity_t$	0.0217***	0.0217***	0.0217***	0.0217***	0.0192***	0.0192***
	(23.61)	(23.60)	(23.60)	(23.59)	(20.93)	(21.06)
$Net\ Debt_t$	0.0166***	0.0166***	0.0166***	0.0166***	0.0145***	0.0145***
	(21.14)	(21.14)	(21.13)	(21.13)	(18.94)	(19.00)
$Net\ Invest_t$	-0.0531***	-0.0531***	-0.0531***	-0.0531***	-0.0504***	-0.0504***
	(-56.31)	(-56.31)	(-56.31)	(-56.31)	(-55.28)	(-55.38)
$IdioVol_{t-1}$	0.00576***	0.00576***	0.00579***	0.00579***	0.00786***	0.00777***
	(8.57)	(8.56)	(8.61)	(8.60)	(11.32)	(11.11)
Peer firms' average characteristics						
$P\_\Delta Cash_{t-1}$						0.00463***
						(3.07)
$P\_Real\ Size_t$	-0.00296	-0.00297	-0.00337*	-0.00338*	-0.00382*	-0.00323*
	(-1.47)	(-1.48)	(-1.70)	(-1.70)	(-1.84)	(-1.72)
$P\_Cash\ Flow_t$	-0.0127*	-0.0129*	-0.0133*	-0.0135*	-0.0156**	-0.0150**
	(-1.75)	(-1.77)	(-1.84)	(-1.86)	(-2.09)	(-2.08)
P_MB_t	-0.00115	-0.00116	-0.000971	-0.000985	-0.00205	-0.00142
	(-0.64)	(-0.65)	(-0.54)	(-0.55)	(-1.12)	(-0.87)
$P\_Net\ Equity_t$	-0.00235	-0.00238	-0.00234	-0.00237	-0.00346*	-0.00225
	(-1.35)	(-1.36)	(-1.34)	(-1.36)	(-1.94)	(-1.60)
$P\_Net\ Debt_t$	-0.00137**	-0.00138**	-0.00134**	-0.00135**	-0.00182***	-0.00120**
	(-2.02)	(-2.03)	(-1.98)	(-1.99)	(-2.64)	(-2.10)
$P\_Net\ Invest_t$	0.0132***	0.0133***	0.0132***	0.0132***	0.0154***	0.0129***
	(2.82)	(2.83)	(2.81)	(2.82)	(3.22)	(3.27)
Industry characteristics						
HHI_{t-1}		0.000410		0.000376		
		(0.86)		(0.79)		
$Ind\ cash\ flow\ Vol_{t-1}$			-0.00246*	-0.00243*		
			(-1.86)	(-1.83)		
1st-stage Instrument						
$P\_RELIdioVol_{t-1}$	0.0388***	0.0388***	0.0388***	0.0388***	0.0388***	0.0449***
	(9.36)	(9.36)	(9.36)	(9.36)	(9.36)	(10.64)
K-P rk Wald F statistics	87.659***	87.651***	87.58***	87.566***	87.619***	113.302***
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
#Obs.	94085	94085	94085	94085	94085	94085

Table 4: Robustness tests

This table presents 2SLS estimated coefficients scaled by the corresponding variable's standard deviation, where the instrument is the lagged average of peer firm relative idiosyncratic risk, and the endogenous variable is the peer firm average cash savings. Column (1) employ TNIC peer groups, column (2) restricts the sample into US domestic firms, column (3) focuses on the period from 2004 to 2014 where no cash trend exists, and column (4) uses pseudo peers to implement placebo tests. Financial firms (SIC code 6000-6999), utilities (SIC code 4900-4999) and government entities (SIC code greater than or equal to 9000) are excluded from the sample. Peer firms' average characteristics denote variables constructed as the average of all firms within an industry-year combination, excluding the i^{th} observations. All the variables are winsorised at 1% and 99% level. The specific definitions of variables are in Appendix. All test statistics are computed using standard errors that are robust to within-firm correlation and heteroscedasticity. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively. *K-P rk Wald F statistics* significance implying less than 15% or 10% size distortion is denoted by ** and ***, respectively.

