Does Firm Structure Matter in Corporate Cash Holdings?*

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Abstract

We analyze whether organizational structure of firms (i.e., whether a firm is diversified or focused) affects corporate cash holdings. There are several reasons why firm structure could affect cash holdings. Unlike focused firms, diversified firms have the potential to use internal capital markets and proceeds from sales of non-core assets, and therefore would have less need to hold cash. Diversified firms also have more agency problems, primarily in the form of conflict over resource allocation across segments that increases the marginal cost of holding cash. Using Compustat financial and segment data in the 1988-2002 period, we find evidence that diversified firms hold significantly less cash than their focused counterparts. This result holds even after industry adjustment at the segment level and after controlling for the different factors found to be important determinants of corporate cashing holdings in both time-series and cross-sectional tests. Using further robustness tests, we are able to attribute the lowered optimal cash holdings to the presence of internal capital markets, the potential for asset sales, and to increased agency problems among diversified firms.

1. Introduction

Cash, as a very important asset on a firm's balance sheet, receives much attention from companies, investors, and analysts. At the end of 2002, the U.S. non-financial and non-utility corporations held $443 billion in cash and cash equivalents, which on average represents about 21% percent of total assets. Compared with the cash balances of about 10 percent of total assets in 1988, the numbers have doubled in relative terms while other items such as debt and investment have stayed at a relative stable level over the same period[2]. Having fortified their balance sheets with cash over the past several years, many companies now are facing a problem of how to use the cash efficiently. For example, at the end of 2002, Microsoft had accumulated cash of $38.6 billion, enough to buy the entire airline industry – twice. All that cash gives Microsoft a financial flexibility that most corporate managers would desire. And yet there is also controversy about Microsoft's cash hoard -- complaints that perhaps the amount has grown too large. One of the key roles of corporate management is to wisely reinvest the cash the business generates to enhance profits.

However, despite the relative magnitude and importance ascribed to cash holdings by firms and investors, it has not received wide attention in the academic literature. In most prior research, transaction cost was assumed to be the major determinant of cash holdings, i.e. firms with a higher marginal cost of cash shortage would hold more cash (Miller and Orr 1966, Meltzer 1993 and Mulligan 1997). Only recently have researchers turned their attention to whether there is an optimal level of corporate cash holding and what determines this optimal level. Opler, Pinkowitz, Stulz and Williamson (1999) develop a useful framework for thinking about the determinants of

[2] Other items in the balance sheet such as debt and investment stayed relatively stable across time. For example, in 2002, the total investment by U.S. non-financial and non-utility corporations, excluding firms with assets less than $20 million, is $256 billion (on average, 5.1% of the individual firms' assets), compared with $236 billion (on average, 7.9% of individual firms' assets) in 1988. The total debt in 2002 was $2,873 billion (on average, 54.6% of individual firms' assets) compared to $1766 billion (on average, 58.6% of individual firms' assets) in 1988. See Appendix table A1 for the detailed statistics.

cash holdings by firms and expand the evidence on the determinants of corporate cash holdings considerably. They examine two broad explanations for cash holdings: the trade-off theory and the financing hierarchy theory. Static tradeoff theory argues that both holding liquid assets and being short of liquid assets have costs so there is an optimal amount of cash where the marginal cost of holding cash is equal to the marginal cost of being short of cash. The costs of holding cash include the opportunity cost of idle capital and agency costs associated with managerial discretion. The costs of being short of cash could arise from transaction costs, information asymmetries, and agency costs of external capital. In contrast to the static tradeoff theory, financing hierarchy theory predicts there is no optimal amount of cash holdings. Firms can issue securities at low cost to raise cash whenever they have insufficient cash to finance their projects. In this scenario, empirically, given the adverse selection costs of equity, liquid assets should rise and fall with the debt level of firms. Opler et al. (1999) find substantial support for the tradeoff model, which suggests that there is an optimal amount of cash holding. They argue that management maximizing shareholder wealth should set a firm's cash holdings at a level such that the marginal benefit of cash holdings equals the marginal cost of those holdings. Their empirical tests provide evidence that firms with higher growth opportunities, those with riskier activities, and smaller firms hold more cash than other firms. Firms that have greater access to the capital market, such as large firms and those with good credit ratings tend to hold less cash.

More recent empirical studies of corporate cash holdings provide further understanding of cash holdings. Dittmar et al. (2002) consider agency problem as an important determinant of corporate cash holdings. Using firms from 45 different countries, they find that corporations in countries with poor shareholders rights protection hold up to twice as much cash as corporations in countries with good shareholder rights protection. Faulkender and Wang (2004) analyze the value that market

places on cash holdings and how it varies cross-sectionally. In particular, they find that marginal value of cash declines with large cash holdings, higher leverage, better access to capital market, and as firms choose to distribute cash via dividends rather than repurchases.

In this paper, we argue that firm structure materially affects the benefits and costs of holding cash, and would therefore be an important determinant of the optimal level of cash holdings. However, prior empirical research has largely ignored this factor while analyzing cash holdings of firms. It is well documented in the diversification literature that diversified firms are not simply combination of segments. Segments in diversified firms are interdependent and there exists an internal capital market in these firms (Lamont 1997, Shin and Stulz 1998 and Khanna and Tice 2001). We expect that firm structure could affect optimal cash holding based on three different aspects. First, investment opportunities for different segments are not perfectly correlated. Therefore the total cash need for the whole diversified firm is less volatile over time. If firms hold cash for potential growth needs, diversified firms need less cash to meet the investment need at any one point in time. Also, the internal capital market within diversified firms makes available the cash flow of one segment as capital for another segment. This reduces the need of external capital thereby reducing a benefit of holding cash. It should be noticed that for complementarities in growth across segments to affect optimal cash holdings, the presence of an active internal capital market is a necessary condition. Yet, the presence of internal capital markets by itself does not reduce the need for cash if there is no imperfect correlation in growth opportunities across the segments. We call our first hypothesis described above as the *Complementary Growth Hypothesis.*

Second, Shleifer and Vishney (1992) discuss the role of assets sales as a source of financing -- a firm with assets on its balance sheet that can be cheaply converted into cash can raise funds at low cost by selling these assets. Diversified firms are more likely to raise funds by selling substantial

assets, especially of non-core segments, than single-segment firms. This reduces the benefits of cash holdings. Hence, firms with more than one segment should have lower levels of liquid assets. We call this the *Assets Sales Hypothesis*.[3] Finally, diversified firms may face more severe agency problems that rises from segment-managers' intent to fight for firm-wide resources (Rajan et. al, 2000). Costs due to these conflicts fall under the general rubric of influence costs in the governance literature. Thus the marginal cost of holding cash and liquid assets, which generate these influence costs, are higher for diversified firms than for focused firms. Hence, we would expect diversified firms to hold less cash. We call this the *Agency Problem Hypothesis*. All three hypotheses (*Complementary Growth, Assets Sales*, and *Agency Problem*) predict that diversified firms will have less cash holdings than their stand-alone counterparts.

