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Multinationals and the High Cash Holdings Puzzle

Finance Working Paper N° 334/2012
May 2012

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This paper can be downloaded without charge from:
https://doi.org/10.67929/ecgi-fin-334-2012

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ECGI Working Paper Series in Finance

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We thank Yeejin Jang, Robert Prilmeier, and Matt Wynter for helpful research assistance.

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Abstract

Defining as normal cash holdings the holdings a firm with the same characteristics would have had in the late 1990s, we find that the abnormal cash holdings of U.S. firms after the crisis represent on average 1.86% of assets. While U.S. firms held less cash than comparable foreign firms in the late 1990s, by 2010 they hold more. However, only U.S. multinational firms experience an increase in abnormal cash holdings during the 2000s. U.S. multinational firms had cash holdings similar to those of purely domestic firms in the late 1990s, but they hold over 3% more assets in cash than comparable purely domestic firms after the crisis. Further, U.S. multinationals increased their cash holdings since the late 1990s relative to foreign multinationals by roughly the same percentage as they increased their cash holdings relative to U.S. domestic firms. A detailed analysis shows that the increase in cash holdings of multinational firms cannot be explained by the tax treatment of profit repatriations, that it is intrinsically linked to their R&D intensity, and that firms that become multinational do not increase their abnormal cash holdings after they become multinational. There is no evidence that poor investment opportunities, regulation, or poor governance can explain the abnormal cash holdings of U.S. firms after the crisis.

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Dice Center WP 2012-10
Fisher College of Business WP 2012-03-010

Original: May 2012

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1. Introduction

Since the financial crisis, considerable attention has been paid to the apparently record high cash holdings of American firms. A common view is that companies have been hoarding cash while shying "away from investing for the future."[1] As one headline puts it, "Firms have record $800 billion of cash but still won't hire."[2] The high cash holdings have been attributed to many factors, but many observers have argued that firms do not invest and accumulate cash because of a poor regulatory climate and excessive uncertainty. An article states, for instance, that "Companies are hoarding a record amount of cash as fears of another Lehman-like credit crisis, weak demand and a lack of incentives from the Obama Administration cause chief executives to choose a negative real return on their money over hiring workers or building a new plant."[3] Another explanation frequently mentioned for the high cash holdings of American firms is that repatriation of cash held abroad by multinationals has adverse tax consequences, so that it is advantageous to keep their profits abroad in the form of cash. For instance, an article in the New York Times noting the increase in cash holdings of multinationals states that "Tax policy is driving much of this trend."[4]

In this paper, we investigate whether the cash holdings of American companies are abnormally high after the financial crisis and whether these cash holdings can be explained by the theories summarized in the previous paragraph. We show that the extent to which cash holdings are unusually high after the crisis depends critically on the measure used. We would expect larger firms to hold more cash. Since corporate assets tend to grow over time, the dollar amount of cash holdings would grow even if the ratio of cash to assets stays constant. Consequently, at the very least, cash holdings should be measured relative to a firm's assets. Using all non-financial and non-regulated public firms with assets and market capitalization greater than $5 million per year, the average cash/assets ratio is 20.18% in 2009-2010 compared to 20.50% in the 2004-2006 pre-crisis period. However, when we consider the median ratio, it is higher by

[1] "What is business waiting for?" by Joe Nocera, The New York times, August 15, 2011.
[2] "Firms have record $800 billion of cash but still won't hire," by John Melloy, CNBC, June 22, 2011.
[3] Ibid.
[4] "Bringing cash piles back home," by Steven M. Davidoff, The New York Times, AugU.S.t 17, 2011.

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0.87% in 2009-2010 than in 2004-2006. Similarly, the asset-weighted ratio is higher by 0.74% in the recent period. The larger increase in the asset-weighted ratio than in the equally-weighted ratio suggests that large firms increased their holdings more and we show that this is the case. However, the changes in cash holdings from 2004-2006 to 2009-2010 are dwarfed by the changes in cash holdings from 1998-2000 to 2004-2006. Over that latter period, the average cash/assets ratio increases by 3.77%, the median by 6.39%, and the asset-weighted average by 3.62%. When we distinguish between private and public firms, we show that there is no evidence of an increase in the cash/assets ratio for private firms.

Having established that cash holdings are much higher during the 2000s than in the late 1990s, and higher after the crisis than before for some measures, we investigate whether this increase in cash holdings is a U.S. phenomenon or a worldwide phenomenon. Cash/assets ratios increase across the world in the 2000s compared to the late 1990s. However, the increase in average cash holdings across the world is smaller than the increase in average cash holdings in the U.S. A striking result is that median cash holdings in the US in the late 1990s are lower than median cash holdings in foreign countries, but the opposite is true by 2010. As for U.S. firms, there is little evidence of an increase in average cash holdings from the pre-crisis period to the post-crisis period for foreign firms.

While univariate statistics of the cash/assets ratio are useful to understand how cash holdings have changed over time and differ across countries, they are of little help in assessing whether the cash holdings are somehow abnormal or unusual. There is a vast literature that explains that cash holdings are related to firm characteristics. Among other results, this literature shows that firms with more growth opportunities hold more cash, firms with more uncertain prospects hold more cash, and firms with higher capital expenditures hold less cash.[5] Over time, firms drop out or enter the sample, the characteristics of firms that stay in the sample can change, and macroeconomic conditions evolve. As a result, comparisons of cash holdings that do not take into account firm characteristics may be comparisons across firm populations with different characteristics, so that it is possible that cash holdings have changed simply because firm characteristics have changed. If this were the case, there might be nothing abnormal about

[5] See, for instance, Opler, Pinkowitz, Stulz, and Williamson (1999).

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the large cash holdings of American firms in recent years. Bates, Kahle, and Stulz (2009) show that changes in firm characteristics explain much of the increase in cash holdings in the 1980s and 1990s.

To evaluate whether the cash holdings of American firms are abnormal, a benchmark is required. We have to estimate what the cash holdings of American firms would be under normal circumstances. Ideally, we would have good theoretical models that would predict cash holdings given the known motivations for firms to hold cash. Unfortunately, such models do not exist. The alternative approach is to use an empirical model that captures cash holdings well before the 2000s. The approach of using an empirical model to assess normal cash holdings is widely used in the literature on cash holdings following its introduction by Opler, Pinkowitz, Stulz and Williamson (1999). With such a model, the empirical analysis evaluates how cash holdings differ from the cash holdings predicted by that model. One approach would be to estimate such a model of cash holdings for U.S. firms in the late 1990s and then use that model in the 2000s to estimate abnormal cash holdings. The problem with this approach is that it does not make it possible to evaluate whether the high recent cash holdings of U.S. firms are an American phenomenon or a global one. The implications of the high cash holdings of American firms would be quite different if American firms behaved like similar firms in other countries. If that were the case, many of the explanations for the high cash holdings of U.S. firms would make no sense. In particular, features of the U.S. tax code or of the U.S. regulatory system could not explain these holdings.

We therefore use a model that explains cash holdings of firms across the globe. We find that at the end of the 1990s, the holdings of cash of foreign firms are lower by 1.01% of assets than the holdings of comparable U.S. firms. Estimating this model every year, we find that as the 2000s evolve, the gap between foreign firms and comparable U.S. firms increases steadily, so that in 2009-2010 foreign firms hold 3.19% less of their assets in cash than comparable U.S. firms. Strikingly, U.S. firms increased their abnormal cash holdings relative to comparable firms from the Eurozone. We would expect that macroeconomic uncertainty concerns would be greater within the Eurozone, so that this result makes it questionable that the high cash holdings of U.S. firms can be explained purely by U.S. macroeconomic uncertainty. A concern with this approach is that the regression model will fit cash holdings over time. On

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average, cash holdings will not be abnormal across the globe. Hence, such a model could distort the extent to which patterns of cash holdings have changed as it will try to explain them using firm characteristics.

Our sample has 45 countries and for 82% of these countries we find that in the 2009-2010 period firms have lower cash holdings than comparable U.S. firms. While there are some types of countries where firms held as much cash as U.S. firms at the end of the 1990s, there is no type of country other than tax havens where firms hold more cash than U.S. firms after the crisis. In particular, U.S. firms hold more cash than comparable firms whether these firms are in developed countries or not, in common law countries or not, in countries that tax income worldwide or not, and in Eurozone countries or not. Additionally, we use the cross-country comparisons to investigate whether the change in cash holdings of firms in a country is related to how much that country was affected by the financial crisis. We find that cash holdings increase more in countries that were less affected by the crisis.

An alternative way to use the regression model is to estimate over time the cash holdings firms would have if they held cash as they did in the late 1990s. This approach produces estimates of abnormal cash holdings relative to the cash holdings firms would have if the determinants of cash holdings were the same as in the late 1990s. With this approach, we again find that U.S. cash holdings become abnormal over time. Strikingly, foreign firms hold abnormally low cash during much of the 2000s. While American firms have abnormal cash holdings of 1.86% of assets on average during 2009-2010 relative to the 1998-2000 benchmark, the average abnormal cash holdings of foreign firms are -0.14%.

We investigate various hypotheses that have been advanced for the increase in cash holdings of U.S. firms. The hypotheses discussed in the first paragraph of this section imply that different types of firms have different changes in cash holdings. We therefore focus much of our analysis on comparing the evolution of cash holdings for different types of firms. For each firm-type classification, we assign firms before the start of the period we consider. Except for large firms, high capital expenditure firms, firms with poor governance and financially constrained firms, all types of firms we consider have positive abnormal cash holdings after the crisis. Since firms with high capital expenditures do not have abnormal

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cash holdings, our results would seem to suggest that low investment is part of the explanation for high cash holdings. However, the high investment firms do not experience a change in abnormal cash holdings throughout the sample period, so that their lack of abnormal cash holdings after the crisis is not different from their lack of abnormal cash holdings before the crisis. The agency hypothesis for the increase in cash holdings suggests that firms with poorer governance should have a greater increase in cash holdings. We find the opposite result when we measure governance by the GIM index. Further, firms whose stock price was more adversely affected by the adoption of Sarbanes-Oxley did not increase their cash holdings more from the late 1990s to the period after the adoption of Sarbanes-Oxley than the other firms. While abnormal cash holdings increase for multinational firms, they do not increase for purely domestic firms. Consequently, it is possible that the increase in abnormal cash holdings of U.S. firms could be explained by the tax treatment of repatriations.

Before examining the cash holdings of multinationals in more detail, we investigate how the cash holdings of various types of U.S. firms compare to the cash holdings of similar types of foreign firms. We find that typically the cash holdings of U.S. firms are higher than those of comparable foreign firms. For instance, American firms that have high R&D expenditures have higher abnormal cash holdings than similar foreign firms. Similar results obtain for multinational companies. However, the abnormal cash holdings of American firms are not higher than those of foreign firms for the most profitable firms and for the firms that have the highest capital expenditures. Further, large foreign firms have higher cash holdings than similar U.S. firms. For all types of firms except for the firms with the highest cash flows, with the highest capital expenditures, and the most reliance on equity financing, abnormal cash holdings of American firms increase during the 2000s compared to abnormal cash holdings of foreign firms. Strikingly, the increase in cash holdings of U.S. multinationals compared to foreign multinationals is comparable to the increase in cash holdings of U.S. multinationals compared to U.S. purely domestic firms.

We find that U.S. multinationals held comparable amounts of cash than purely domestic firms in the late 1990s, but now hold significantly more cash than similar purely domestic firms. Since the increase in

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cash holdings of U.S. firms is concentrated among multinational firms, we investigate why the cash holdings of U.S. multinationals increased so much and whether the increase is explained by the tax treatment of repatriations. Foley, Hartzell, Titman, and Twite (2007) show that the tax treatment of remittances makes it advantageous for multinationals to keep their earnings abroad and they find that firms for which repatriation is more costly hold more cash. Our findings suggest that the tax costs of repatriation are not the whole story for the increase in cash holdings of U.S. multinationals in the 2000s. We find that the Homeland Investment Act of 2004, which was designed to reduce momentarily the tax cost of repatriation, failed to reduce the cash holdings of multinational firms. There are at least two explanations for this finding. First, it could be that the incentives of the Act were insufficient to affect firms' cash holdings. Second, the repatriation tax costs could affect more where firms locate their cash rather than how much cash they hold. We expect that the tax cost of repatriation would be more important for high cash flow multinationals, but empirically these multinationals do not hold more cash than low cash flow multinationals. The increase in cash holdings of multinationals is strongly related to their R&D intensity, so that multinationals with no R&D expenditures do not have an increase in abnormal cash holdings compared to domestic firms with no R&D expenditures. Further, a striking result is that, among high R&D spending firms, firms that were already multinationals before 1998 do not hold more cash now than firms that were purely domestic firms before 1998. Among these firms, cash holdings increase sharply for multinationals relative to purely domestic firms, but that is because the cash holdings of multinationals are becoming more comparable to the cash holdings of purely domestic firms. Finally, and perhaps most importantly, we find no evidence that firms that become multinationals start holding more cash after they become multinationals. It appears that firms that become multinationals are firms with attributes that lead them to hold large amounts of abnormal cash even before they become multinationals.

The paper proceeds as follows. In Section 2, we show how cash holdings evolved for U.S. public firms, private firms, and foreign firms. In Section 3, we present our benchmark model, show how abnormal cash holdings differ between U.S. and foreign firms over time, and explore whether country characteristics can explain these differences. In Section 4, we use our benchmark model to test hypotheses

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about the increase in cash holdings for U.S. firms. We examine why multinationals have such high cash holdings in Section 5. We conclude in Section 6.