	TNIC peers (1)	Domestic firms (2)	2004 - 2014 (3)	Pseudo peers (4)
$P\_\Delta Cash_t$	0.0315**	0.0219*	0.0211*	0.00784
	(2.07)	(1.93)	(1.80)	(0.30)
Firm-specific characteristics				
$Real\ Size_t$	0.00776**	0.00941***	0.0117***	0.00726***
	(2.38)	(4.45)	(2.88)	(5.14)
$Cash\ Flow_t$	0.0221***	0.0298***	0.0207***	0.0345***
	(5.46)	(12.30)	(3.70)	(12.72)
MB_t	0.0105***	0.0126***	0.0129***	0.0126***
	(5.47)	(7.60)	(6.62)	(12.19)
$Net\ Equity_t$	0.0203***	0.0196***	0.0369***	0.0219***
	(16.83)	(13.26)	(20.10)	(23.88)
$Net\ Debt_t$	0.0242***	0.0129***	0.0291***	0.0165***
	(18.14)	(11.07)	(18.05)	(20.94)
$Net\ Invest_t$	-0.0620***	-0.0521***	-0.0615***	-0.0529***
	(-43.47)	(-37.77)	(-43.51)	(-56.16)
$IdioVol_{t-1}$	0.00568***	0.00742***	0.00394***	0.00620***
	(3.76)	(7.37)	(2.76)	(9.41)
Peers average characteristics				
$P\_Real\ Size_t$	-0.00170	-0.00283	-0.00299	-0.00108
	(-0.87)	(-1.17)	(-1.39)	(-0.51)
$P\_Cash\ Flow_t$	-0.00313	-0.00296	-0.00302	-0.00185
	(-1.42)	(-1.10)	(-1.04)	(-0.37)
P_MB_t	-0.00617	0.000656	-0.00382	-0.000217
	(-1.52)	(0.30)	(-1.43)	(-0.37)
$P\_Net\ Equity_t$	-0.00636*	-0.00124	-0.00525	-0.00187
	(-1.94)	(-0.76)	(-1.63)	(-0.74)
$P\_Net\ Debt_t$	-0.00475***	-0.00101	-0.00387**	-0.000197
	(-2.58)	(-1.44)	(-2.12)	(-0.12)
$P\_Net\ Invest_t$	0.0240***	0.0118**	0.0157**	0.00233
	(3.05)	(2.43)	(2.37)	(0.28)
Industry characteristics				
HHI_{t-1}	0.00110	0.000530	-0.000348	0.000638
	(1.35)	(0.65)	(-0.19)	(1.05)
$Ind\ Cash\ Flow\ Vol_{t-1}$	-0.000625	-0.000395	-0.00626	-0.00273**
	(-0.15)	(-0.16)	(-1.45)	(-2.25)
1st-stage Instrument	0.0491***	0.0548***	0.0798***	0.013***
$P\_RELIdioVol_{t-1}$	(6.48)	(9.23)	(8.81)	(3.45)
K-P rk Wald F statistics	43.337***	85.235***	81.669***	11.913**
Year Fixed Effect	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes
#Obs.	44878	47081	24613	94058

Table 5: Rivalry-based mechanism

This table reports 2SLS estimated coefficients for the peer firm average cash savings interacted with indicator variables identifying industry concentration, the intensity of cash flow volatility, and the extent of product market threats. The dependent variable is the change in cash ratio. The coefficient estimates are scaled by the corresponding variable standard deviation. The endogenous variables are the peer firms average cash savings interacted with indicator variables, and the instrument variables are the one-period-lagged peer frim average relative idiosyncratic risk interacted with the same indicator variables. The indicator variable D_{low} is equal to one if firms are ranked into the bottom tercile and zero if the firms are at the top tercile based on the competition proxies listed in the top row. Just the reverse, D_{high} is equal to one if firms are ranked into the top tercile and zero for bottom tercile. The *K-P rk Wald F statistics* are reported at the bottom of the table. Industries are defined by 3-digit SIC code. All test statistics are computed using standard errors that are robust to within-firm correlation and heteroscedasticity. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively. *K-P rk Wald F statistics* significance implying less than 15% or 10% size distortion is denoted by ** and ***, respectively.