Fig. 1 shows the marginal cost curve of being short of liquid assets and the marginal cost curve of holding cash for focused firms and diversified firms. Following Opler et al. (1999), we may assume that the marginal cost curve of holding liquid assets is horizontal and the marginal cost curve of liquid asset shortage has a downward slope. As argued in Opler et al. (1999), the equilibrium for the optimal cash holdings is the intersection of the two curves. Absent agency costs, there is no reason to believe that the marginal costs are different for focused firms and diversified firms. But the marginal benefit of holding liquid assets, i.e. the marginal costs of liquid assets shortage should vary between diversified firms and focused firms. The first hypothesis – *Complementary Growth Hypothesis* suggests that the possibility of cash shortage is lower in diversified firm and the existence of internal capital market suggests that segments in diversified firms have less marginal costs of shortage because the firm can easily transfer liquid assets among segments. The second hypothesis – *Assets Sales Hypothesis* suggests that diversified firms have

[3] It is also possible that diversified firms have better access to the external capital market, which results in less cash holding for them. We control for this possibility using different proxies including firm debt ratings.

one more external financing method, i.e. assets sales, compared to focused firms. Both hypotheses predict that diversified firms should have less cash-shortage costs and therefore move the benefits of liquid assets toward the left, which implies a lower level of liquid assets in diversified firms. The third hypothesis – *Agency Cost Hypothesis* – affects the magnitude of the costs of holding cash. If agency problems related to influence costs are higher for diversified firms, then we would expect the horizontal line representing the marginal costs of holding cash to be higher for diversified firms than for focused firms. This, in turn, causes the intersection between the marginal cost and benefit curves for diversified firms to be on the left of the intersection for focused firms. Again, predicting a lower level of liquid asset holdings.

(Insert Figures 1a and 1b here.)

The remainder of the paper is organized in the following three sections. In section 2, we present the data, and describe the variables and methodology used in this study. In section 3, we empirically examine corporate cash holdings and present the results that diversified firms hold less cash than focused firms after adjusting for industry at the segment level, and after controlling for all previously found determinants of corporate cash holdings. In this section, we also analyze the role of our three main hypotheses in explaining why diversified firms hold less cash. In addition, we conduct tests to examine the robustness of our findings. Section 4 concludes.

2. Sample Data and Methodology

We compile our sample from Compustat Industry Segment (CIS) annual data from 1988 to 2002. SFAS No.14 requires that firms report information for segment that represent 10 percent or more of consolidated sales for fiscal year ending after December 15, 1977. We start the sample period from 1988 instead of 1977 because the Segment SIC codes are not available before 1988 from

COMPUSTAT Segment dataset. A firm is classified as a diversified firm if it reports more than one business segment with different SIC codes at the 2-digit level. A firm is classified as a focused firm otherwise. Following Berger and Ofek (1995), we exclude firms with any segment in a financial industry (SIC 6000–6999) or utility industry (SIC 4900–4999) or firms with any segments reporting negative sales or assets. We also exclude any firm with negative cash. Then we merge the Segment data with the Compustat Industry annual file to get firm level data. We refine the sample by applying the same criteria used by Berger and Ofek (1995). We eliminate any firm years with total assets less than $20 million. We also exclude any firm years where the sum of the segment sales is not within one percent of the firm's total sales or the sum of the segment assets is not within 25 percent of the firm's total assets. These data include survivors and non-survivors that appeared on Compustat at any time in the sample period. The final sample for regressions includes 33483 focused firm-years and 8476 diversified firm-years.

Since our main research focus is on how firm structure affects the optimal cash holdings, we use industry-adjusted cash holdings as our primary dependent variable. Firms operating in different industries may have different cash holdings as is illustrated in Chudson (1945) through some anecdotal evidence. For our sample, in Table I we report the cash holdings in the different industries.

(Insert Table I here)

To produce Table 1 we calculate cash to total asset for each 2-digit SIC code industry. To avoid any ambiguity in the industry affiliation we only include focused firms in this calculation. We also require an industry to have at least 100 observations of firm years to enter the table. The top 10 industries (panel B) hold cash almost 10 times as much as the bottom 10 industries (panel A). For example the bottom cash holding industry is Textile Mill Products industry, with median (mean)

cash holding of 1.43% (4.59%), while the top cash holding industry, Chemicals and Allied Products industry, has median (mean) cash holding of 30.25% (37.86%).

The huge industry variation for cash holdings motivates us to control for the industry effects in cash holdings. We use a method similar in spirit to that in Berger and Ofek (1995) to calculate diversification discount to construct our main dependent variable – *industry-adjusted cash holdings*. We first calculate imputed cash holdings of each segment in a diversified firm by multiplying the median ratio of cash over total asset for single-segment firms in that segment's industry (hereafter, median (CASH/TA) by that segment's asset value. The industry median ratios are based on the narrowest SIC grouping that include at least five single-line businesses. The imputed cash holding for each segment is therefore the total asset of the segment times median (CASH/TA). Adding up imputed cash holdings for each segment of a diversified firm gives us the imputed cash holdings (ImputedCash) for the diversified firm. The sum of the imputed cash holdings of a company's segments estimates the cash holding level of the firm if all its segments operated as standalone businesses. Our main dependent variable is the difference between the actual Cash holding of the firm and ImputedCash calculated from the same two-digit SIC standalone firms scaled by total asset of the firm ((Cash-ImputedCash)/total asset). We call this variable ADJCASH in all the regressions. Positive ADJCASH indicates that the diversified firms hold more cash than their stand-alone counterparts and negative ADJCASH indicates that diversified firms hold less cash compared with the stand-alone counterparts.

For the single-segment firms, we do the same calculation and the ADJCASH is again defined as (Cash- ImputedCash)/total asset. Because we are using the single-segment as benchmark to calculate the ADJCASH for the focused firms, the median ADJCASH for all the focused firms should be zero. We believe our method to control for industry effects can effectively eliminate the

industry effects at the segment level. It rests on segment accounting data and calculates an "imputed value" as a benchmark value for the conglomerate by adding up imputed segment values.