2. The evolution of cash holdings

In this section, we examine the evolution of cash holdings of American public firms since the late 1990s compared to American private firms and foreign firms.

2.a. The cash holdings of American public firms

We first show that cash holdings of public firms evolved in the 2000s and whether they are higher after the financial crisis than before. We use Compustat to construct our U.S. sample. We include all publicly traded industrial firms with assets and market capitalization (in year 2000 dollars) greater than $5 million. Financial firms (SIC codes 6000-6999) and utilities (SIC 4900-4999) are excluded from our main analyses, although we later examine utilities relative to industrial firms.

Figure 1 shows the holdings of cash of the 2000s in a long-run perspective. The high cash holdings after 2000 stand out relative to the experience of the U.S. over the last fifty years. The Figure shows that the mean holdings reach levels in the 2000s that were not reached since data became available to compute the mean in 1950.

In Panel A of Table 1, we show three measures of cash holdings to total assets for each year from 1998 to 2010. We start in 1998 so that we can have a pre-2000s benchmark. The first measure is an equally-weighted average. The second measure is the median. The third measure is an asset-weighted average. Considering first the equally-weighted measure, it was at 15.51% in 1998 and 20.28% in 2010. However, it was higher in 2004 and 2005 than in 2010. Its highest value in the 2000s was in 2004, when it was 20.65%. Consequently, using the equally-weighted average, the cash holdings after the crisis are not higher than the previous peak in cash holdings of 2004. Turning next to the median holdings, we see that they increase more than the mean holdings. Further, the median holdings are higher after the crisis than in the mid-2000s. The peak median cash/assets ratio before the crisis is 13.46% in 2005, which is 73

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basis points less than the peak after the crisis of 14.19%. The last column of Panel A of Table 1 shows the asset-weighted cash holdings. The asset-weighted cash holdings correspond to the total amount of cash held by corporations in the sample divided by the total assets. The pre-crisis peak in asset-weighted holdings is essentially the same as the post-crisis peak – 11.77% versus 11.83%.

In Panel B of Table 1, we show the statistics for the three periods we will focus on in the remainder of the paper. The first period is 1998-2000, the second is the pre-crisis period of 2004-2006, and the third one is the post-crisis period of 2009-2010. The motivation for these periods is straightforward. We want to understand the post-crisis holdings and whether they are different from pre-crisis holdings. Further, we want to assess whether the change in cash holdings from before the crisis to after the crisis has similar patterns to the change in cash holdings from the late 1990s to before the crisis. Note that all our cash holdings data are end of year data, so that 2009 data are for fiscal year-ends after June 2009. Most of the data for 2009 is for the end of December 2009. Consequently, the data for 2009 correspond to a time after the end of the recession. It also corresponds to a time after the financial panic of 2008. Not surprisingly, cash holdings are higher in 2004-2006 and 2009-2010 than in 1998-2000 for all measures.

As much attention has been paid to the extremely large cash holdings of a handful of firms, we explore whether dollar cash holdings have become more concentrated. The top five dollar holdings of cash in 2010 are in decreasing order Apple, $51 billion, Microsoft, $46 billion, Cisco, $40 billion, Google, $35 billion, and Oracle, $29 billion.[6] We compute the Gini coefficient of cash holdings and of assets for our sample. Figure 2 shows the results. We see that holdings of cash and assets are extremely concentrated. By way of comparison, the Gini coefficient for income in the U.S. was 46.2 in 2000 and 46.8 in 2009. We see that there is an increase in the concentration of cash holdings, but that increase takes place early in the 2000s. Since then, the concentration of cash holdings has remained about the same.

[6] Our measure of cash holdings, which is standard in academic research, includes cash and short-term investments. Some companies include in statements they make about their cash holdings some items from long-term investments. Consequently, public statements of cash available by companies may reveal larger cash holdings than the ones we measure.

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2.b. A comparison of cash holdings of public firms to those of private firms

There is no database for private firms comparable to Compustat. Existing studies that investigate holdings of cash on samples of private firms show that these firms have lower cash holdings than public firms (Gao, Harford, Li (2011) and Farre-Mensa (2011)). To assess holdings of cash by private firms, we use aggregate data from the flow of funds accounts and subtract from it the holdings by the Compustat firms. More specifically, we use the data collected from the Federal Reserve flow of funds accounts release Z.1. We use the data from B.102 "Balance Sheet of Nonfarm Nonfinancial Corporate Business," data items and line numbers are shown in the Data Appendix. From the quarterly Compustat data, we determine public cash holdings based on all publicly traded firms (stko = 0), which are U.S. based (fic="USA") and reported in U.S. dollars (curcd="USD"). Additionally, we omit financial firms (SIC between 6000 and 6999), but not utilities because SIC 4900-4999 would be included in the private firms. In each quarter we calculate the sum of assets (*atq*) and cash and marketable securities (*cheq*) on Compustat. We define assets (cash) held by private firms to be the total assets (cash) from the flow-of-funds balance sheet data less the aggregate assets (cash) held by Compustat firms. Figure 3 shows the results of this calculation. While the holdings of cash by public firms in the 1990s have been well documented, those of private firms have not. Therefore, we start our sample period for private firms in 1990.

Panel A of Figure 3 shows that about 45% of U.S. corporate assets are held by public corporations. This figure is reasonably stable across the twenty years, with the range varying from 40% to 50%. Conversely, the percentage of corporate cash held by public companies skyrockets from about 45% to roughly 80% at the end of the sample. In Panel B of Figure 3, we plot the ratio of total cash held by public firms to total assets. This ratio is equivalent to the asset-weighted ratio of Table 1. We plot the same ratio for private firms. As shown in Panel B of Figure 3, in a direct comparison of aggregate cash to assets, private firms' cash/assets ratio decreases from 4% to 3% over the entire sample. Public firms on the other hand have their cash/assets ratio increase from 5% in 1990 to almost 12% in 2010. It follows from this that only public firms increase their cash ratios systematically over the 2000s. The holdings of

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cash by private firms increase slightly after the crisis, but this increase stands in sharp contrast with the increase for public firms.

2.c. A comparison of cash holdings of U.S. public firms to those of foreign public firms

We use Compustat Global for our data on foreign firms. We only include firms that have at least $5 million in assets and market capitalization. Foreign currency data are converted to dollars using the annual exchange rate from Compustat. For stock variables, we use the prevailing exchange rate at the end of the firm's fiscal year. For flow variables, we use the average of monthly exchange rates during the fiscal year. Table 2 shows the distribution of firms, for which we have complete data, across countries over our sample period. We eliminate financial firms and utilities. We require a country to have at least 5 firms with data in each of the 13 years. The average total number of firms per year is 14,209. We use the definition of advanced countries from the IMF. All non-advanced countries are classified as developing countries. We have data from 45 countries besides the U.S. of which there are 26 advanced countries and 19 developing countries. There is substantial variation in the number of firms across countries and within countries over the sample period. We see that the mean number of firms from the U.S. is 2,963, but twenty-one foreign countries have less than 100 firms per year on average. Japan has almost as many firms on average as the U.S.

Figure 4 and Table 3 show results. As in Table 1, we start in 1998. When comparing U.S. firms to foreign firms, we could compare the U.S. firms to all foreign firms. The problem with this comparison is that an average of foreign firms will be dominated by data from a handful of countries. To avoid this problem, we compare average cash holdings across countries. We therefore compute a cash ratio mean (or median) at the country level and then average these measures across countries. It is immediately clear from Table 3 that U.S. firms hold significantly more cash than foreign firms when we compare mean holdings across the world. They do so for each period. We consider separately advanced countries from which we exclude Japan and the UK. The UK is a country that is more comparable to the U.S. than any other, which makes the direct comparison especially interesting. Japan is already known from the

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literature to be a country with higher cash holdings than other countries (see Pinkowitz and Williamson (2003)). The U.S. holds more cash than advanced countries (without the UK and Japan), the UK, and Japan for each period. The same result holds for developing countries and for Eurozone countries. When we turn to medians, the U.S. firms have similar cash holdings as foreign firms in the late 1990s, except that they hold less cash than Japanese firms. In the 2000s, the U.S. firms hold significantly more cash than all groups of foreign firms except for Japanese firms in the most recent period.

In Figure 4, we normalize all mean cash/assets ratios to 1 in 1998. As shown in Panel A of Figure 4, cash holdings increase from the late 1990s to the 2000s for firms in most countries. The U.S. percentage increase relative to 1998 is always higher than the comparison countries except in 2008 where developing countries have higher cash relative to 1998 than the U.S. With the median holdings, the increase is sharply less for all foreign groups of countries. Panel B of Figure 4 shows the evolution of the medians, again normalizing to 1 for 1998. The U.S. stands out dramatically for the medians.

When we turn to the change in cash holdings from the pre-crisis period to the post-crisis period, the mean holdings do not change much in foreign countries or in the U.S. Similarly, median cash holdings are not very different after the crisis compared to their peak before the crisis. In a comparison of cash holdings between the peak before the crisis to after the crisis, the most striking difference is for the UK, where cash holdings are noticeably lower after the crisis compared to their pre-crisis peak, and for Japan, where cash holdings are noticeably higher after the crisis compared to their pre-crisis peak. In these comparisons, the U.S. does not stand out.

3. Can firm or country differences account for the higher cash holdings of US firms?

The comparisons presented in Section 2 were comparisons of the ratio of cash to assets. It is well-known that there are predictable differences in cash holdings across firms. A classic theory of cash holdings, which is that firms hold cash for transaction purposes (Miller and Orr (1966)), shows that cash holdings as a percentage of assets should fall as firm size increases. Another classic theory, the precautionary theory of cash holdings (Keynes (1936)), predicts that riskier firms and firms with more

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growth opportunities should hold more cash. Finally, much attention has been paid in the literature to the cash build-up resulting from a lack of investment opportunities for firms and the reluctance of managers to pay out the cash to shareholders (Jensen (1986)). There is a large empirical literature that investigates the relative importance of these motives to hold cash. It could therefore be that differences in cash holdings between U.S. firms and foreign firms can be explained by differences in firm characteristics. In this section, we first estimate a model of normal cash holdings, we then show how abnormal cash holdings from that model changes over time and across countries. Finally, we explore whether abnormal cash holdings are related to country characteristics.

3.a. The model of normal cash holdings

To obtain estimates of predicted or normal cash holdings, we use the model of Bates, Kahle, and Stulz (2009). This model makes cash holdings depend on variables that proxy for the motives to hold cash that have been analyzed in the literature. Similar models have been used widely through the literature on cash holdings of U.S. firms. Here, we differ from the literature in that we estimate a worldwide model of cash holdings allowing for country fixed effects. Such a model is necessary for us to understand how cash holdings of U.S. firms differ from holdings of comparable foreign firms.

Table 4 shows time-series averages of country means and medians of firm characteristics that are used in the model for the U.S. and for groups of foreign countries. The literature shows that cash is increasing in the ratio of the market value of assets to their book value (see, for instance, Opler, Pinkowitz, Stulz, and Williamson (1999)). Not surprisingly, this ratio differs substantially across countries. It is also much higher for U.S. firms, which could help explain why U.S. firms have larger cash holdings. The transactions motive predicts that the cash ratio should fall with firm size. We see that U.S. firm size, measured by the logarithm of the real value of assets, is higher than for some countries and lower than for others. Firms with higher cash flow accumulate more cash, but they also need to keep less cash in reserve since they can replenish their holdings more quickly. Cash flow has a lower mean but higher median for U.S. firms. The non-cash part of net working capital is a substitute for cash. We see

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that U.S. firms have much higher net working capital than foreign firms. The argument that firms hold more cash when they invest less suggests that capital expenditures are related to cash holdings. There is little difference in capital expenditures across countries, except that they are lower in Japan and the UK. We would expect leverage to be related to cash holdings as it would make little sense for a firm to hold vast amounts of cash while it is heavily indebted. There are no dramatic differences in leverage across countries. R&D expenditures are often viewed as a proxy for growth opportunities. Further, it is more difficult to borrow to finance R&D expenditures than to finance capital expenditures. We would therefore expect the precautionary motive to be stronger for high R&D spending firms. The Table shows that U.S. firms have more R&D spending relative to sales than typical foreign firms. Dividend payments reduce cash. U.S. firms are less likely to be dividend payers than foreign firms. U.S. firms are more likely to spend on acquisitions than foreign firms. Finally, we show that U.S. firms raise more funds through equity issuance than foreign firms but less through debt issuance. Existing evidence suggests that firms retain more cash from equity issues than from debt issuance (see McLean (2011)).

Table 5 shows our regression estimates across years. We estimate the model with country fixed effects. We see that cash holdings increase with industry cash flow volatility, market-to-book, R&D expenditures, debt issuance and equity issuance. Cash holdings decrease with size, cash flow, net working capital, capital expenditures, leverage and acquisitions. Whether a firm is a dividend payer or not is not related to cash holdings. The estimates are fairly similar to those of Bates, Kahle, and Stulz (2009) even though the samples are very different. Here, we use a world-wide sample from 1998 to 2010. They estimate their regressions over the period of 1980 to 2006 for U.S. firms. We estimate the regression year by year from 1998 to 2010. The only noteworthy difference is that cash flow has a positive coefficient in Bates, Kahle, and Stulz (2009), while here it varies over time, being mostly significantly negative but significantly positive in the last year. Except for cash flow, there is no dramatic variation in the coefficients over time. The only coefficient that loses significance in addition to cash flow is equity issuance which is insignificant in 2001, 2002, and 2008. The regression has more explanatory power early in the sample, but not dramatically so.