	(1) Compustat HHI	(2) TNIC HHI	(3) EPCM	(4) Cash flow volatility	(5) Product market fluidity
$P\_\Delta Cash_t * D_{low}$	0.0188**	0.0285***	0.0334**	0.0103	0.0206**
	(2.51)	(2.63)	(2.29)	(1.37)	(1.97)
$P\_\Delta Cash_t * D_{high}$	0.0161	0.0119	0.0289***	0.0166*	0.0295***
	(1.39)	(0.97)	(2.79)	(1.83)	(2.94)
D_{high}	0.000637	-0.00745	0.000664	0.00344	0.00241
	(0.11)	(-1.37)	(0.11)	(0.82)	(0.48)
K-P rk Wald F statistics	11.165***	19.191***	20.414***	20.724***	16.979***
Firm-specific characteristics	Yes	Yes	Yes	Yes	Yes
Peers average characteristics	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes
#Obs.	72394	31815	61785	56495	29423

Table 6: Information-based mechanism

This table reports 2SLS estimated coefficients for the peer firm average cash savings interacted with indicator variables identifying the lower and upper third of the within-industry-year distribution of market share, gross margin, market cap, book size, market-to-book ratio, and firm age in Panel A, as well as whether the firm has a bond rating, whether the firm paid a dividend, whether the firm has lines of credit, the Whited-Wu (2006) Index and HP Index (Hadlock and Pierce, 2010) in Panel B. The dependent variable is the change in cash ratio. The coefficient estimates are scaled by the corresponding variable standard deviation. The endogenous variables are the peer firms average cash savings interacted with indicator variables, and the instrument variables are the one-period-lagged peer frim average relative idiosyncratic risk interacted with the same indicator variables. The *K-P rk Wald F statistics* are reported at the bottom of the table. Industries are defined by 3-digit SIC code. All test statistics are computed using standard errors that are robust to within-firm correlation and heteroscedasticity. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively. *K-P rk Wald F statistics* significance implying less than 15% or 10% size distortion is denoted by ** and ***, respectively.

Panel A	(1) Market share	(2) Gross margin	(2) Market Cap	(3) Book size	(4) Market-to-book	(5) Firm age
$P\_\Delta Cash_t * D_{low}$	0.0290**	0.0277**	0.198*	0.0258**	-0.0158	0.0293**
	(2.11)	(1.99)	(1.66)	(2.07)	(-1.39)	(2.40)
$P\_\Delta Cash_t * D_{high}$	0.0148	0.0275***	0.0113***	0.0129*	0.0338**	0.0128
	(2.09)	(2.84)	(1.56)	(1.69)	(1.98)	(1.32)
D_{high}	0.00155	0.00157	-0.0210	-0.0220***	0.0218**	-0.00542
	(0.24)	(0.28)	(-3.19)	(-3.19)	(2.53)	(-1.18)
K-P rk Wald F statistics	25.672***	25.316***	25.854***	36.915***	19.026***	23.573***
Firm-specific characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Peers average characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
#Obs.	61986	60762	61990	62018	61941	62378

Table 6: Information-based mechanism (cont'd)

Panel B	(1) Bond rating (Group 2 = Yes)	(2) Dividend payment (Group 2 = Yes)	(3) Lines of credit (Group 2 = Yes)	(4) HP Index (Group 2 = Low)	(5) WW Index (Group 2 = Low)
$P\_\Delta Cash_t * D_1$	0.0294***	0.0182**	0.0221**	0.0322***	0.0203**
	(2.70)	(2.17)	(2.49)	(2.76)	(2.44)
$P\_\Delta Cash_t * D_2$	0.00525	0.0138	0.0112	0.0159*	0.0159*
	(0.95)	(1.44)	(1.43)	(1.91)	(1.74)
D_2	0.0264***	-0.00478	0.0116***	0.0233***	0.00969*
	(5.84)	(-1.03)	(7.01)	(3.72)	(1.77)
K-P rk Wald F statistics	31.947***	11.045***	28.386***	24.657**	17.11***
Firm-specific characteristics	Yes	Yes	Yes	Yes	Yes
Peers average characteristics	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes
#Obs.	94085	94085	61990	62209	60713

Table 7: Information-based mechanism – Bad times vs. Normal times

This table reports 2SLS estimated coefficients for the peer firm average cash savings interacted with indicator variables identifying the "bad times" in economics. Column (1) is based on the NBER-defined recessions; column (2) consider separately the Subprime mortgage crisis from December 2007 to June 2009; The column (3) set the indicator variable *Crisis* following the Loh and Sultz (2016) definition: September-November 1987 (1987 crisis), August-December 1998 (LTCM crisis), and July 2007-March 2009 (Credit crisis). The dependent variable is the change in cash ratio. The coefficient estimates are scaled by the corresponding variable standard deviation. The endogenous variables are the peer firm average cash savings interacted with indicator variables, and the instrument variables are the one-period-lagged peer frim average relative idiosyncratic risk interacted with the same indicator variables. The *K-P rk Wald F statistics* are reported at the bottom of the table. Industries are defined by 3-digit SIC code. All test statistics are computed using standard errors that are robust to within-firm correlation and heteroscedasticity. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively. *K-P rk Wald F statistics* significance implying less than 15% or 10% size distortion is denoted by ** and ***, respectively.