Our hypotheses require us to measure three factors. First we need to measure the degree that growth opportunities among segments can complement each other. Second we need to measure the level of activities in the internal capital market in diversified firms. Third, we need to measure the possibility that a firm can sell assets for financing and the effectiveness of the assets sales.

We measure the degree of complementarity in growth opportunities among segments using the mean time-series correlation between segments' growth opportunities. We follow the extant literature to proxy segment's growth opportunity by using the median market-to-book ratio of focused firms in that segment's industry. Then for every two segments we calculate the correlation between growth opportunities during the sample period. We compute the mean of the correlations (MEANQCORR) for each two-segment combination. All focused firms have MEANQCORR equal to 1. The higher the MEANQCORR, the higher is the correlation between segments' growth opportunities, and therefore, fewer the complementary effects within the firm. According to our hypothesis high correlation between segments' growth opportunities will increase the benefits of cash holdings and thus the optimal cash holdings.

We measure the activeness of the internal capital market within each firm using two variables. The first variable is DIVERSITY, which follows Rajan et al. (2000). It is the difference of growth opportunities among segments in the firm. As Rajan et al. (2000) argue, when the segment growth opportunities differ, managers in different segments will fight more for internal funds. Therefore DIVERSITY can be used as a proxy for the activeness of the internal capital market. Given that DIVERSITY is only an indirect measure in that it measures the propensity for influence-related agency cost, we also use a second measure Minter. Minter is a more direct measure of internal

capital market, and follows Berger and Hann (2003). For each year, we calculate Transfer as Max (sum of excess CAPX–Firm level excess CAPX, 0), where Excess CAPX=Max (CAPX–(OPS+DEP), 0), CAPX=capital expenditure, OPS=operating profits, DEP= depreciation expense. All variables are deflated by total assets. Minter is then defined as the mean of Transfer during the sample period.

We construct two variables to measure the use or the effectiveness of assets sales. MSALEPPE measures how often the firm sells Property, plant and equipment. For a firm year, if sale of property, plant and equipment is bigger than 0 (Compustat data item 107), then we let Dumsaleppe=1, else Dumsaleppe=0. Assets Sales Hypothesis suggests that assets sales can be used as an external financing method. It however does not mean that in the year that firms sell assets, it has less cash holding.[4] Therefore, we take the average of Dumsaleppe during the sample period and name it MSALEPPE. If assets sales are indeed a cheaper method of external financing, the firm should use it more often. We predict that MSALEPPE is negatively related to cash holding. We use LOSSASSET to measure the effectiveness of assets sales. MSALEPPE can only indirectly measure the effectiveness. If a firm can effectively uses assets sales as an external financing method, it should earn a profit or at least sell the assets at a lower discount. For a firm year, if the loss from assets sales (Compustat data item 213) is larger than 0, then we let Dumlossasset=1, else Dumlossasset=0. We then take the average of Dumlossasset during the sample period and name it MLOSSASSET. Mlossasset indicates how often a firm has losses when it sells its PPE and Investment.

Variables used to control other determinants of cash holdings follow Opler et al. (1999). The main cash holding determinants they find are industry, market to book ratio, size, cash flow, net

[4] Actually the opposite may be correct: when a firm sells asset, it may receive a large amount of cash and increase the cash holdings temporarily

working capital, investment, leverage, R&D and dividend dummy. Since we control for industry effect at a segment level when we construct our main dependant variable ADJCASH, we do not include industry dummy or industry cash flow volatility in our regressions. The market-to-book ratio is to measure the likelihood that a firm will have positive net present value (NPV) projects in the future. The higher the market-to-book ratio, the higher the growth options in the firm. We measure size as the natural logarithm of book value of assets. We define cash flow as earnings after interest, dividend, and taxes, but before depreciation, amortization, divided by assets. Firms may choose to insure themselves against losses by holding liquid asses besides cash. It is often that firms liquidate receivables as a means of raising liquidity so we use working capital minus cash as a measure of liquid asset substitutes. We measure investment of the firm by capital expenditure divided by assets. Leverage is measured by using the debt –to-assets ratio defined as (long-term debt +short term debt)/book value of assets. We use R&D expense-to-sales ratio as a measure of potential for financial distress costs. We define a dummy set equal to one in year where a firm pays a dividend. Otherwise the dummy variable equals zero.

Definitions of all the variables are listed in table II.

(Insert Table II here)

3. Empirical results

3.1. Descriptive evidence

Table III reports the summary statistics for the focused and diversified firms in the sample, and the difference in the various characteristics between the two groups. From the table it may be seen that diversified firms have cash holdings that are 6.8% of their assets, lower than the 15.7% for focused firms. The median ADJCASH for focused firms is very close to 0 as we expect and is –

2.7% for diversified firms. This implies that diversified firms hold less cash not only when cash is measured as a percentage of assets but also even after we control for industry affiliation at the segment level. This result also demonstrates that controlling for industry is important – a 9% difference before industry adjustment vs. 3% difference after industry adjustment. Second, diversified and focused firms differ in other determinants of cash holdings. For example, diversified firms are larger than focused firms in general (median size of $151 million of assets for focused firms vs. $425 million for diversified firms) and diversified firms have better bond ratings than focused firms. Because Opler et al. (1999) find that firm size and bond ratings are important determinants for corporate cash holding, the difference in these determinants between diversified firms and focused firms can lead to different cash holding levels. So, in subsequent tests we control for all factors found to be relevant in Opler, et al. to examine whether diversified firms still hold less cash than focused firms. Finally, we also observe that there are significant differences between diversified and focused firms in their propensity for and efficiency in generating funds through asset sales. MSALEPPE is 0.333 for diversified firms and 0.267 for focused firms. This suggests that diversified firms use assets sales more often than focused firms. MLOSSASSET is 0.083 for diversified firms and 0.125 for focused firms, suggesting that diversified firms sell assets in a more effective way. The evidence is consistent with the Assets Sales Hypothesis.

(Insert Table III here)

3.2. Regression evidence

Table III provided univariate evidence that diversified firms hold less cash than focused firms. In this section we examine whether diversified firms hold less cash once we control for all the previously found cash holding determinants.

First, we explore this question by using the determinants of cashing holdings identified in Opler, et. al., 1999 and adding a dummy variable for firm structure (1 for diversified firm and 0 for focused firms) in the regressions that explain cash holdings of firms. The models in Table IV present four broad types of regressions – (i) the Fama-MacBeth regression, (ii) time-series regression, (iii) firm and year fixed-effect regression, and (iv) cross-sectional regression using the 1988–2002 data. We control for all the determinants suggested by Opler et al. and find that the Dummy variable is significant in all four regressions. This result indicates that even after controlling for determinants of cash holdings identified in prior literature, firm structure plays an important role in determining corporate cash holdings.