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3.b. Country-level estimates of abnormal cash holdings

To examine whether differences in firm characteristics explain cross-country differences in cash holdings, we proceed in a way that is standard in the literature, in that we examine abnormal cash holdings, which are cash holdings that are not explained by a regression model that reflects the motivations to hold cash. We use the models presented in Table 5 and rely on the country indicator variables to make our inferences. In these models, the country indicator variables measure how, for given firm characteristics, cash holdings differ in each country relative to the U.S. These country indicator variables are a measure of abnormal cash holdings of foreign firms relative to U.S. firms. Alternatively, when the country indicator variable is multiplied by minus one, it measures the abnormal cash holdings of U.S. firms relative to foreign firms. The results are shown in Panel A of Table 6. The first column shows the average country indicator variable across all countries. The average indicator variable is not significant in 1998, 2000 and 2001. In 1999, it takes a value of -1.08%, which means that on average firms in a foreign country have 1.08% less of assets in cash than comparable U.S. firms. After 2001, the indicator dummy variable is always significant. Except for a large increase in 2008, it never experiences a material increase but it decreases substantially as by 2010 it is -3.11%. Comparing the abnormal cash measure to the differences in cash holdings that are observed in Table 3, we see that firm characteristics explain a substantial fraction of the differences in cash holdings. In 2010, American firms held 7.19% of assets more in cash than the cross-country average in Table 3. Consequently, 57% of the higher cash holdings of U.S. firms after the crisis are accounted for by the fact that the population of U.S. firms differs from the population of foreign firms.

The next column of Table 6 looks at the excess cash holdings of firms in advanced countries. We exclude from advanced countries the UK and Japan as we consider these countries separately next. We find that for firms in these countries, abnormal cash first became significantly less than for the U.S. firms in 2002 and remained significantly lower through 2010 with the exception of in 2003. Turning to the UK, which is the country most similar to the U.S., we see that cash holdings in the UK fall compared to the U.S. and that the difference becomes large and significant after the crisis. Japan always has more cash

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than U.S. firms, but the difference is rarely significant after 2002. Developing countries have significantly less cash than U.S. firms after taking into account firm characteristics in every year but 1998. Finally, Eurozone countries have significantly less cash than U.S. firms after 2001. For all subsets of countries, the average indicator variable mostly increases in absolute value through time, but depending on the subset, it peaks before the crisis or after.

Panel B of Table 6 provides results for sub-periods. We show that there is weak evidence that the American firms have abnormal cash holdings compared to the rest of the world in the late 1990s, but strong evidence that they do after the crisis except for Japan. Firms from advanced countries, except for UK firms, are less different from U.S. firms than firms from developing countries in their cash holdings. While we see little evidence that average cash/assets ratios increased after the crisis, we see that average abnormal cash/assets ratios increase for U.S. firms relative to foreign firms across the world except for Japan.

In the next panel, Panel C, we estimate the significance of the changes in the mean indicator variables. We see that the mean falls significantly only for the Eurozone countries from the late 1990s to 2004-2006. It falls significantly for the world, advanced countries, developing countries, and the Euro zone from the late 1990s to 2009-2010. Finally, the average indicator variable falls significantly from 2004-2006 to 2009-2010 for the whole world and the UK. In contrast, it increases for Japan.

3.c. Country characteristics and abnormal cash holdings

The results of this section show that when one takes into account firm characteristics, U.S. firms have abnormal cash holdings relative to comparable foreign firms in recent years. There is more evidence of an increase in cash holdings of U.S. firms after the crisis once one controls for firm characteristics. We now turn to an investigation of whether the differences in changes in cash holdings between U.S. firms and foreign firms are related to country characteristics. In Table 7, we look at country characteristics related to legal origin, economic development, financial development, and taxation. For country characteristics that change over time, we assign countries to a type for a period using its status the year before the start of a

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period. Irrespective of the type of country we consider, firms in a country of that type have significantly less cash after controlling for firm characteristics than U.S. firms after the crisis. However, for a number of country types, abnormal cash holdings are not significantly negative in the late 1990s.

Following La Porta, Lopez-de-Silanes, Shleifer and Vishny (1998), there is a vast literature that demonstrates the importance of legal origin for finance. In particular, that literature shows that common law countries tend to be more financially developed and to protect investors better. We find that there is no significant difference in cash holdings relative to U.S. firms between civil law and common law countries. However, compared to the U.S., cash holdings fall sharply in civil law countries, but not in common law countries, in the 2000s.

We consider next economic and financial development. We collect economic and financial development data from the World Development Indicators of the World Bank. Firms from low GDP per capita countries hold less cash relative to U.S. firms. Controlling for firm characteristics, firms from developing countries do not have less cash than U.S. firms before the crisis, but they do afterwards. We divide sample countries in each period by the median GDP growth rate. We find no significant difference between these two groups of countries relative to U.S. firms.

Existing research suggests that the precautionary motive of cash holdings implies that firms in countries with less developed credit markets should have more cash but fails to find that they do (Dittmar, Mahr-Smith, and Servaes (2003), Kalcheva and Lins (2007)). For our sample period, financial development does not seem to explain differences in cash holdings across countries relative to the US. More importantly given our focus, differences in financial development are not related to changes in abnormal cash holdings. There is no difference in the change in cash holdings between countries with high credit to GDP versus countries with low credit to GDP. Both types of countries hold less cash after the crisis relative to U.S. firms than in the late 1990s. Firms in countries with low stock market capitalization to GDP hold less cash after the crisis relative to U.S. firms than countries with high stock market capitalization to GDP, but not before. However, the differences in changes in cash holdings between firms from these two groups of countries relative to the U.S. firms are never significant.

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Given that the recent crisis was a credit crisis, firms from countries more reliant on credit from banks might have used up their excess cash to offset restrictions on bank credit. However, we find that the extent to which credit markets are developed relative to equity markets does not seem to make a difference for changes in cash holdings. From the end of the 1990s to after the crisis, firms from countries with low capitalization of bond and equity markets decrease their cash holdings relative to the U.S. compared to firms from countries with high capitalization of bond and equity markets. However, there is no evidence that cash policies of firms in these two types of countries responded to the crisis differently.

The next country characteristics we consider are tax related. We divide countries according to their corporate tax rate. Using data from PwC, firms in countries with a marginal tax rate higher than the median do not change their cash holdings relative to U.S. firms in the 2000s compared to firms in countries with a lower marginal tax rate. The U.S. has a worldwide tax system where firms are taxed on their worldwide income, though they can defer U.S. taxes until repatriation. Some other countries have territorial tax systems where they only tax domestic income. The identification of tax systems is taken from Markle (2010). In our sample, 23 countries have a worldwide tax system for most of the sample. Differences in tax systems cannot explain differences in abnormal cash holdings. U.S. firms hold more cash than firms in other countries that have a worldwide tax system, but firms from countries with a worldwide tax system do not hold significantly more cash relative to U.S. firms than firms from a territorial tax system.

So far, in these comparisons, we have not considered on how a country fared during the crisis. We now examine whether a country's experience in the crisis affects the cash holdings of firms from that country after the crisis. To investigate this issue, we regress the change in average abnormal cash holdings of a country from before the crisis to after the crisis on the stock return of the country during 2008. If the crisis played a role in cash holdings, we would expect the change in abnormal cash holdings to be related to 2008 returns. We find (not tabulated) that the coefficient on the market return is 0.06 with a t-statistic of 2.36. In other words, the firms from countries that fared better during the crisis increased their cash holdings more from before the crisis to after the crisis.

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4. Abnormal cash holdings using the late 1990s as a benchmark

In this section, we investigate whether firms across the world hold more cash than they would if they held cash in the same way as they did in the late 1990s. In other words, we use the model of the previous section estimated over 1998-2000 and compare actual cash holdings in the 2000s to the cash holdings predicted by that model. The model includes country indicator variables, so that it allows for differences in cash holdings that are country-specific at the end of the 1990s. When we use the model to predict cash holdings in other years, we include the country indicator variables. Consequently, we account for country specific factors (including possibly accounting differences) that affect cash holdings as of the late 1990s.[7] Our estimates of abnormal cash holdings, defined as actual cash holdings minus predicted cash holdings from our model, correspond therefore to changes in abnormal cash holdings relative to a benchmark of zero abnormal cash holdings at the end of the 1990s when the indicator variables are taken into account. The indicator variables for the end of the 1990s correspond to the indicator variables shown for 1998-2000 in Table 6.

In Figure 5, we show the predicted average cash/assets ratio of U.S. firms using our model as well as the actual ratio. We see that the predicted ratio increases in the 2000s but drops sharply in 2008 before increasing again. It follows from this that part of the high holdings of cash are normal cash holdings in that firms that hold cash as they did in the late 1990s would be holding more cash in the 2000s. In the first part of this section, we show how abnormal cash holdings evolve across the world during the 2000s. Abnormal cash holdings in this section are defined as abnormal cash holdings relative to what firms would hold if they held cash as in 1998-2000. In the second part of this section, we investigate which types of U.S. firms experienced the greatest increase in abnormal cash holdings. We then compare the abnormal cash holdings of types of U.S. firms to similar foreign firms.

[7] To allow for differences in the accounting treatment of R&D, we also estimate the model interacting R&D with the country dummies. None of our results are different when we do so.

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4.a. Evolution of abnormal cash holdings across the world during the 2000s.

In Table 8, we show the estimates of abnormal cash holdings across the world relative to the benchmark of 1998-2000. Panel A shows the yearly results. We start with 2001, since the abnormal cash holdings are set to zero at the end of the 1990s. We see that average abnormal cash holdings increase quickly after the late 1990s to reach 1.75% for the U.S. in 2002. Abnormal cash holdings fall after 2002, hovering around 1% until 2008 when they reach their peak of 2.19%. While raw cash holdings fall at the peak of the crisis in Table 1, abnormal cash holdings increase. In other words, changes in firm characteristics suggest that cash holdings should have fallen more than they did, which explains that abnormal cash holdings increased during the crisis. Abnormal cash holdings fall slightly after 2008 as they reach 1.73% in 2010. These results show that U.S. firms, keeping firm characteristics the same, hold more abnormal cash at the end of the sample than they do in the late 1990s. In Panel B, we see that abnormal cash holdings are 1.06% higher in 2004-2006 and 1.86% in 2009-2010.

We now turn to abnormal cash holdings for foreign firms. As before, we look at averages across countries rather than across firms. For the world as a whole, Panel A shows that abnormal cash holdings are always extremely small and that they actually are negative every year after 2002 except 2008. Abnormal cash holdings abroad do not show the increase they show in the U.S. during the 2000s. When we turn to the advanced countries, we see that abnormal cash holdings are less than 0.7% in every year. They are negative in five years and positive in five years. There is no clear pattern to the evolution of abnormal cash holdings in advanced countries except that firms in these countries have significantly less cash than U.S. firms. We turn next to two advanced countries separately. First, we see that abnormal cash holdings in the UK are insignificantly different from U.S. firms in five years and significantly negative otherwise. The UK experiences a very sharp decrease in abnormal cash holdings in the last year of the sample. It is interesting to note that the UK changed the taxation of foreign income in 2009 so that it moved from a country that taxes income worldwide to a country that taxes only domestic income that year. Japan has significantly negative abnormal cash holdings throughout the 2000s, but the abnormal cash holdings increase in the last three years of the sample and turn positive in the last two years. Japan

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also moved to taxing only domestic income in 2009, but in contrast to the UK abnormal cash holdings did not decrease in Japan, suggesting that a move to taxing domestic income only does not necessarily lead to a decrease in cash holdings.

The last two columns of Table 8 show abnormal cash holdings for developing countries and for countries from the Eurozone. Both Eurozone countries and developing countries have typically negative abnormal cash holdings. However, both types of countries have positive abnormal cash holdings in 2008. Firms from these countries appear to have higher abnormal cash holdings after the crisis than before the crisis. One would think that uncertainty is high in the Eurozone countries after the crisis as 2010 marks the beginning of the Eurozone sovereign crisis. Yet, abnormal cash holdings fall after 2008 for Eurozone countries. U.S. firms hold more abnormal cash holdings relative to Eurozone countries after the crisis than before.

We checked to make sure that the increase in abnormal cash holdings is not due to changes in the composition of the sample. A legitimate reason to worry about this issue is that Dittmar and Duchin (2011) provide evidence that firm age is an important determinant of cash holdings. We define young firms to be firms that have been public for five or fewer years. Firms which have been public for 20 years or more are old firms. When we split firms between young and old firms, we find that cash holdings increase much more for old firms than for young firms from the late 1990s to after the crisis or from 2004-2006 to after the crisis. We also investigate abnormal cash holdings for a constant sample of firms that exist in 1998. We find that the increase in abnormal cash holdings is roughly the same for that sample.

4.b. Did increases in abnormal cash holdings differ across firm types in ways consistent with potential explanations for the high cash holdings of U.S. firms?

The often-heard view mentioned in the introduction about the implications of the tax treatment of foreign income suggests that abnormal cash holdings should have increased more for multinationals if the adverse tax consequences of repatriation lead firms to build up cash abroad rather than repatriate it to pay

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dividends. The agency view of cash holdings would suggest that firms with poorer governance experienced greater increases in abnormal cash holdings. The poor investment opportunities hypothesis implies that firms that experienced a greater decrease in capital expenditures because of the crisis would have higher cash holdings afterwards. The view that Sarbanes-Oxley led firms to increase cash holdings as it made firms risk-averse suggests that firms that were more affected by Sarbanes-Oxley increased their abnormal cash holdings. We examine these possible explanations for cash holdings, but also consider other possible explanations.