	(1)	(2)	(3)
	NBER Recess	Dec 2007 – Jun 2009	Crisis
$P\_\Delta Cash_{-ijt}$ * *Bad time dummy*	0.0375**	0.0232*	0.0173***
	(2.06)	(1.71)	(3.52)
$P\_\Delta Cash_{-ijt}$ * *Other period dummy*	0.0162**	0.0193**	0.0164*
	(2.18)	(2.27)	(1.78)
Bad time dummy	0.00160	-0.0293	0.0179*
	(0.71)	(-1.00)	(1.67)
K-P rk Wald F statistics	7.247***	51.605***	46.095***
Firm-specific characteristics	Yes	Yes	Yes
Peers average characteristics	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes
#Obs.	94085	94085	94085

Table 8: Whether cash-rich firms are less sensitive to peer effect?

This table reports 2SLS estimated coefficients for the peer firms average cash savings interacted with indicator variables identifying cash-rich firms. The dependent variable is the change in cash ratio. The coefficient estimates are scaled by the corresponding variable standard deviation. All models are estimated by 2SLS method where the endogenous variables are the peer firm average cash savings interacted with indicator variables, and the instrument variables are the one-period-lagged peer frim average relative idiosyncratic risk interacted with the same indicator variables. The *K-P rk Wald F statistics* are reported at the bottom of the table. Industries are defined by 3-digit SIC code. The indicator variable in Column (1) identifying the lower and upper third of the within-industry-year distribution of last period cash holding levels. The indicator variables in Column (2) and Column (3) follows the Harford (1999), where cash-rich firm-years are years in which a firm's cash holdings are more than 1.5 standard deviations and 2 standard deviations above the predicted cash holdings, respectively. All test statistics are computed using standard errors that are robust to within-firm correlation and heteroscedasticity. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively. *K-P rk Wald F statistics* significance implying less than 15% or 10% size distortion is denoted by ** and ***, respectively.

	(1) Lagged cash	(2) Cash rich 1.5X	(3) Cash rich 2X
$P\_\Delta Cash_t * D_{low}$	0.0161*	0.0263**	0.0239**
	(1.70)	(2.10)	(2.44)
$P\_\Delta Cash_t * D_{rich}$	0.0153	0.0187**	0.0161**
	(1.05)	(2.18)	(2.29)
D_{rich}	-0.0994***	-0.0709***	-0.062***
	(-16.71)	(-10.66)	(-8.33)
K-P rk Wald F statistics	22.133***	32.895***	40.250***
Firm-specific characteristics	Yes	Yes	Yes
Peers average characteristics	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes
#Obs.	61406	75272	75272

Table 9: Total economic impact of peer effect on industry cash savings

This table displays estimates from the excess variance-based tests pioneered by Graham (2008). The sample includes all Compustat firm-year observations from 1980 to 2014 with positive total assets and sales for firms incorporated in the United States and publicly traded on the NYSE, AMEX and NASDAQ. Financial firms (SIC code 6000-6999), utilities (SIC code 4900-4999) and government entities (SIC code greater than or equal to 9000) are excluded from the sample. When the estimate of the peer effect multiplier γ^2, is significantly different from 1, then peer effects of corporate cash saving decisions exist. Column (1) presents results for the changes of cash holdings, which conditions for firm-level characteristics such as cash flow to assets ratio, market-to-book ratio, firm real size, net equity issue, net debt issue, and net investment (Almeida, Campbell and Weisbach (2004), and Palazzo (2012)). Column (2) conditions for all firm-specific and peer firm average characteristics. The industry-specific factors are controlled in both models. Statistical significance at the 10%, 5% and 1% levels is denoted by *, **, and ***, respectively.

	(1)	(2)
Estimate of γ^2	1.832	1.809
Implied Peer Effect Multiplier	1.354	1.345
Chi-Squared Test (H0: There's no peer influence)	(7.76)***	(7.70)***
Implied effect of Multiplier (Small industry)	12.8%	12.5%
Implied effect of Multiplier (Large industry)	6.2%	6.0%
Firm-specific characteristics	Yes	Yes
Industry-specific characteristics	Yes	Yes
Peer firms' average characteristics	No	Yes
# Industry-year combinations	4445	4445