(Insert Table IV here)

From table IV, we can see that coefficient for the diversified dummy is –2.4 in the Fama-MacBeth and the regression with year dummy. It's –0.007 and –0.035 in the fixed effects and cross-sectional regressions respectively. This coefficient in the fours regressions are all statistically significant at the 1% level. This evidence confirms the view that diversified firms hold significantly less cash than focused firms even after controlling for the industry effect and the previously found determinants for corporate cash holdings.

To understand why diversified firms hold less cash, we test our three main hypotheses—Complementary Growth hypothesis, Assets Sales hypothesis and Agency Cost Hypothesis in the regressions. We first use Meanqcor (Mean of correlations between segments' growth opportunities), Diversity (diversity of growth opportunities between segments following Rajan, Servaes and Zingales 2000) and Minter (a direct measurement of internal capital market following Berger and Hann 2003) to test the Complementary Growth Hypothesis. Finally Msaleppe (Msaleppe indicates how often the firm sells Property, Plant and Equipment) and Mlossasset (Mlossasset indicates how

often the firm loses when it sells PPE and Investments) are used to test the Assets Sales hypothesis. The main results are presented in table V.

(Insert Table V here)

In all four regressions in table V, the diversified dummy becomes statistically insignificant once we add the variables that capture the effects predicted by the asset sale and complementary growth hypotheses. The t-statistics for this coefficient ranges between 0.34 and 1.73 in magnitude in the different regressions. In effect, Table V explains away the difference between diversified and focused firms in their cash holdings. The evidence is strongly supportive of the two non-mutually-exclusive complementary growth and assets sales hypotheses. In particular, we find that the higher the correlation of the growth opportunities between segments in a firm, the lower are the complementarities in growth opportunities and higher are the cash holdings. Consistent with this, the coefficients of Meanqcorr in all four regressions are significantly positive at the 1% level. These results support the complementary growth hypothesis. We also find that the two variables that capture the role of asset sales (Diversity and Minter) are significantly negative. The regression results indicate that firms that engage in more asset sales and those with fewer losses from asset sales have lower levels of cash holdings. This evidence supports the Assets Sales Hypothesis.

3.3. Robustness tests

We conduct other robustness tests to examine the reliability of the results. The fist robustness test is conducted using only diversified firms. For focused firms, the variable that measures internal capital market is always 0 and the variable that measures growth complementarity is always 1. By focusing on diversified firms we can better understand how the cross-sectional variation in these variables affects corporate cash holdings within this sub-sample.

(Insert Table VI here)

We should note that Opler et al.(1999) also test whether diversified firms and focused firms have different levels of optimal cash holdings. They use the number of segments as the explanatory variable but do not find any difference in the cash holdings patterns in the year of 1994. The cash holding they use in their regressions are not adjusted for industry at the segment level. But as we showed in table I, cash holdings vary widely across industries. So the industry adjustment for cash holding at segment level is a necessary requirement to reliable estimate the impact of firm structure on corporate cash holdings. As our results indicate, the main reason that Opler et al.(1999) do not find a significant impact of firm structure is because they do not adjust the cash holding at the segment level for industry-wide effects, and because they only focus on one year. Here in this robustness test, we duplicate their test using un-adjusted cash holdings and we get the same results for the same year 1994. However, when we use industry-adjusted cash holdings as our dependant variable and redo the tests, we find the statistically significant difference in cash holding across the firm structures.[5] More importantly, once we add the new variables AgencyP, Meanqcorr, mlossasset, msaleppe, minter, and diversity in the regressions, the significance of number of segments disappears.

(Insert Appendix AII here)

4. Conclusions

In this paper, we analyze whether organizational structure of firms (i.e., whether a firm is diversified or focused) affects corporate cash holdings. There are several reasons why firm structure could affect cash holdings. Unlike focused firms, diversified firms have the potential to use internal capital markets and proceeds from sales of non-core assets, and therefore would have

[5] Opler et al. (1999) use the number of segments (instead of dummy for diversified firms or focused firms) in their regression., here we use both number of segments and dummy in the robustness test and the results are virtually identical. We report the results using dummy to be consistent with other tests in this paper.

less need to hold cash. Diversified firms also have more agency problems, primarily in the form of conflict over resource allocation across segments that increases the marginal cost of holding cash. Using Compustat financial and segment data in the 1988-2002 period, we find evidence that diversified firms hold significantly less cash than their focused counterparts. This result holds even after industry adjustment at the segment level and after controlling for the different factors found to be important determinants of corporate cashing holdings in both time-series and cross-sectional tests. Using further robustness tests, we are able to attribute the lowered optimal cash holdings to the presence of internal capital markets, the potential for asset sales, and to increased agency problems among diversified firms.