A simple explanation for the increase in abnormal cash holdings is the free cash flow hypothesis of Jensen (1986). With that hypothesis, firms accumulate abnormal cash holdings when they have profits but insufficient investment opportunities and do not want to pay out the cash they accumulate to shareholders because of agency problems. If this hypothesis is correct, we expect firms with high cash flow to accumulate abnormal cash holdings. We assign firms to the top quartile of cash flow and to the bottom quartile of cash flow the year before the start of a period. We see that the high cash flow firms do not accumulate abnormal cash holdings from the late 1990s to 2004-2006, but that they do so from 2004-2006 to 2009-2010. It follows that Jensen's hypothesis does not help understand the increase in cash holdings from the end of the 1990s to the 2000s. While firms with low capital expenditures accumulate abnormal holdings of cash from the end of the 1990s to the 2000s, they do not accumulate more cash than the firms with high capital expenditures from before the crisis to after the crisis. We also consider firms that have high cash flow but low capital expenditures. These firms have higher abnormal cash holdings than the firms with high cash flow but high capital expenditures. However, there is no evidence that the difference in abnormal cash holdings between these two types of firms increases during the 2000s.

To further examine the agency hypothesis of high cash holdings, we use the GIM index of Gompers, Ishii, and Metrick (2003). Harford, Mansi, and Maxwell (2008) show that firms with weaker governance have less cash and spend it more quickly. Dittmar and Mahrt-Smith (2007) find that cash is worth more at better governed firms. The GIM index is calculated every two years and the most recent data is for 2006. We use the 2006 data for the subsequent years. Firms with a higher GIM index are presumed to have

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worse governance by the users of that index. We divide our sample into quartiles of the index and compare firms in the top quartile with firms in the bottom quartile. Agency problems should be least important for firms in the bottom quartile, but we find that these firms hold more cash than firms in the top quartile. Cash holdings of firms in the bottom quartile increased sharply over time, but so did the cash holdings of the firms in the top quartile. There is no evidence that abnormal cash holdings of weakly governed firms increase more from the late 1990s to the 2000s. While firms in the top quartile have a greater increase in cash holdings from before the crisis to after, these firms have no abnormal cash holdings after the crisis. It follows from these results that there is no evidence that agency problems explain the increase in abnormal cash holdings of U.S. firms from the late 1990s to after the crisis.

One hypothesis discussed in the previous section is that the crisis led to high cash holdings. We saw that this hypothesis does not appear to be supported with cross-country data. In this Section, we examine this hypothesis for U.S. firms. One way that the crisis could have led to high cash holdings is that the crisis adversely affected investment, so that firms had more cash to accumulate. Note that we cannot exclude the possibility that firms invested less so that they could save more cash; however, the literature would predict that firms that invest more out of cash are financially constrained firms and we show later that financial constraints do not explain the growth in cash holdings, a result which is perhaps not unexpected since cash holdings increase more for large firms. Our first look at this issue is to sort firms in 2008 by their capital expenditures (results not tabulated). The firms with low capital expenditures in 2008 have high abnormal cash holdings in 2009-2010. However, these firms do not experience a significant increase in abnormal cash holdings from 2004-2006 to 2009-2010. Second, we split firms into quartiles of capital expenditures in 2009-2010. Again, the firms that are in the bottom quartile hold more cash, but their abnormal cash holdings do not increase significantly from before the crisis to after the crisis. Finally, we regress the change in abnormal cash holdings from before the crisis to after the crisis on the change in capital expenditures over the same period. For U.S. firms, the change in capital expenditures has no explanatory power whatsoever. For foreign firms, the coefficient on the change in capital expenditures is positive (0.16 with t-statistic of 7.34), so that firms whose capital expenditures dropped more decreased

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their abnormal cash holdings. There is no evidence supportive of the view that firms have been accumulating cash because of poor investment opportunities.

We saw in Section 2 that the top five holders of cash in 2010 are firms for which R&D is extremely important. This evidence raises the question of whether the abnormal cash holdings increase is concentrated among high R&D firms. When we split the sample between the top R&D expenditure firms, namely the ones in the top quartile of firms with R&D expenditures, we find that high R&D firms increase abnormal cash holdings from the late 1990s to the 2000s much more than other firms. In fact, abnormal cash holdings as a percentage of assets increase by 4.0 percentage points for high R&D firms from 1998-2000 to 2009-2010, but only by 0.70 percentage points for firms with no R&D. At the same time, cash holdings of high R&D firms do not increase from before the crisis to after the crisis, while cash holdings of other firms increase by 1.10 percentage points.

As discussed in the introduction, a frequent argument is that multinationals have high cash holdings because they keep substantial amounts of cash outside the U.S. to avoid the adverse tax consequences of repatriation. We use two different definitions of multinationals. With the first definition, a firm is a multinational if it reports foreign income in any of the previous three years. Since we consider three different periods in the Table, a firm is assigned to the multinational group for a period if it has foreign income in any of the three years preceding the start of that period. The second definition is that a firm becomes a multinational once it has 25% of its sales abroad according to Compustat Historical Segment data. Since, in general, the results are the same for both definitions of multinationals, we only reproduce the results for the second definition. This definition has the advantage of making comparisons between U.S. and foreign multinationals straightforward as the definition is the same for both domestic and foreign multinationals. Duchin (2010) shows that diversified firms hold less cash. Firms can be diversified across countries as well as across industries. His study focuses on industry diversification. In the late 1990s, there was no difference in abnormal cash holdings between multinational and domestic firms. We define domestic firms as firms that have no foreign sales and no foreign income. However, in recent years, multinationals' cash holdings are large compared to the cash holdings of comparable domestic firms, so

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that international diversification does not seem to affect cash holdings in the same way as industrial diversification. As shown in Panel A of Table 9, after the crisis, multinationals hold 3.6% more of assets in cash than comparable domestic firms. All this increase in cash holdings took place from the late 1990s to before the crisis. Strikingly, while the cash holdings of multinationals increase sharply in the 2000s, the cash holdings of the domestic firms do not. Not surprisingly, therefore, cash holdings of multinational corporations increase significantly from the late 1990s to before the crisis. Neither multinational corporations nor domestic corporations have higher cash holdings after the crisis than before.

It is well-known that an important reason for firms to become multinational is that they have intangible assets and that they can better protect their property rights on these assets abroad by exploiting them directly.[8] A major source of intangible assets is R&D. We already know from Panel A of Table 9 that high R&D firms hold more cash. One explanation in the literature for the high cash holdings of R&D intensive firms is that R&D has high adjustment costs (Brown and Petersen (2011)). In Panel A of Table 9 we compare purely domestic high R&D firms to multinational high R&D firms. We find that cash holdings increase for multinationals relative to purely domestic firms. We also estimate but do not report in the table results for the balanced panel where firms are classified at the end of 1997. For that panel, we find no significant difference in abnormal cash holdings between high R&D multinationals after the crisis and high R&D purely domestic firms after the crisis. However, for that panel, multinational cash holdings increase sharply over time relative to purely domestic firm cash holdings. The reason that multinationals do not hold more cash than purely domestic firms after the crisis is that they held so much less, 7.0% of assets, at the end of the 1990s.

Financial markets experienced large changes in the 2000s. At the beginning of the 2000s, equity markets saw a sharp downturn. Throughout the 2000s, there were few IPOs (Gao, Ritter, and Zhu (2011), Doidge, Karolyi and Stulz (2012)). With the crisis, debt markets experienced sharp difficulties. These facts raise the question of whether firms more dependent on outside financing increased abnormal cash holdings more because financial markets became less reliable for them. Such a result would be consistent

[8] See Morck and Yeung (1991) for references.

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with the existing literature which shows that financially constrained firms invest in cash out of cash flow (Almeida, Campello, and Weisbach (2004)) and are able to better take advantage of investment opportunities because of their higher levels of cash (Denis and Sibilkov (2009)). We first contrast financially constrained firms to other firms. To do this, we identify constrained firms as those in the top 7% of the Hadlock and Pierce (2010) Size-Age index, which is the rounded percentage of firms that are constrained in their study using qualitative information from firms. We see that financially constrained firms did not increase their abnormal cash holdings, but the other firms did. However, the differences in changes in abnormal cash holdings are not significant across these two types of firms. We then turn to firms that are dependent on equity financing. McLean (2011) shows that firms that raise funds with equity save a substantial fraction of these funds in the form of cash. Though equity-dependent firms hold more abnormal cash holdings than other firms at the end of the 1990s, they do not after the crisis. We find that the firms that were dependent on equity financing do not increase their abnormal cash holdings in the 2000s, while the other firms do. Finally, we turn to the firms that had long-term debt. We see that these firms increase their abnormal cash holdings significantly, but so do the firms without long-term debt.

We now consider the role of regulation as a possible explanation of the increase in cash holdings. As discussed earlier, our sample does not include utilities. It is interesting to note that when we use our model to predict cash holdings of utilities, utilities hold much less cash than expected. It follows that it is not necessarily the case that a heavier regulatory burden leads to higher cash holdings. Further, there is no change in their abnormal cash holdings. In contrast, abnormal cash holdings of industrial firms increase significantly over time. To examine further the role of regulation, we consider the cash holdings of the firms that were most adversely affected by the adoption of Sarbanes-Oxley (SOX). Sarbanes-Oxley is by far the most important change in federal law affecting corporate governance since the 1930s. Existing empirical work shows evidence that it made corporations more conservative (Bargeron, Lehn, and Zutter (2010)). We use two approaches to identify firms that were the most adversely affected by SOX. First, we use the firms that met less than four of the ten SOX key measures as recorded by Institutional Shareholder Services. Second, we identify those firms whose common stock reacted more adversely to the passage of

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SOX. We use the dates in Litvak (2007) as relevant dates for the passage of SOX and then identify the firms that have cumulative abnormal returns on these dates that are at the bottom quartile of all firms. We see that the firms that satisfied less than four of the ten SOX key measures have significantly higher abnormal cash holdings than other firms after SOX but not before. However, these firms as well as the other firms increase their abnormal cash holdings in the 2000s and the increase across these two types of firms is not significantly different. When we turn to the firms that experienced the largest equity loss, we see that these firms hold more abnormal cash holdings both before and after SOX than the other firms. However, these firms do not increase their cash holdings significantly more from the end of the 1990s to 2004-2006 as expected if the adoption of SOX would have led them to hold more cash.

4.c. Did certain U.S. firms increase their abnormal cash holdings more than comparable foreign firms?

The evidence of Section 4.b. shows that large, high tech, high R&D, and multinational firms increased their abnormal cash holdings the most from the late 1990s to after the crisis.[9] We now investigate whether the large abnormal cash holdings increases of these firms are a U.S. phenomenon or whether similar foreign firms increased abnormal cash holdings as much. To make our comparisons, we construct subsets of foreign firms based on the thresholds we use for U.S. firms so that, for instance, a large foreign firm would be a large firm in the U.S. We compare U.S. firms and foreign firms directly in Panel B of Table 9. The first comparisons are for large firms, high tech firms, and multinationals. These are the groups that experience the greatest increase in abnormal cash holdings in the U.S. These firms do not have higher abnormal cash holdings than foreign firms in the late 1990s except for the high tech firms. Strikingly, U.S. multinational corporations hold less cash than comparable foreign multinational corporate in the late 1990s. All groups of U.S. firms experience a greater increase in abnormal cash holdings than foreign firms from the late 1990s to 2004-2006 and from the late 1990s to 2009-2010.

[9] Good governance firms increased their cash holdings sharply as well. However, we cannot find comparable firms abroad since the GIM index is only for U.S. firms. Further, it seems more plausible that this increase is due to the fact that high tech and high R&D firms tend to be good governance firms using the GIM index.

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Consequently, the increase in abnormal cash holdings for these firms from the late 1990s to the 2000s is a U.S. phenomenon. However, for these three groups of firms, abnormal cash holdings do not increase more from before the crisis to after the crisis than for foreign firms. In other words, the change in abnormal cash holdings from before the crisis to after the crisis for these firms is not a U.S. phenomenon but a global phenomenon.

We also compare abnormal cash holdings for firms in the top quartile of cash flow and top quartile of capital expenditures. Strikingly, there is no difference in abnormal cash holdings between foreign firms and U.S. firms among these firms. However, while U.S. and foreign firms in the top quartile of R&D spending held similar amount of abnormal cash holdings in the late 1990s, the U.S. firms in that group increased their cash holdings sharply compared to foreign firms from the late 1990s to 2004-2006. The difference between the two groups increases after the crisis, but that is because of a decrease in abnormal cash holdings for foreign firms. U.S. equity-dependent firms hold more abnormal cash than foreign firms, but the difference between U.S. firms and foreign firms does not change over time. U.S. firms with long-term debt increase abnormal cash holdings over time, but foreign firms only do so after the crisis.

5. An examination of the increase of cash holdings of multinationals

We show that there is an increase in abnormal cash holdings for U.S. multinationals but not for U.S. domestic firms. This evidence raises the question of why the cash holdings of multinationals have increased so much. One important hypothesis is that multinationals hoard cash abroad because it is costly for them to repatriate profits. For this hypothesis to be correct, it must be that if multinationals could repatriate their foreign income without a tax penalty, they would do so and they would pay out the cash to shareholders either in the form of dividends or through repurchases. If multinationals would repatriate the cash but not pay it out, the tax penalty on repatriation would mostly affect the location of cash holdings and not the level.