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Figure 1a

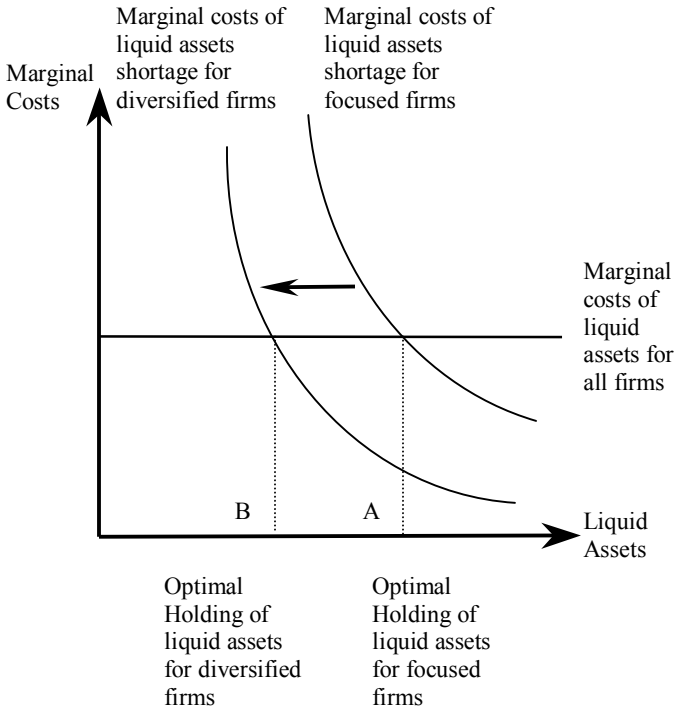
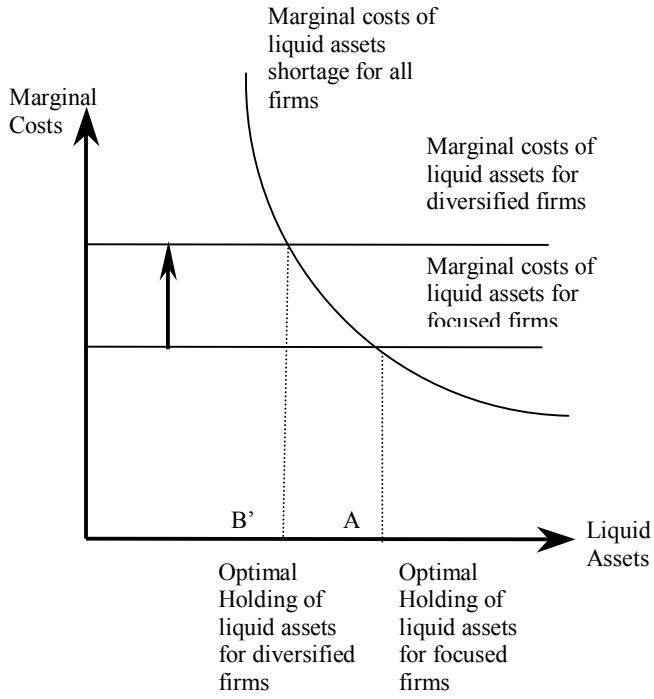


Figure 1b



Optimal Holding of Liquid Assets for Diversified Firms and Focused Firms[6]

Figure 1a

The optimal amount of liquid assets is given by the intersection of marginal costs of liquid asset curve and the marginal cost of liquid assets shortage curve. The marginal cost of liquid asset curve is non-decreasing while marginal cost of liquid asset shortage curve is decreasing. (Opler et al. 1999). Due to the existence of a internal capital market and more flexibility to sell non-cored segment, diversified firms, with lower marginal costs of liquid asset shortage, have the marginal cost of liquid asset shortage curve moving parallel inward compared with focused firms. Thus, A is the optimal amount of liquid asset holdings for focused firms and B is the optimal amount of liquid asset holdings for diversified firms.

Figure 1b

Figure 1b assumes that marginal costs of liquid assets shortage for all firms are the same curve while marginal costs lines are different for focused and diversified firms. Due to a higher agency problem (Rajan et al. 2000), diversified firms are facing higher marginal costs of holding liquid assets. Thus A is the optimal amount of liquid asset holdings for focused firms and B' is the optimal amount of liquid asset holdings for diversified firms.

[6] One could as well argue that combining both figure 1a and 1b is plausible. Thus, the optimal liquid assets holdings for diversified firms are on the most extreme left in the graph. It can only strengthen our hypotheses, so we do not include the graph in this paper.

Table I: Cash holdings pattern across different industries, 1988-2002

The statistics are calculated from Compustat Industry Segment (CIS) database, 1988-2002. Cash holding is defined as Cash/Assets, which is calculated as cash and marketable securities (Compustat #1) divided by Assets (Compustat #6). Panel A shows the bottom 10 industries with the least cash holdings and Panel B shows the top 10 industries with the most cash holdings. SIC codes are the two-digit SIC codes, n is the number of firms in that industry, median is the median cash holding from the reported industry, mean is the mean cash holding from the reported industry and s.t.d. is the standard deviation of the cash holdings in the industry. We request the industry to have at least 100 firms to enter the table. All the statistics are calculated using only the single segment firms.

Panel A: bottom 10 industries

SIC	Industry Descriptions	n	Median	Mean	s.t.d.
2200	Textile Mill Products	430	1.43%	4.59%	0.078
4000	Railroad Transportation	247	1.51%	3.47%	0.063
3300	Primary Metal Industries	835	2.22%	4.89%	0.065
4200	Motor Freight Transprt & Warehouse	526	2.33%	5.11%	0.080
5000	Wholesale Trade-durable Goods	1597	2.57%	7.09%	0.122
2600	Paper And Allied Products	442	2.63%	6.28%	0.093
3400	Fabricated Metal Products	610	2.77%	6.56%	0.092
2500	Furniture And Fixtures	379	2.90%	6.96%	0.089
5300	General Merchandise Stores	584	2.99%	6.04%	0.073
2000	Food And Kindred Products	1337	3.10%	8.48%	0.126

Panel B: top 10 industries

SIC	Industry Descriptions	n	Median	Mean	s.t.d.
1600	Hvy Constrctn (Other Than Buildg Constrctn)	150	9.47%	12.21%	0.126
4500	Transportation By Air	613	9.99%	13.72%	0.128
4700	Transportation Services	210	10.90%	17.66%	0.195
8700	Engnrng, Accntng, Resrch & Mangment	913	13.48%	22.90%	0.244
3500	Industrl & Commrcl Machnr & Comptr Equpmnt	3500	15.01%	21.32%	0.204
3600	Electronic(Except Computer Equipment)	4187	15.68%	22.78%	0.223
3800	Measurng Instrmnts; Phtgrphic, Watches & Clocks	2904	15.75%	24.36%	0.245
8200	Educational Services	166	20.57%	24.97%	0.203
7300	Business Services	6566	26.85%	31.72%	0.255
2800	Chemicals And Allied Products	3523	30.25%	37.86%	0.325

Table II: Variables Definitions

Variable names	Definitions	Compustat data item
Cash Holdings	Cash/asset	Data1/Data6
Liquidity	Cash/Net Asset	Data1/(Data6-Data1)
ImputedCash	Imputed Cash= $\sum_{i=1}^{n} (Asset_i * (\frac{Cash}{Asset})_{Industry_i})$	Segment Data Item At and Compustat Data 1
ADJCASH	(Cash-ImputedCash)/asset;	(Data1-ImputedCash)/Data6
Size:	Natural log of Assets	Data6
Growth Opportunity (Tobins Q)	Book value of asset less the book value of the equity, plus the market value of the equity, divided by assets	(Data6-Data60-Data74+Data199*Data25)/Data6
Total Leverage	Total debt over total assets	Data 181/Data 6
Cash flow:	Earnings before extraordinary items, plus depreciation & amortization divided by assets	(Data 14+Data18)/Data 6
Net working capital:	working capital, less cash, divided by assets	(Data179-Data1)/Data6
Invest	Capital Expenditure divided by assets;	Data128/Data6
R&D:	Research and Development spending over sales	Data46/Data12
Dummy:	1 for firms operate in more than one segment and 0 o/w	Segment data
DivDum:	1 if the firms pay dividend in that year and 0 o/w	Data 21 and Data19
Bonddum	1 if firms debt has an investment grade rating (bbb or higher) ,0 if o/w	Data 280 (bond rating)
FirmSigma	FirmSigma is a measure of the volatility of a firm's cash flow over the time period. It is the mean of the standard deviations of the cash flow over assets.	(Data 14+Data18)/Data 6
AgencyP	AgencyP is a measure of potential overinvestment caused by agency problem. For every industry (defined by DNUM) and year, we calculate the mean TobinsQ. If in that year, a firm's TobinsQ is lower than the mean of the industry, DlowTobinsQ is 1 otherwise DlowTobinsQ=0. DlowTobinsQ is a dummy indicating whether the firm is operating below the industry TobinsQ level. Then we interact this dummy with the investment level of the firm. i.e. AgencyP= DlowTobinsQ*Invest . This variable allows us to measure the potential overinvestment caused by the agency problem.	TobinsQ: (Data6-Data60-Data74+Data199*Data25)/Data6 Invest: Data128/Data6

Table II Continued

Variable names	Definitions	Compustat data item
Meanqcor	Mean of correlations between segments' growth opportunities. For each industry (defined as 2-digit sic), we first get the median of Tobinsq in each year during the sample period. Then a correlation between every two industries is calculated. This correlation can measure how growth opportunities vary together for these two industries. The correlation between segments' growth opportunities is proxy for the correlation of industries that segments belong to. We then take the mean of the correlations between every two segments as Meanqcorr. Focused firms have Meanqcor equal to 1.	
Diversity	Diversity means the diversity of growth opportunities between segments. The calculations follow Rajan, Servaes and Zingales (2000)--the standard deviation of segment asset weighted q's for the firm divided by the equally weighted average q of segments in the firm. The measurement is an indirect measurement of internal capital market.	
Minter	Minter is a direct measurement of internal capital market. It follows Berger and Hann (2003). First for every year, we calculate transfer as: Max(sum of excess CAPX-Firm level excess CAPX, 0). Where excess CAPX=Max(CAPX-(OPS+DEP), 0), CAPX=capital expenditure, OPS=operating profits, DEP=depreciation expense. All variabls are deflated by total assets. Minter is the mean of Transfer during the sample period.	CAPX, OPS, DEP in segment data
Msaleppe	For a firm year, if data107>0, then we let Dumsaleppe=1, else Dumsaleppe=0. We then take mean of Dumsaleppe during the sample period. Msaleppe indicates how often the firm sells Property, Plant and Equipment.	Data107(Sale of Property, Plant & Equip)
Mlossasset	For a firm year, if data213>0 then we let Dumlossasset=1, else Dumlossasset=0. We then take mean of Dumlossasset during the sample period. Mlossasset indicates how often the firm loses when sell PPE and Investment	Data213(Sale of PPE & Invest-Loss(Gain))

Table III: Firm Characteristics across different firm structures, 1988-2002

Variables definitions and calculations are shown in table II. All the variables are winsorized at top and bottom 1% level. We define focused and diversified firms by 2-digit SIC code. The p values for the difference are reported in parenthesis.

Dummy=0 Focused Firms N=33483			Dummy=1 Diversified Firms N=8476		Mean Difference
Variable	Mean	Median	Mean	Median	T-statistic
Cashholding	**0.157**	**0.071**	**0.068**	**0.034**	**-34.75**
asset	1015.44	151.018	2298.75	424.513	16.23
liquidity	0.358	0.076	0.097	0.035	-22.39
ADJCASH	**0.037**	**-0.002**	**-0.04**	**-0.027**	**-28.59**
size	5.271	5.017	6.131	6.051	36.39
Leverage	0.526	0.502	0.604	0.591	22.89
TobinsQ	1.959	1.433	1.52	1.278	-20.63
RaD	0.121	0	0.021	0	-13.73
Invest	0.076	0.053	0.065	0.05	-10.85
wcapital	0.107	0.096	0.132	0.125	10.03
cashflow	0.059	0.085	0.073	0.086	8.27
bonddum	0.066	0	0.195	0	36.22
FirmSigma	0.095	0.058	0.062	0.040	-27.16
AgencyP	0.046	0.024	0.043	0.029	-3.96
meanqcor	1	1	0.413	0.415	-336.41
mgainasset	-0.003	0	-0.003	-0.001	-4.86
mlossasset	0.216	0.125	0.181	0.083	-8.23
msaleppe	0.398	0.267	0.437	0.333	7.26
Diversity	0	0	0.299	0.27	274.75
minter	0	0	0.005	0.002	91.912

Table IV: Regressions predicting firm cash holding levels, 1988-2002

The dependant variable in all regressions is the ADJCASH, which is calculated as (cash-imputed cash) divided by asset. Imputed cash= $\sum_{i=1}^{n}$ ($Asset_i$ * ($\frac{Cash}{Asset}$)$_{Industry\ i}$) It denotes the segment-level-industry-adjusted cash holding of the firm. In all the independent variables denominators, assets are Compustat Data 6. The Fama-MacBeth (1973) model gives the average of time series of coefficients from annual cross-sectional regressions. The year dummy regression is run with a dummy for each year from 1989-2002. The fixed-effect regression is fixed on firms. Note: for the variable Dummy, we did not take the means across all years for each firm. The cross-sectional regression uses means of all variables for each firm. Only firms that did not change the firm structure over the 15 years and have more than 10 years of data are used in the cross-sectional specification. All tests use independent variables from Opler et al. 1999, plus a dummy variable to indicate the cash holding difference between focused and diversified firms. T-statistics are reported in parenthesis.