Panel B of Table 9 shows that cash holdings of US multinationals did not increase more than the cash holdings of comparable foreign multinationals after the crisis. Such a result might still be consistent with

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the tax hypothesis if the most profitable US multinationals increased their cash holdings more since taxation of profits would be most relevant for these firms. In Panel A of Table 10, we split the sample of firms by quartile of cash flow to assets in the year before the start of each period. We then compare the multinationals in the top quartile and the multinationals in the bottom quartile. If lack of repatriation of profits leads to high cash holdings, we would expect firms in the top quartile to have higher abnormal cash holdings than firms in the bottom quartile. We find that the firms with higher cash flows have significantly lower abnormal cash holdings than the firms with lower cash flows. Further, there is no evidence that cash flow is related to the growth of cash holdings as there is no significant difference in cash flow changes between high cash flow and low cash flow multinationals. We also compare multinationals in the top quartile of cash flows to domestic firms in the same quartile. We find that high cash flow multinationals hold more cash than similar high cash flow purely domestic firms. However, high cash flow multinationals and high cash flow purely domestic firms increase their cash holdings similarly from before the crisis to after the crisis.

We show in Panel A of Table 9 that high R&D multinationals experienced a higher increase in cash holdings from the late 1990s to the 2000s than high R&D domestic firms. In Panel A of Table 10, high R&D domestic multinationals experienced a higher increase in cash holdings during the 2000s than comparable high R&D foreign multinationals. Multinationals without R&D do not have positive abnormal cash holdings, but they hold more cash than comparable purely domestic firms with no R&D as shown in Panel A of Table 10. However, no R&D multinationals only marginally increase their cash holdings relative to no R&D domestic firms. In other words, the increase in cash holdings of multinationals is primarily located among multinationals with R&D expenditures. We confirm this inference by regressing abnormal cash holdings on a firm's R&D expenditures normalized by assets, its multinational status, and the interaction of the R&D expenditures with the multinational status.[10] We find that abnormal cash holdings increase in the interaction term, so that multinationals apparently require higher cash holdings for a given level of R&D than comparable purely domestic firms. Moreover, the

[10] Results are not shown, but available upon request from the authors.

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level of R&D is actually negative and significant, while the indicator variable for multinational status is insignificantly negative.

The number of multinational firms increases during the 2000s. Roughly 350 firms become multinationals in the U.S. We investigate whether the firms that were already multinationals before the start of our sample have high cash holdings during the 2000s compared to firms that were domestic at the start of the sample. We find that multinational firms that were already multinational firms at the end of the 1990s increase their abnormal cash holdings more than firms that were domestic firms at the end of the 1990s, but the increase occurs prior to the crisis.

In Panel B of Table 10, we show regression tests attempting to isolate the impact on abnormal cash holdings of firms becoming multinationals. We use the whole sample of firms. We use indicator variables to indicate years in which a firm is multinational and control for macroeconomic shocks through year indicator variables. Regression (1) has no firm fixed effects. We see that abnormal cash holdings of multinational firms are higher than those of domestic firms.

We then add firm fixed effects in regression (2). The firm fixed effect completely absorbs firms which are either domestic or multinational for our entire sample. Thus, the coefficient on multinational now represents the marginal change in (abnormal) cash holdings from before a firm was multinational to after it became multinational. The coefficient is insignificant. Based on this evidence, multinational firms have high abnormal cash holdings before they become multinationals, and do not appear to increase their abnormal cash holdings after they become multinationals.[11] Such a result further indicates that the tax treatment of foreign profits is at most only part of the explanation for the high cash holdings of multinational firms.

In Panel C of Table 10, we conduct an event study of abnormal cash holdings of U.S. multinationals compared to foreign multinational firms around the time that U.S. multinationals were allowed to repatriate foreign profits under advantageous conditions. Admittedly, the law required them to reinvest

[11] The same result (not reported) holds if we only consider firms that switch status to multinational until the mid-2000s so that these firms have time to increase their cash holdings.

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the funds, but cash is fungible so that the domestic cash they might have used instead to invest could be paid out. The year 2003 is before the advantageous repatriation period and the year 2006 is for most firms after that period. We see that during that period of time, abnormal cash holdings for multinational firms do not decrease. In fact, abnormal cash holdings do not change significantly for multinational firms or for domestic firms. When we compare the abnormal cash holdings of U.S. multinationals to foreign multinationals during that period, we see no significant decrease in abnormal cash holdings of U.S. multinationals. Existing empirical evidence (Blouin and Krull (2009), Dharmapala, Foley, and Forbes (2011), and Faulhaber and Petersen (2012)) indicates that multinational firms mostly paid out the repatriated funds. From our evidence, these payouts do not seem to have had enough of an impact on cash holdings to lead to a decrease in abnormal cash holdings.

6. Conclusion

In this paper, we show that American firms hold more cash after the crisis than firms with similar characteristics in the late 1990s. The difference is 1.86% of assets. This increase is U.S. made in that foreign firms do not experience such an increase, so that U.S. firms hold more cash now than in the late 1990s relative to similar foreign firms. The increase in abnormal cash holdings is not uniform across firms as it takes place mostly for multinational corporations. We find no increase in abnormal cash holdings for purely domestic corporations. The role of multinational corporations in the increase in cash holdings of US firms is striking. Multinationals (defined as firms with more than 25% of foreign sales) held $157 billion in cash in 1998, while in 2010 they held $835 billion. Part of the growth in cash held by multinationals is due to their increased economic importance in the U.S., but the cash holdings of multinationals increased by 433% while their assets increased by 205%. In contrast, cash holdings of domestic firms increased by 66% while their assets increased by 40%. Importantly, however, U.S. multinationals did not increase their cash holdings more after the crisis than similar foreign multinationals.

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Much has been made of the tax cost of repatriation of foreign earnings for multinationals and how this cost might explain the high cash holdings of multinationals. We find that multinationals do not decrease their cash holdings as a result of the Homeland Investment Act of 2004 and, perhaps more importantly, that firms that become multinationals do not appear to increase their cash holdings. Our evidence is that the firms that become multinationals after 1998 have high cash holdings when they become multinationals. These results suggest that the type of firms that are or become multinational firms have unique attributes that make cash holdings particularly valuable for them. The exact reasons these firms hold more cash require further investigation. However, a promising direction is that we know from the literature that these firms are high R&D firms and that high R&D firms hold more cash. In our sample, the firms with the highest abnormal cash holdings are high R&D multinationals. We find that the relation between R&D and cash holdings is substantially stronger for multinational firms than it is for purely domestic firms. This result is particularly interesting in light of the work of Morck and Yeung (1991). They find that multinational firms are not valued more highly per se, but that R&D undertaken by multinational firms is valued more highly than R&D undertaken by poorly domestic firms. Another direction to investigate is whether firms that become multinationals accumulate cash to become multinationals. A possible explanation for this is that firms might become multinationals through cash acquisitions. Lastly, it does not follow from our results that the tax cost of repatriation is not relevant for multinationals. In particular, this cost might determine where firms hold their cash. Further work on the location of cash would be helpful to understand better the impact of the tax cost of repatriation.

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Table 1: U.S. Firm Cash/Asset Ratios, 1998 - 2010

The table shows the cash to assets ratios of U.S. firms from 1998 to 2010. Mean cash is the mean cash to assets ratio of all U.S. firms in the sample, median cash is the median of the ratio for all U.S. firms in the sample. Asset-weighted cash is aggregate cash to aggregate assets of all U.S. firms in the sample. For the sub-periods, N represents the number firm-years.

Panel A: U.S. Firm Cash/Asset Ratios by Year

Year	N	Mean Cash	Median Cash	Asset-Weighted Cash
1998	3,430	15.51%	6.37%	6.53%
1999	3,338	17.04%	6.57%	7.56%
2000	3,171	17.71%	7.07%	7.79%
2001	2,957	18.66%	8.84%	8.30%
2002	2,853	18.82%	9.96%	9.43%
2003	2,903	19.93%	12.05%	10.62%
2004	2,944	20.65%	13.12%	11.77%
2005	2,913	20.58%	13.46%	11.13%
2006	2,897	20.25%	12.46%	10.09%
2007	2,887	20.11%	11.45%	9.79%
2008	2,755	18.41%	10.73%	9.76%
2009	2,759	20.08%	13.49%	11.57%
2010	2,716	20.28%	14.19%	11.83%

Panel B: U.S. Firm Cash/Asset Ratios by Sub-periods

Year	N	Mean Cash	Median Cash	Asset-Weighted Cash
1998-2000	9,939	16.73%	6.63%	7.34%
2004-2006	8,754	20.50%	13.02%	10.96%
2009-2010	5,475	20.18%	13.89%	11.70%

Panel C: U.S. Firm Cash/Asset Ratios by Sub-periods and Size

	Top NYSE Asset Quintile				Below top NYSE Asset Quintile			
Year	N	Mean Cash	Median Cash	Asset-Weighted Cash	N	Mean Cash	Median Cash	Asset-Weighted Cash
1998-2000	476	6.32%	2.63%	5.83%	9,463	17.25%	7.01%	9.92%
2004-2006	422	11.19%	7.51%	9.90%	8,332	20.97%	13.45%	12.74%
2009-2010	267	11.21%	7.98%	10.55%	5,208	20.64%	14.45%	13.72%

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Table 2: Distribution of Firms by Country 1998-2010.

Advanced countries are bolded. Euro countries are italicized. IMF classifications are used.

Country	Minimum	Maximum	Mean	Median
Argentina	13	41	28.7	29
Australia	240	761	469.5	539
Austria	43	59	52.2	52
Belgium	49	86	73.2	75
Bermuda	166	366	288.3	330
Brazil	41	174	92.5	65
Canada	578	776	667.1	660
Cayman Islands	27	261	127.4	138
Chile	8	86	50.6	53
China	25	1381	554	369
Colombia	5	14	8.8	9
Denmark	72	92	81	82
Finland	56	110	93.5	101
France	342	478	437.2	457
Germany	294	497	439	445
Greece	37	160	104.4	99
Hong Kong	87	208	124.8	110
Hungary	11	15	13.4	13
India	46	1218	482.5	433
Indonesia	94	175	131.5	135
Ireland	34	42	37.4	37
Israel	24	113	61	60
Italy	102	193	158.7	162
Japan	1175	2791	2434.2	2617
Luxembourg	6	20	13.9	14
Malaysia	386	684	527.3	537
Mexico	45	72	56.2	56
Netherlands	91	138	119.6	119
New Zealand	38	70	56.2	61
Norway	64	148	104.2	94
Pakistan	26	109	63.3	50
Peru	8	49	23.2	21
Philippines	39	80	54.3	53
Poland	25	229	99.2	67
Portugal	32	40	36.2	36
Singapore	179	464	327.2	334
South Africa	94	186	144.5	154
South Korea	182	645	382.2	363
Spain	77	91	85.3	86
Sweden	106	233	189.6	207
Switzerland	120	165	148.8	153
Taiwan	96	1245	611.7	723
Thailand	133	326	229.6	239
Turkey	32	103	62.9	55
United Kingdom	706	1017	899.7	919
United States	2716	3430	2963.3	2903

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Table 3: Averages of Country Mean and Median Cash/Asset Ratios

Panel A (Panel B) shows the mean of the annual cross-sectional means (medians) of cash/asset, based on country grouping. ***, **, ***** ($^{+}$,$^{++}$,$^{+++}$) indicate the mean is significantly smaller (larger) than the US at the 10, 5, and 1% levels, respectively Using a two-tailed t-test. Advanced is whether the country is defined as advanced by the International Monetary Fund and Developing are all countries in the sample that are not designated as advanced. Euro specifies those countries that are identified as in the Euro zone by the IMF. For the subgroups All, Advanced excluding UK and Japan, Developing, and Euro, the standard error for the t-test is based on the cross-sectional distribution of country means (or medians). For the UK and Japan, the standard error is determined with firm level data. The results in the categories All and Advanced exclude the US.

Panel A: Mean cash holdings

	U.S. Firms	All N=45	Advanced ex. UK and Japan N=24	UK	Japan	Developing N=19	Euro N=12
1998	0.1551	0.1065***	0.1137***	0.1147***	0.1543	0.0946***	0.1163**
1999	0.1704	0.1084***	0.1138***	0.1183***	0.1638	0.0980***	0.1091***
2000	0.1771	0.1071***	0.1111***	0.1138***	0.1398***	0.0999***	0.0991***
2001	0.1866	0.1168***	0.1213***	0.1273***	0.1406***	0.1093***	0.1075***
2002	0.1882	0.1197***	0.1248***	0.1303***	0.1464***	0.1113***	0.1113***
2003	0.1993	0.1240***	0.1329***	0.1381***	0.1511***	0.1106***	0.1186***
2004	0.2065	0.1280***	0.1371***	0.1337***	0.1546***	0.1147***	0.1199***
2005	0.2058	0.1300***	0.1396***	0.1326***	0.1540***	0.1165***	0.1217***
2006	0.2025	0.1311***	0.1373***	0.1494***	0.1547***	0.1211***	0.1192***
2007	0.2011	0.1321***	0.1378***	0.1335***	0.1573***	0.1236***	0.1166***
2008	0.1841	0.1234***	0.1281***	0.1216***	0.1696***	0.1152***	0.1126***
2009	0.2008	0.1322***	0.1390***	0.1275***	0.1834***	0.1212***	0.1218***
2010	0.2028	0.1309***	0.1368***	0.1211***	0.1887***	0.1209***	0.1188***
1998-2000	0.1673	0.1071***	0.1128***	0.1156***	0.1514***	0.0972***	0.1076***
2004-2006	0.2050	0.1298***	0.1380***	0.1389***	0.1544***	0.1175***	0.1202***
2009-2010	0.2018	0.1315***	0.1380***	0.1244***	0.1860***	0.1208***	0.1204***

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Panel B: Median cash holdings

	U.S. Firms	All N=45	Advanced ex. UK and Japan N=24	UK	Japan	Developing N=19	Euro N=12
1998	0.0637	0.0756++	0.0803+	0.0682	0.1317+++	0.0671	0.0832
1999	0.0657	0.0733	0.0740	0.0680	0.1401+++	0.0692	0.0690
2000	0.0707	0.0713	0.0701	0.0598**	0.1173+++	0.0709	0.0613
2001	0.0884	0.0787*	0.0772*	0.0642***	0.1169+++	0.0792	0.0688***
2002	0.0996	0.0806***	0.0798***	0.0748***	0.1187+++	0.0799*	0.0693***
2003	0.1205	0.0880***	0.0897***	0.0848***	0.1219	0.0841***	0.0780***
2004	0.1312	0.0913***	0.0961***	0.0877***	0.1251	0.0835***	0.0839***
2005	0.1346	0.0902***	0.0959***	0.0902***	0.1236**	0.0814***	0.0812***
2006	0.1246	0.0916***	0.0945***	0.0999***	0.1250	0.0858***	0.0787***
2007	0.1145	0.0926***	0.0956**	0.0834***	0.1260++	0.0875**	0.0781***
2008	0.1073	0.0862***	0.0878**	0.0787***	0.1387+++	0.0818***	0.0773***
2009	0.1349	0.0982***	0.1035***	0.0865***	0.1567+++	0.0890***	0.0906***
2010	0.1419	0.0985***	0.1030***	0.0827***	0.1605+++	0.0905***	0.0898***
1998-2000	0.0663	0.0716	0.0730	0.0654	0.1287+++	0.0672	0.0683
2004-2006	0.1302	0.0909***	0.0954***	0.0925***	0.1247*	0.0833***	0.0812***
2009-2010	0.1389	0.0978***	0.1028***	0.0853***	0.1583+++	0.0889***	0.0894***

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Table 4: Summary Statistics by Country

The table shows the time-series mean of the annual cross-sectional means, and below it the time-series mean of the annual country medians. Advanced are the countries defined as advanced by the International Monetary Fund (but without the UK and Japan as they are shown separately) and Developing are the countries not designated as advanced. Euro specifies those countries that are identified as in the Euro zone by the IMF at the end of the sample period. Compustat data items are in brackets after the variable description. Cash/Asset [che/at] is cash to assets; Mkt/Book [((at-ceq)+(csho*prcc_f))/at] is the market to book ratio of assets; Size [log(at/cpi)] is the logarithm of real assets, deflated to 2000 dollars using the CPI; CF/Assets [((oibdp-xint-txt-dvc)/at)] is cash flow to assets; NWC/Assets [(wcap-che)/at] is non-cash net working capital to assets; Capex [capx/at] is capital expenditures to assets; Leverage [(dltt+dlc)/at] is short- and long-term debt to assets; RD/Sales [xrd/sale] is R&D expense to sales; Dividend Payer is an indicator if the firm paid common dividends [dvc] in the year; Acquisitions [aqc/at] is acquisitions to assets; Debt Issuance [(dltis-dltr)/at] is net debt issuance to assets; Equity Issuance [(sstk-prstkc)/at] is net equity issuance to assets; Ind Vol is the mean, by 2 digit SIC code, of firm standard deviation of CF/Assets for the prior 10 years. A minimum of 3 years is required to calculate firm volatility. ***, **, ***** ($^{+}$,$^{++}$,$^{+++}$) indicate the mean is significantly smaller (larger) than the U.S. at the 10, 5, and 1% levels, respectively Using a two-tailed t-test. For the subgroups All, Advanced excluding UK and Japan, Developing, and Euro, the standard error for the t-test is based on the cross-sectional distribution of country means (or medians). For the UK and Japan, the standard error is determined with firm level data. The results in the categories All and Advanced exclude the U.S.

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Variable	U.S. Firms	All N=45	Advanced exclude UK and Japan N=24	UK	Japan	Developing N=19	Euro N=12
Cash/Assets	0.190 0.106	0.125*** 0.087***	0.131*** 0.089**	0.128*** 0.078***	0.159*** 0.130+++	0.115*** 0.082**	0.114*** 0.076***
Mkt / Book	2.101 1.547	1.435*** 1.152***	1.485*** 1.195***	1.696*** 1.336***	1.126*** 0.980***	1.373*** 1.096***	1.474*** 1.199***
Size	5.642 5.572	5.498 5.338**	5.604 5.433	5.059*** 4.789***	5.917+++ 5.736+++	5.365 5.227*	5.978+ 5.818
CF / Assets	0.023 0.068	0.051+++ 0.057***	0.043+++ 0.054***	0.033+++ 0.057***	0.044+++ 0.044***	0.061+++ 0.061	0.051+++ 0.059**
NWC / Assets	0.066 0.053	0.023*** 0.020***	0.022*** 0.020***	0.006*** -0.005***	0.001*** 0.012***	0.025*** 0.022***	0.021*** 0.021**
Capex	0.056 0.036	0.059 0.040+++	0.058 0.039+	0.053*** 0.034***	0.035*** 0.025***	0.062+ 0.043++	0.057 0.041++
Leverage	0.220 0.176	0.238++ 0.223+++	0.246++ 0.233+++	0.188*** 0.159***	0.231+++ 0.202+++	0.231 0.214++	0.259++ 0.252+++
RD / Sales	0.213 0.003	0.014*** 0.001***	0.022*** 0.001***	0.034*** 0.000***	0.017*** 0.004+++	0.003*** 0.000	0.016*** 0.001***
Dividend Payer	0.281 0.000	0.393+++ 0.289+++	0.432+++ 0.333+++	0.604+++ 1.000+++	0.843+++ 1.000	0.309 0.158+	0.419+++ 0.167
Acquisitions	0.026 0.000	0.009*** 0.000	0.013*** 0.000	0.013*** 0.000+++	0.000*** 0.000+++	0.005*** 0.000	0.012*** 0.000
Debt Issuances	0.008 0.000	0.013+++ 0.001+	0.014+++ 0.001	0.012+++ 0.000+++	0.001*** 0.000+++	0.012+ 0.001	0.016+++ 0.003
Equity Issuances	0.050 0.002	0.019*** 0.000***	0.022*** 0.000***	0.040*** 0.000***	0.000*** 0.000***	0.014*** 0.000	0.014*** 0.000***
Ind Vol	0.114 0.109	0.059*** 0.050***	0.060*** 0.052***	0.065*** 0.056***	0.053*** 0.048***	0.057*** 0.048***	0.057*** 0.050***

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Table 5: Cash/Assets Cross-Section Regressions

The dependent variable is cash/assets [che/at]. Mkt/Book [((at-ceq)+(csho*prcc_f))/at] is the market to book ratio of assets; Size [log(at/cpi)] is the logarithm of real assets, deflated to 2000 dollars using the CPI; CF/Assets [((oibdp-xint-txt-dvc)/at)] is cash flow to assets; NWC/Assets [(wcap-che)/at] is non-cash net working capital to assets; Capex [capx/at] is capital expenditures to assets; Leverage [(dltt+dlc)/at] is short- and long-term debt to assets; RD/Sales [xrd/sale] is R&D expense to sales; Dividend Payer is an indicator if the firm paid common dividends [dvc] in the year; Acquisitions [aqc/at] is acquisitions to assets; Debt Issuances [(dltis-dltr)/at] is net debt issuance to assets; Equity Issuance [(sstk-prstkc)/at] is net equity issuance to assets; Ind Vol is the mean, by 2 digit SIC code, of firm standard deviation of CF/Assets for the prior 10 years. A minimum of 3 years is required to calculate firm volatility. Country indicator variables (Country FE) are indicators representing individual countries and are not reported here. Regressions are run by year (or year window). *, **, *** indicate significance at the 10, 5, and 1% levels, respectively using standard errors clustered at the firm level. Robust standard errors are used (clustered at the country level).

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Ind. Vol	0.526***	0.394***	0.498***	0.521***	0.616***	0.543***	0.532***	0.449***	0.434***	0.406***	0.444***	0.349***	0.388***
Mkt/Book	0.017***	0.019***	0.017***	0.025***	0.020***	0.026***	0.028***	0.028***	0.024***	0.020***	0.021***	0.026***	0.021***
Size	-0.006***	-0.005***	-0.005***	-0.005***	-0.006***	-0.006***	-0.006***	-0.007***	-0.008***	-0.008***	-0.008***	-0.007***	-0.006***
CF/Assets	-0.065**	-0.048*	-0.080***	-0.128***	-0.088***	-0.006	0.012	-0.036*	-0.024*	-0.033**	-0.018	0.008	0.048**
NWC/Assets	-0.194***	-0.163***	-0.160***	-0.146***	-0.164***	-0.163***	-0.165***	-0.159***	-0.164***	-0.158***	-0.141***	-0.136***	-0.143***
Capex	-0.336***	-0.356***	-0.257***	-0.260***	-0.364***	-0.419***	-0.388***	-0.333***	-0.356***	-0.308***	-0.248***	-0.339***	-0.353***
Leverage	-0.291***	-0.272***	-0.284***	-0.303***	-0.324***	-0.310***	-0.296***	-0.284***	-0.294***	-0.292***	-0.277***	-0.295***	-0.286***
RD/Sales	0.048***	0.037***	0.036***	0.059***	0.065***	0.057***	0.055***	0.058***	0.054***	0.054***	0.062***	0.060***	0.054***
Dividend Payer	-0.017	-0.008	-0.011	-0.015	-0.016	-0.009	-0.003	-0.006	-0.005	-0.006	-0.006	-0.001	-0.003
Acquisitions	-0.319***	-0.350***	-0.345***	-0.224***	-0.335***	-0.371***	-0.376***	-0.367***	-0.455***	-0.386***	-0.286***	-0.337***	-0.399***
Debt Issuances	0.153***	0.142***	0.156**	0.120***	0.168***	0.224***	0.218***	0.144***	0.216***	0.203***	0.099***	0.192***	0.195***
Equity Issuances	0.122***	0.201***	0.197***	0.014	0.024	0.096***	0.096***	0.080***	0.165***	0.169***	0.057	0.088***	0.165***
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.4312	0.5006	0.4922	0.4600	0.4217	0.4379	0.4354	0.4196	0.4268	0.4151	0.3632	0.3783	0.3795
N	9,943	10,868	11,354	11,718	12,276	13,446	14,423	15,264	16,633	17,154	16,690	17,221	17,735

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Table 6: Estimated Coefficients on Country Indicator Variables in Cross-Section Regressions

The indicator variables are from regressions of Cash/assets on Mkt/Book, NWC/Assets, Capex, Leverage, RD/Sales, Dividend Payer, Acquisitions, Debt Issuance, Equity Issuance, Ind Vol, and country indicator variables, where Cash/Assets [che/at] is cash to assets; Mkt/Book [((at-ceq)+(csho*prcc_f))/at] is the market to book ratio of assets; Size [log(at/cpi)] is the logarithm of real assets, deflated to 2000 dollars using the CPI; CF/Assets [((oibdp-xint-txt-dvc)/at)] is cash flow to assets; NWC/Assets [(wcap-che)/at] is non-cash net working capital to assets; Capex [capx/at] is capital expenditures to assets; Leverage [(dltt+dlc)/at] is short- and long-term debt to assets; RD/Sales [xrd/sale] is R&D expense to sales; Dividend Payer is an indicator if the firm paid common dividends [dvc] in the year; Acquisitions [aqc/at] is acquisitions to assets; Debt Issuances [(dltis-dltr)/at] is net debt issuance to assets; Equity Issuance [(sstk-prstkc)/at] is net equity issuance to assets; Ind Vol is the mean, by 2 digit SIC code, of firm standard deviation of CF/Assets for the prior 10 years. A minimum of 3 years are required to calculate firm volatility. Country indicator variables are indicators representing individual countries. Regressions are run by year (or year window). Advanced is whether the country is defined as advanced by the International Monetary Fund (but without the UK and Japan as they are shown separately) and Developing are all countries in the sample that are not designated as advanced. Euro specifies those countries that are identified as in the Eurozone by the IMF. *, **, *** indicate significance at the 10, 5, and 1% levels, respectively, using the cross-sectional standard error of the coefficients. Numbers below the coefficient shows the percentage of country indicator variables which are greater than the US coefficient (no percentages are shown for UK or Japan as they are the only country in their respective regressions). ^, ^^, ^^^, indicate significant differences from 50% using a binomial test. Robust standard errors are used (clustered at the country level).