Independent Variables	Fama-MacBeth Model	Regression using Year Dummy	Fixed-Effect Regression	Cross- Sectional Regression
Intercept	0.192	N.A.	0.002	0.216
	(10.745)		(2.27)	(10.08)
Size	-0.000	-0.001	-0.045	0.007
	(-0.306)	(-2.14)	(-47.41)	(2.36)
Leverage	-0.25	-0.252	-0.217	-0.286
	(-23.701)	(-73)	(-54.9)	(-15.94)
TobinsQ	0.0149	0.012	0.009	-0.001
	(6.032)	(20.88)	(16.6)	(-0.29)
RaD	0.056	0.047	0.025	0.072
	(10.677)	(27.76)	(12.53)	(6.21)
Invest	-0.314	-0.305	-0.215	-0.489
	(-7.649)	(-25.93)	(-19.04)	(-7.03)
Wcapital	-0.274	-0.28	-0.251	-0.309
	(-39.79)	(-60.49)	(-43.05)	(-13.52)
Cashflow	-0.024	-0.007	0.069	0.024
	(-2.277)	(-1.020)	(13.32)	(0.41)
Divdum	-0.017	-0.019	0.002	-0.013
	(-10.007)	(-10.8)	(1.67)	(-1.620)
Bonddum	-0.041	-0.04	-0.003	-0.064
	(-10.631)	(-11.84)	(-1.51)	(-4.410)

Table IV continued

Independent Variables	Fama-MacBeth Model	Regression using Year Dummy	Fixed-Effect Regression	Cross- Sectional Regression
Firmsigma	0.068	0.069	0.000	0.088
	(5.355)	(7.97)	(-0.02)	(1.96)
Dummy	**-0.024**	**-0.024**	**-0.007**	**-0.035**
	(-8.965)	**(-10.63)**	**(-5.19)**	**(-3.58)**
N	15	32921	32921	1148
Adj. R^2		0.333	0.191	0.428

Table V: Regressions predicting firm cash holding levels, 1988-2002

The dependant variable in all regressions is the ADJCASH, which is calculated as (cash-imputed cash) divided by asset. Imputed cash= $\sum_{i=1}^{n} (Asset_i * (\frac{Cash}{Asset})_{Industry_i})$ It denotes the segment-level-industry-adjusted cash holding of the firm. In all the independent variables denominators, assets are Compustat Data 6. The Fama-MacBeth model gives the average of time series of coefficients from annual cross-sectional regressions. The year dummy regression is run with a dummy for each year from 1989-2002. The fixed-effect regression is fixed on firms. Note: for the variables Dummy, Minter, Mlossasset and Msaleppe, we did not take the means across all years for each firm. The cross-sectional regression uses means of all variables for each firm. Only firms that did not change the firm structure over the 15 years and have more than 10 years of data are used in the cross-sectional specification. All tests use independent variables from Opler et. al. 1999, plus a dummy variable to indicate the cash holding difference between focused and diversified firms. Newly added variables Meanqcor, Diversity, Minter, Msaleppe and Mlossasset further explore why focused and diversified firms have different cash holding levels. T-statistics are reported in parenthesis.

Independent Variable	Fama-MacBeth Model	Regression using Year Dummy	Fixed-Effect Regression	Cross-Sectional Regression
Intercept	0.171	N.A.	0.001	0.157
	(8.47)		(1.19)	(4.08)
Size	-0.000	-0.001	-0.044	0.007
	(-0.28)	(-2.07)	(-46.24)	(2.49)
Leverage	-0.25	-0.252	-0.216	-0.289
	(-23.67)	(-72.76)	(-54.83)	(-16.09)
TobinsQ	0.0128	0.010	0.009	-0.005
	(4.99)	(16.04)	(15.47)	(-1.33)
RaD	0.057	0.048	0.025	0.072
	(11.09)	(27.97)	(12.52)	(6.26)
Invest	-0.247	-0.233	-0.206	-0.365
	(-5.26)	(-16.43)	(-15.80)	(-4.13)
Wcapital	-0.276	-0.282	-0.251	-0.324
	(-38.83)	(-60.85)	(-42.99)	(-13.91)
Cashflow	-0.024	-0.008	0.069	0.008
	(-2.39)	(-1.24)	(13.28)	(0.13)
Divdum	-0.016	-0.018	0.001	-0.016
	(-9.70)	(-10.72)	(1.20)	(-1.94)
Bonddum	-0.043	-0.041	-0.004	-0.065
	(-10.90)	(-12.27)	(-2.01)	(-4.53)

Firmsigma	0.065 (5.00)	0.068 (7.76)	0.001 (0.19)	0.085 (1.91)
Dummy	**0.009** **(1.73)**	**0.011** **(1.65)**	**-0.003** **(-1.42)**	**0.010** **(0.34)**
AgencyP	**-0.133** **(-5.98)**	**-0.141** **(-8.50)**	**-0.164** **(-1.28)**	**-0.333** **(-2.81)**
Meanqcor	**0.027** **(5.76)**	**0.028** **(4.04)**	**0.019** **(3.46)**	**0.072** **(2.31)**
Diversity	**-0.046** **(-4.39)**	**-0.047** **(-4.13)**	**0.034** **(-4.28)**	-0.006 (-0.08)
Minter	**-0.68** **(-2.87)**	**-0.644** **(-2.86)**	0.228 (1.52)	0.326 (0.25)
Mlossasset	**0.010** **(2.23)**	**0.008** **(2.59)**	-0.000 (-0.01)	0.000 (0.01)
Msaleppe	**-0.007** **(-3.46)**	**-0.006** **(-3.12)**	-0.000 (-0.65)	0.01 (1.16)
N	15	32921	32921	1148
Adj. R^2		0.334	0.192	0.432

Table VI: Robustness Tests
Regressions predicting cash holding levels using only diversified-firm-year, 1988-2002

Only diversified-firm-year observations are used in these robustness tests. The dependant variable in all regressions is the ADJCASH, which is calculated as (cash-imputed cash) divided by asset. Imputed cash= $\sum_{i=1}^{n} (Asset_i * (\frac{Cash}{Asset})_{Industry_i})$ .It denotes the segment-level-industry-adjusted cash holding of the firm. In all the independent variables denominators, assets are Compustat Data 6. The Fama-MacBeth model gives the average of time series of coefficients from annual cross-sectional regressions. The year dummy regression is run with a dummy for each year from 1989-2002. The cross-sectional regression uses means of all variables for each firm. Only firms that have more than 10 years of data are used in the cross-sectional specification. T-statistics are reported in parenthesis.