Panel A: Unbalanced Panel

	All	Advanced ex. UK and Japan	UK	Japan	Developing	Euro
1998	-0.0049 44%	0.0033 50%	-0.025**	0.063***	-0.0214** 32%	0.0038 58%
1999	-0.0108** 38%	-0.0023 38%	-0.031**	0.053**	-0.0233*** 26%^	-0.0025 42%
2000	-0.0068 47%	-0.0025 50%	-0.039*	0.047***	-0.0184* 32%	-0.009 42%
2001	-0.002 56%	-0.0011 50%	-0.019	0.036**	-0.0135 47%	-0.0095 33%
2002	-0.0116** 38%	-0.011* 38%	-0.022	0.023**	-0.0225** 26%^	-0.0158** 17%^^
2003	-0.0111** 40%	-0.0055 46%	-0.035	0.015	-0.0305*** 16%^^^	-0.0161** 25%
2004	-0.0138** 38%	-0.0092* 42%	-0.042	0.019	-0.03*** 21%^^	-0.0211** 8%^^^
2005	-0.0186*** 33%^^	-0.0122** 38%	-0.044	0.013	-0.0313*** 26%^	-0.0214*** 8%^^^
2006	-0.0245*** 22%^^^	-0.0233*** 21%^^^	-0.045	0.013	-0.0307*** 21%^^	-0.034*** 0%^^^
2007	-0.0269*** 24%^^^	-0.0242*** 21%^^^	-0.051	0.019	-0.0314*** 16%^^^	-0.0308*** 8%^^^
2008	-0.0192*** 27%^^^	-0.0174** 25%^^	-0.039**	0.034*	-0.0216** 21%^^	-0.0186*** 17%^^
2009	-0.0321*** 20%^^^	-0.0234*** 25%^^	-0.060*	0.032	-0.0461*** 11%^^^	-0.0301*** 8%^^^
2010	-0.0311*** 20%^^^	-0.022*** 21%^^^	-0.064*	0.041	-0.0413*** 11%^^^	-0.0264*** 8%^^^

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Panel B: Sub-Period Coefficients on Country Indicator Variables in Cross-sectional regressions

Sub-period	All	Advanced ex. UK and Japan	UK	Japan	Developing	Euro
1998-2000	-0.0101* 42%	-0.0026 46%	-0.033***	0.050**	-0.0225** 32%	-0.0047 58%
2004-2006	-0.0194*** 29%^^^	-0.0149** 33%	-0.044	0.015	-0.0307*** 21%^^	-0.0252*** 8%^^^
2009-2010	-0.0319*** 18%^^^	-0.0227*** 25%^^	-0.062*	0.037	-0.0439*** 11%^^^	-0.0279*** 8%^^^

Panel C: Differences in Mean Coefficients

98-00 v 04-06	-0.0093	-0.0123	-0.0114	-0.0351	-0.0082	-0.0205*
98-00 v 09-10	-0.0218***	-0.0201**	-0.0288	-0.0135	-0.0214*	-0.0232**
04-06 v 09-10	-0.0125*	-0.0078	-0.0174*	0.0216*	-0.0133	-0.0027

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Table 7: Country Characteristics and Changes in Cash Holding

Examination of the country indicator variables from the regressions of Table 6. For the country characteristics that vary though time, the assignment of a country to a type is made the year before the start of each period we consider. Common and Civil Law is the legal tradition of the country and comes from La Porta, Lopes de Silanes, Shleifer and Vishny (1998), Advanced is whether the country is defined as advanced by the International Monetary Fund and Developing are all countries in the sample that are not designated as advanced. Euro specifies those countries that are identified as in the Euro zone by the IMF. Country development data comes from the World Bank's, World Development Indicators. Low (High) means below (above) the median for all countries in that time window. GDP growth is the growth in GDP per capita. Credit/GDP is domestic credit available to private sector divided by GDP, Stock Market /GDP is the total stock market capitalization divided by GDP, (Stock+Credit)/GDP is the stock market capitalization plus domestic credit to private sector to GDP, Stock/Credit is the stock market capitalization to GDP divided by domestic credit to private sector to GDP. Tax rate is top corporate marginal rate as reported by PwC. The identification of tax systems as worldwide or territorial is taken from Markle (2010). Our identification of tax havens is taken from the Organization for Economic Cooperation and Development (OECD). Only two countries in our sample are classified as tax havens, Bermuda and the Cayman Islands. *, **, *** indicate that the mean of the coefficients is significantly different from zero (i.e. from the US) at the 10, 5, and 1% levels, respectively.

	Mean 1998-2000	**Mean 2004-2006**	**Mean 2009-2010**	**Changes 98-00 v 04-06**	**Changes 98-00 v 09-10**	**Changes 04-06 v 09-10**
Legal Origin						
Civil Law	-0.0078	-0.0250***	-0.0380***	-0.0172**	-0.0301***	-0.0130*
Common Law	-0.0146**	-0.0082	-0.0197*	0.0064	-0.0050	-0.0114
Differences	-0.0068	0.0167	0.0183	0.0236***	0.0251***	0.0016
Economic Development (Advanced includes UK and Japan)						
Developing	-0.0187**	-0.0271***	-0.0429***	-0.0083	-0.0241**	-0.0158
Advanced	-0.0025	-0.0127**	-0.0222***	-0.0101	-0.0197**	-0.0095
Differences	0.0162	0.0144	0.0207*	-0.0018	0.0045	0.0063
Economic Growth – Growth in GDP per Capita						
Low GDP Growth	-0.0084	-0.0208***	-0.0346***	-0.0125	-0.0263**	-0.0138
High GDP Growth	-0.0130*	-0.0233***	-0.0340***	-0.0103	-0.0209*	-0.0107
Differences	-0.0047	-0.0024	0.0007	0.0022	0.0053	0.0031
Financial Development – Credit Market Size/GDP						
Low Credit/GDP	-0.0125	-0.0258***	-0.0400***	-0.0133	-0.0275**	-0.0142
High Credit/GDP	-0.0099	-0.0207***	-0.0309***	-0.0109	-0.0211**	-0.0102
Differences	0.0027	0.0051	0.0091	0.0024	0.0064	0.004
Financial Development – Stock Market Size/GDP						
Low Stock Market/GDP	-0.0152*	-0.0292***	-0.0445***	-0.0141	-0.0293**	-0.0153
High Stock Market/GDP	-0.0065	-0.0153**	-0.0246***	-0.0088	-0.0181*	-0.0093
Differences	0.0086	0.0139	0.0199*	0.0053	0.0113	0.006

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Table 7, Cont'd

	Mean 1998-2000	Mean 2004-2006	Mean 2009-2010	Changes 98-00 v 04-06	Changes 98-00 v 09-10	Changes 04-06 v 09-10
Financial Development – Capital Market Size/GDP						
Low (Stock + Credit) / GDP	-0.0107	-0.0295***	-0.0480***	-0.0189*	-0.0373***	-0.0184
High (Stock + Credit) / GDP	-0.0117*	-0.0170**	-0.0230**	-0.0052	-0.0113	-0.006
Differences	-0.0011	0.0126	0.0250**	0.0136	0.0260**	0.0124
Financial Development – Stock Market/Credit Market						
Low Stock / Credit	-0.0119	-0.0236***	-0.0386***	-0.0117	-0.0267**	-0.015
High Stock / Credit	-0.0105	-0.0229***	-0.0323***	-0.0124	-0.0218*	-0.0094
Differences	0.0014	0.0007	0.0063	-0.0007	0.0049	0.0056
Taxes – Average Corporate Marginal Tax Rate						
Low Tax Rate	-0.0051	-0.0116*	-0.0156*	-0.0065	-0.0106	-0.004
High Tax Rate	-0.0149*	-0.0269***	-0.0437***	-0.012	-0.0288***	-0.0168*
Differences	-0.0098	-0.0153	-0.0281**	-0.0055	-0.0183	-0.0128
Taxes – Repatriation System						
Worldwide Tax System	-0.0194**	-0.0274***	-0.0404***	-0.008	-0.0210*	-0.013
Territorial Tax System	-0.0012	-0.0118**	-0.0251***	-0.0106	-0.0239***	-0.0133
Differences	0.0182*	0.0156	0.0153	-0.0026	-0.0029	-0.0003
Taxes – Classification as Tax Haven						
Not Tax Haven	-0.0110**	-0.0223***	-0.0344***	-0.0113	-0.0234***	-0.0122*
Tax Haven	0.0096***	0.0430***	0.0239***	0.0334	0.0143	-0.0191
Differences	0.0206***	0.0653***	0.0583***	0.0447***	0.0377***	-0.007

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Table 8: Examination of Abnormal Cash Holdings

A firm's abnormal cash holding is the difference between the actual cash holding and the predict cash holding from a regression using the period 1998-2000 using all firms and including country indicator variables. Panel A (Panel B) shows the mean of the annual country means of abnormal cash/assets. Advanced are the countries defined as advanced by the International Monetary Fund (but without the UK and Japan as they are shown separately) and Developing are all countries in the sample that are not designated as advanced. Euro specifies those countries that are identified as in the Euro zone by the IMF. For the subgroups All, Advanced excluding UK and Japan, Developing, and Euro, the standard error for the t-test is based on the cross-sectional distribution of country means. For the UK and Japan, the standard error is determined with firm level data. The results in the categories All and Advanced exclude the US. ***, **, ***** ($^{+}$,$^{++}$,$^{+++}$) indicate the mean is significantly smaller (larger) than the US at the 10, 5, and 1% levels, respectively Using a two-tailed t-test.

Panel A: Examination of Abnormal Cash Holdings by Year

	U.S. Firms	All	Advanced ex. UK and Japan	UK	Japan	Developing	Euro
2001	0.0096	0.0012***	-0.0005***	0.0052	-0.0212***	0.0043	-0.0046**
2002	0.0175	0.0005***	-0.0018***	0.0087	-0.0219***	0.0041*	-0.0043***
2003	0.0084	-0.0048***	-0.0040***	0.0018	-0.0273***	-0.0049**	-0.0066***
2004	0.0095	-0.0038***	-0.0036***	-0.0042***	-0.0254***	-0.0029**	-0.0086***
2005	0.0124	-0.0024***	-0.0023***	-0.0017***	-0.0296***	-0.0011**	-0.0088***
2006	0.0100	-0.0051***	-0.0083***	0.0039	-0.0316***	0.0000	-0.0145***
2007	0.0088	-0.0065***	-0.0079***	-0.0030**	-0.0282***	-0.0039*	-0.0144***
2008	0.0219	0.0081***	0.0054***	0.0130	-0.0062***	0.0121*	0.0019***
2009	0.0198	-0.0009***	-0.0005***	-0.0028***	0.0015***	-0.0016***	-0.0042***
2010	0.0173	-0.0025***	-0.0025**	-0.0094***	0.0064***	-0.0027***	-0.0056**

Panel B: Examination of Abnormal Cash Holdings by Sub-Periods

	U.S. Firms	All	Advanced ex. UK and Japan	UK	Japan	Developing	Euro
1998-2000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2004-2006	0.0106	-0.0047***	-0.0015**	-0.0005***	-0.0289***	-0.0013*	-0.0107***
2009-2010	0.0186	-0.0014***	0.0004*	-0.0059***	0.0039***	-0.0024***	-0.0048**

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Table 9: Analysis of Abnormal Cash Holdings by Firm Types

A firm's abnormal cash holding is the difference between the actual cash holding and the predicted cash holding from a regression estimated using the period 1998-2000 using all firms and country indicator variables. The assignment of a firm to a type is made the year before the start of each period. Large firm is set to one if the firm's assets are above the top quintile of assets for all NYSE firms. Young firms are those which have been public for five or fewer years, while Old firms are those which have been public for 20 years or more. Top means in the 4th quartile. Bottom means in the 1st quartile. Top quartile CF/Asset (Capex/Asset) means the firm is in the top quartile of all firms for that year and compared only to firms in the bottom quartile of cash flow (capex). The GIM index is as constructed in Gompers, Ishii, and Metrick (2003). High tech means that firms are in the high tech category based on the Fama-French 10 industry definitions. Top quartile RD means the firm is in the top quartile of RD/sales in a given year and is compared to firms which conduct no R&D. Multinational means that the firm reported foreign income in any of the years t-3 to t-1. Important MNC means that the firm is in the top half of abs(foreign income)/sales for all MNCs. Financially constrained firms are those in the top 7% of the Hadlock and Pierce (2010) Size-Age index in a given year. Firms are equity dependent if they are in the top quartile, within country, of equity issues to assets over the prior three year period. Had Debt is an indicator if the firm had any long-term debt in the prior three years. Firms are Affected by SOX if they met three or fewer of ten provisions of Sarbanes-Oxley as measured by Institutional Shareholder Services. Alternatively, firms are Affected by SOX if their cumulative abnormal returns are in the bottom quartile of CARs Using the Litvak (2007) dates which are dates relevant to the passage and implementation of the SOX provisions. In Panel B, US (Foreign) indicates that the firm is incorporated inside (outside) the United States. *, **, *** indicate that the mean excess cash (or differences between the groups) is significantly different from zero at the 10, 5, and 1% levels, respectively.