Independent Variable	Fama-MacBeth Model	Regression using Year Dummy	Cross-Sectional Regression
Intercept	0.082 (5.29)	N.A.	0.140 (1.94)
Size	-0.003 (-1.83)	-0.004 (-3.20)	0.005 (0.81)
Leverage	-0.115 (-14.88)	-0.110 (-14.5)	-0.145 (-3.36)
TobinsQ	0.003 (0.797)	0.000 (0.01)	-0.033 (-2.09)
RaD	-0.386 (-4.41)	-0.144 (-4.44)	-1.307 (-4.22)
Invest	-0.027 (-0.44)	-0.030 (-0.77)	0.228 (0.70)
Wcapital	-0.176 (-12.62)	-0.175 (-17.16)	-0.203 (-3.16)
Cashflow	-0.005 (-0.20)	-0.009 (-0.52)	-0.086 (-0.35)
Divdum	-0.005 (-1.15)	-0.004 (-1.05)	-0.022 (-1.01)

Table VI continued

Independent Variable	Fama-MacBeth Model	Regression using Year Dummy	Cross-Sectional Regression
Bonddum	-0.023 (-5.14)	-0.024 (-5.42)	-0.031 (-1.51)
Firmsigma	0.076 (2.99)	0.075 (3.10)	0.274 (1.46)
AgencyP	**(-0.201)** **(-3.51)**	**-0.199** **(-5.10)**	**-0.83** **(-2.60)**
Meanqcor	**0.032** **(6.31)**	**0.031** **(6.38)**	**0.074** **(3.26)**
Mlossasset	0.007 (0.97)	0.007 (1.06)	-0.021 (-0.72)
Msaleppe	0.003 (1.19)	0.005 (1.25)	0.000 (0.00)
Diversity	**-0.024** **(-2.03)**	**-0.025** **(-2.91)**	-1.22 (-1.06)
Minter	0.213 0.90	-0.048 (-0.23)	-0.050 (-0.95)
N Adj. R^2	15	4952 0.150	153 0.257

Appendix AI

This table shows how cash holdings increase compared with debt and investments across time. Aggregated total assets (COMPUSTAT data item 6), total cash (COMPUSTAT data item 1), total debt (COMPUSTAT data item 181) and total investments (COMPUSTAT data item 128) are calculated from all firms in COMPUSTAT industrial annual dataset. Average % asset held as cash, debt and investments are calculated from individual firms. Medians are reported in parentheses. Firms with assets less than $20 millions are excluded.

Year	Total assets (in $billion)	Total cash (in $billion)	Mean(Median) % of assets Held as Cash	Total Debt (in $billion)	Mean(Median) % of assets Held as Debt	Total Investments (in $billion)	Mean(Median) % of assets Held as Investments
1988	2789.1	213.7	**10.3%(5.0%)**	1766.3	**58.6%(56.6%)**	236.5	**7.9%(5.7%)**
1989	3058.1	230.6	**10.2%(4.5%)**	1998.0	**60.3%(58.0%)**	257.1	**7.9%(5.6%)**
1990	3336.4	243.2	**10.3%(4.5%)**	2181.7	**60.2%(57.2%)**	283.1	**7.6%(5.5%)**
1991	3372.8	229.0	**12.5%(5.3%)**	2174.9	**57.8%(55.4%)**	273.1	**6.6%(4.7%)**
1992	3575.2	259.2	**12.9%(5.9%)**	2329.3	**55.9%(54.4%)**	276.4	**6.9%(4.9%)**
1993	3874.1	287.7	**14.3%(6.4%)**	2523.8	**54.1%(52.2%)**	290.9	**7.5%(5.1%)**
1994	4654.6	379.9	**13.1%(5.7%)**	3011.6	**54.1%(52.7%)**	341.6	**8.0%(5.6%)**
1995	5065.8	387.3	**14.5%(5.7%)**	3323.5	**54.7%(52.9%)**	399.4	**8.2%(5.7%)**
1996	6080.7	463.8	**17.0%(6.9%)**	3848.3	**52.5%(50.4%)**	494.0	**8.2%(5.4%)**
1997	6493.9	481.9	**17.1%(7.1%)**	4109.3	**52.9%(51.0%)**	560.7	**8.2%(5.4%)**
1998	5056.8	400.2	**17.0%(6.4%)**	3247.7	**54.9%(51.9%)**	423.9	**8.2%(5.4%)**
1999	5283.9	423.5	**19.9%(7.2%)**	3190.4	**53.8%(50.5%)**	374.8	**7.0%(4.7%)**
2000	5069.6	463.6	**20.5%(7.6%)**	2981.3	**52.6%(49.2%)**	384.5	**7.1%(4.5%)**
2001	4557.9	435.2	**20.8%(8.9%)**	2910.3	**53.7%(49.8%)**	319.3	**6.3%(3.9%)**
2002	4520.1	443.3	**20.6%(9.6%)**	2873.1	**54.6%(48.9%)**	256.3	**5.2%(3.2%)**

Appendix AII: Robustness test using 1994 data

We use different two methodologies to calculate cashholdings (Model A reports the results using Opler et al.(1999) methodology, i.e. cash holdings are not adjusted at the segment level. The dependent variable is cash/asset. Model B reports the results using our methodology to adjust cash holding at the segment level. The dependent variable is the ADJCASH, which is calculated as (cash-imputed cash) divided by asset. And Imputed cash= $\sum_{i=1}^{n} (Asset_i * (\frac{Cash}{Asset})_{Industry_i})$. Model C adds new explanatory variables AgencyP, Meanqcorr, mlossasset, msaleppe, minter, diversity into the model B.

Independent Variable	Model A	Model B	Model C
Intercept	0.96	0.222	0.211
	(16.49)	(16.37)	(8.16)
Size	-0.026	-0.002	-0.002
	(-2.91)	(-1.00)	(-1.06)
Leverage	-0.846	-0.274	-0.027
	(-17.13)	(-23.75)	(-23.67)
TobinsQ	0.064	0.020	0.020
	(6.38)	(8.44)	(7.94)
RaD	0.553	0.058	0.058
	(22.51)	(10.10)	(10.03)
Invest	-1.714	-0.37	-0.378
	(-11.75)	(-10.79)	(-9.11)
Wcapital	-0.949	-0.267	-0.268
	(-15.42)	(-18.62)	(-18.59)
Cashflow	-0.158	-0/040	-0.041
	(-1.61)	(-1.76)	(-1.80)
Divdum	-0.067	-0.019	-0/019
	(-2.94)	(-3.57)	(-3.53)
Bonddum	-0.011	-0.027	-0.028
	(-0.24)	(-2.54)	(-2.64)
Firmsigma	0.179	0.097	0.096
	(1.50)	(3.47)	(3.45)

Dummy	**-0.035** **(-1.15)**	**-0.020** **(-2.71)**	**0.013** **(0.65)**
AgencyP			**0.023** **(0.48)**
Meanqcor			0.010 (0.47)
Diversity			-0.071 (-1.90)
Minter			-0.941 (-1.34)
Mlossasset			0.007 (0.73)
Msaleppe			-0.000 (-0.07)
N	2668	2668	2668
Adj. R^2	0.444	0.404	0.452