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Panel A: Analysis of Abnormal Cash Holdings in the U.S. by Firm Types

	Mean 1998-2000	Mean 2004-2006	Mean 2009-2010	Changes 98-00 v 04-06	Changes 98-00 v 09-10	Changes 04-06 v 09-10
	Quartile of cash flow/assets					
Top	0.005**	0.004	0.026***	-0.001	0.021***	0.022***
Bottom	0.028***	0.046***	0.045***	0.018***	0.017***	-0.0010
Differences	-0.023***	-0.041***	-0.018***	-0.019***	0.005	0.023***
Quartile of capital expenditures/assets						
Top	-0.002	-0.006**	-0.003	-0.004	-0.001	0.0030
Bottom	0.020***	0.038***	0.042***	0.018***	0.023***	0.0040
Differences	-0.022***	-0.044***	-0.046***	-0.022***	-0.024***	-0.0020
Quartile of capital expenditures/assets for top quartile cash flow firms						
Top	-0.011***	-0.017***	0.001	-0.006	0.012*	0.018***
Bottom	0.049***	0.047***	0.051***	-0.003	0.001	0.0040
Differences	-0.061***	-0.064***	-0.050***	-0.003	0.010	0.0130
Quartile of GIM Index						
Top	-0.041***	-0.018***	-0.002	0.022***	0.038***	0.016***
Bottom	-0.012***	0.040***	0.040***	0.052***	0.052***	0.0010
Differences	-0.028***	-0.058***	-0.042***	-0.030***	-0.014	0.016*
Quartile of R&D Expenditures						
Top	0.062***	0.103***	0.102***	0.041***	0.040***	-0.0010
Bottom	-0.012***	-0.016***	-0.005**	-0.004	0.007***	0.011***
Differences	0.075***	0.120***	0.107***	0.045***	0.032***	-0.012*
Multinational or domestic firms						
Multinational	0.002	0.030***	0.034***	0.028***	0.032***	0.0040
Domestic	0.001	-0.004	-0.002	-0.005*	-0.004	0.0010
Differences	0.001	0.034***	0.036***	0.033***	0.036***	0.0020

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	Mean 1998-2000	Mean 2004-2006	Mean 2009-2010	Changes 98-00 v 04-06	Changes 98-00 v 09-10	Changes 04-06 v 09-10
Multinational or domestic firms for top quartile RD/Sales firms						
Multinational	0.054***	0.117***	0.109***	0.063***	0.055***	-0.0080
Domestic	0.065***	0.072***	0.074***	0.007	0.008	0.0020
Differences	-0.011	0.045***	0.035***	0.056***	0.047***	-0.0100
Financial Constraint - classified as being in the top 7% of SA Index						
Constrained	-0.036***	-0.026***	-0.023**	0.010	0.013	0.0030
Unconstrained	0.000	0.014***	0.022***	0.014***	0.022***	0.008***
Differences	-0.035***	-0.040***	-0.045***	-0.005	-0.010	-0.0050
Equity Dependence						
Dependent	0.022***	0.024***	0.022***	0.002	0.000	-0.0020
Independent	-0.011***	0.007***	0.019***	0.019***	0.030***	0.011***
Differences	0.033***	0.016***	0.003	-0.017***	-0.030***	-0.013**
Firms split on long-term debt over the prior 3 years						
Had Debt	-0.010***	-0.001	0.006***	0.009***	0.016***	0.007***
No Debt	0.071***	0.093***	0.090***	0.022***	0.019**	-0.0030
Differences	-0.081***	-0.094***	-0.083***	-0.013*	-0.003	0.0100
Utilities vs. industrials						
Utilities	-0.035***	-0.040***	-0.040***	-0.005	-0.005	0.0000
Industrials	0.000	0.011***	0.019***	0.011***	0.019***	0.008***
Differences	-0.035***	-0.051***	-0.059***	-0.016***	-0.024***	-0.0080
Affected by SOX – 3 or less measures in place of the Reg 10						
Affected	0.003	0.018***	0.029***	0.015***	0.026***	0.011*
Unaffected	0.000	0.010***	0.017***	0.010***	0.018***	0.008***
Differences	0.003	0.008*	0.012**	0.005	0.008	0.0040
Affected by SOX – Lowest quartile of stock returns using Litvak dates						
Affected	0.011***	0.031***	0.046***	0.020***	0.034***	0.015**
Unaffected	-0.005***	0.009***	0.014***	0.014***	0.019***	0.0050
Differences	0.016***	0.022***	0.032***	0.006	0.016**	0.0100

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Panel B – Analysis of Abnormal Cash Holdings by Firm Types - U.S. Firms vs. Foreign Firms

	Mean 1998-2000	Mean 2004-2006	Mean 2009-2010	Changes 98-00 v 04-06	Changes 98-00 v 09-10	Changes 04-06 v 09-10
	Large Firms – Top quintile of assets based on NYSE firms					
U.S.	-0.056***	-0.022***	-0.019***	0.034***	0.037***	0.0030
Foreign	0.0020	-0.015***	-0.0030	-0.017***	-0.0050	0.012***
Differences	-0.058***	-0.0080	-0.017***	0.051***	0.042***	-0.0090
	High Tech classification based on Fama-French 10 industries					
U.S.	0.040***	0.061***	0.071***	0.021***	0.031***	0.010*
Foreign	0.017***	0.025***	0.036***	0.008***	0.019***	0.011***
Differences	0.023***	0.035***	0.035***	0.013**	0.012*	-0.0010
	Multinationals					
U.S.	0.002	0.030***	0.034***	0.028***	0.032***	0.0040
Foreign	0.012***	0.006***	0.015***	-0.006***	0.003	0.009***
Differences	-0.010***	0.024***	0.019***	0.034***	0.029***	-0.0050
	Top Quartile of cash flow/assets					
U.S.	0.005**	0.0040	0.026***	-0.0010	0.021***	0.022***
Foreign	0.0020	0.018***	0.022***	0.016***	0.020***	0.0030
Differences	0.0030	-0.014***	0.0050	-0.017***	0.0010	0.019***
	Top Quartile of capital expenditures/assets					
U.S.	-0.0020	-0.006**	-0.0030	-0.0040	-0.0010	0.0030
Foreign	-0.006***	-0.009***	-0.003**	-0.004**	0.003**	0.007***
Differences	0.0040	0.0040	-0.0010	0.0000	-0.0050	-0.0040
	Quartile of Capital Expenditures/Assets, top quartile of cash flow/assets					
Top	-0.011***	-0.017***	0.0010	-0.0060	0.012*	0.018***
Bottom	-0.006***	0.005**	0.008***	0.011***	0.014***	0.0030
Differences	-0.0050	-0.022***	-0.0070	-0.017***	-0.0020	0.014**
	Top Quartile RD/Sales					
U.S.	0.062***	0.103***	0.102***	0.041***	0.040***	-0.0010
Foreign	0.063***	0.083***	0.060***	0.020***	-0.0030	-0.023***
Differences	0.0000	0.020***	0.042***	0.020**	0.043***	0.022***
	Equity dependence					
U.S.	0.022***	0.024***	0.022***	0.0020	0.0000	-0.0020
Foreign	0.0000	-0.006***	-0.0030	-0.005**	-0.0030	0.0030
Differences	0.022***	0.029***	0.025***	0.0070	0.0030	-0.0040
	Firms which have long-term debt in the past 3 years					
U.S.	-0.010***	-0.0010	0.006***	0.009***	0.016***	0.007***
Foreign	0.003***	-0.016***	-0.001*	-0.019***	-0.004***	0.015***
Differences	-0.012***	0.015***	0.008***	0.027***	0.020***	-0.007***

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Table 10: Cash Holdings of Multinational Firms

Panels A and C show abnormal cash/asset ratios. The abnormal cash/asset ratio is the difference between the actual cash/assets ratio and the predicted cash/assets ratio from a regression estimated for the period 1998-2000 using all firms and country dummy variables. The assignment of a firm to a type in Panels A and B is made the year before the start of each period. In Panel B, the dependent variable is excess cash which is the residual from regressions estimated from 1998-2000 Using all firms and country dummy variables. Pre MNC is an indicator set to 1 in the years before a firm is classified as a multinational company. Year of MNC is an indicator set to 1 in the year when a firm first is classified as a multinational company. Post MNC is an indicator set to 1 in the years after a firm is classified as a multinational company. The regressions indicate whether they include yearly dummy variables and firm fixed effects. p-values based on robust standard errors are reported in brackets. . *, **, *** indicate that the mean excess cash (or the difference between the US and Foreign firms) is significantly different from zero at the 10, 5, and 1% levels, respectively, using a t-test.

Panel A: Abnormal Cash Holdings for Multinational Firm Types

	Mean 1998-2000	**Mean 2004-2006**	**Mean 2009-2010**	**Changes 98-00 v 04-06**	**Changes 98-00 v 09-10**	**Changes 04-06 v 09-10**
U.S. multinationals: By quartile of cash flow						
Top	0.004	0.030***	0.034***	0.026***	0.030***	0.0040
Bottom	0.034***	0.059***	0.060***	0.024**	0.025**	0.0010
Differences	-0.030***	-0.029***	-0.026***	0.001	0.004	0.0030
U.S. firms in top quartile of cash flow/assets: By MNC						
MNC	0.004	0.030***	0.034***	0.026***	0.030***	0.0040
Domestic	0.008**	-0.015***	0.005	-0.024***	-0.003	0.020***
Differences	-0.004	0.045***	0.029***	0.049***	0.033***	-0.0160
Multinationals in top quartile of research and development expenses/sales						
US	0.054***	0.117***	0.109***	0.063***	0.055***	-0.0080
Foreign	0.054***	0.082***	0.050***	0.028***	-0.004	-0.033***
Differences	0.000	0.035***	0.060***	0.035***	0.059***	0.024**
Zero R&D: Multinational or domestic firm						
Multinational	-0.008	-0.009**	0.004	-0.001	0.011*	0.012**
Domestic	-0.014***	-0.021***	-0.017***	-0.007**	-0.003	0.0040
Differences	0.006	0.012**	0.020***	0.006	0.014*	0.0090
Multinational status in 1998						
Multinational	0.000	0.021***	0.026***	0.022***	0.027***	0.0050
Domestic	0.002	0.006***	0.011***	0.004	0.009**	0.0050
Differences	-0.003	0.015***	0.015***	0.018***	0.018***	0.0000

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Panel B: Cash Holdings as Firms Become Multinational

	(1)	(2)
Dependent variable	Abnormal Cash	Abnormal Cash
Multinational	0.024*** (6.51)	0.002 (0.23)
Year fixed effects	Yes	Yes
Firm fixed effects	No	Yes
Adjusted R^2	0.0094	0.0098
N	30,149	30,149

Panel C: U.S. Tax Holiday Event Study

	2003	**2004**	**2005**	**2006**	**2003 v 2006**
U.S. Firms only					
Multinational	0.025***	0.028***	0.032***	0.029***	0.004
Domestic	-0.005	-0.008*	-0.004	-0.005	0.000
Differences	0.025***	0.028***	0.032***	0.029***	0.004
Multinationals only					
U.S.	0.025***	0.028***	0.032***	0.029***	0.004
Foreign	0.008***	0.009***	0.006***	0.002	-0.005**
Differences	0.017***	0.020***	0.026***	0.027***	0.009

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Figure 1
U.S. Cash Holdings 1950-2010

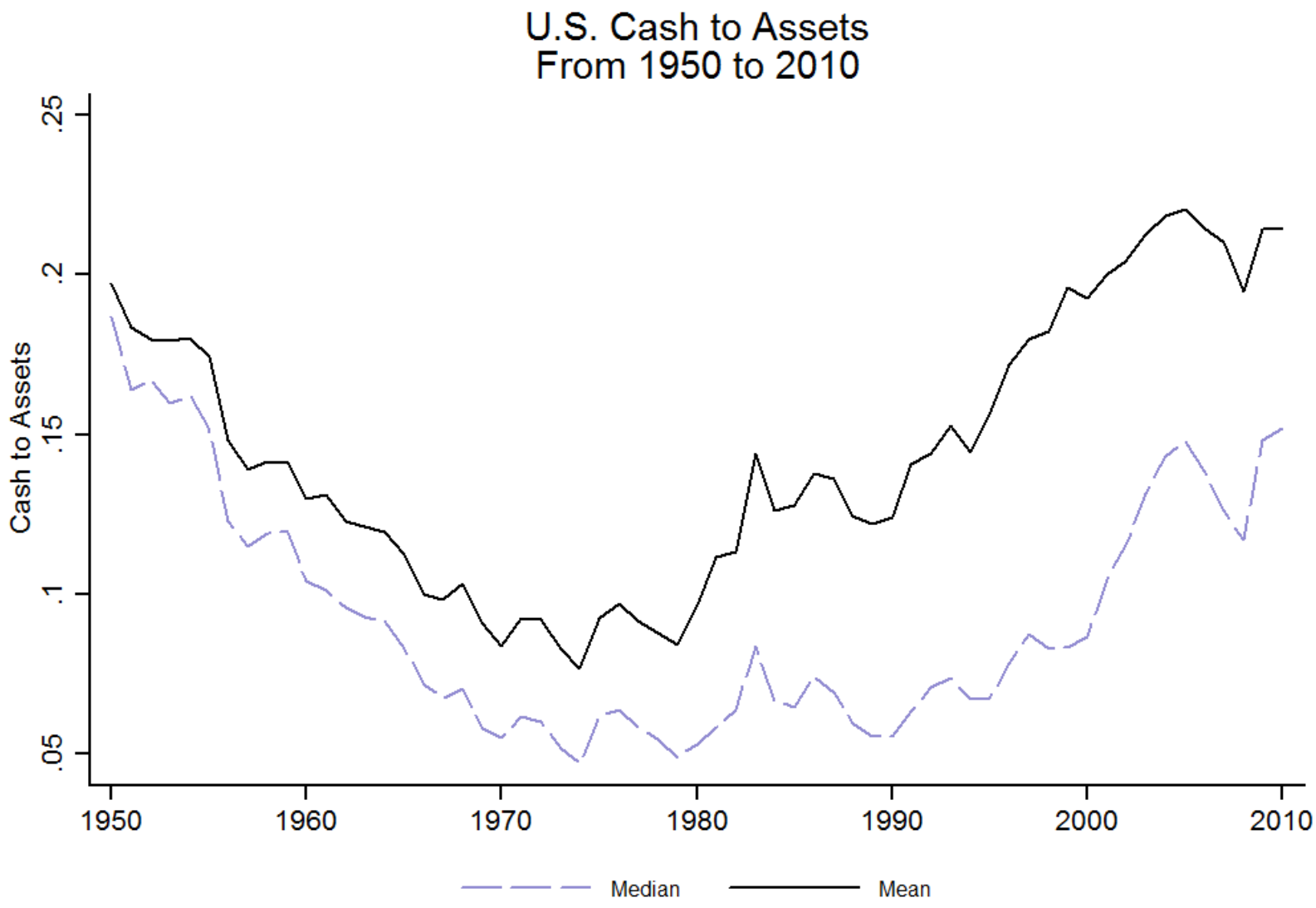

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Figure 2: Cash Gini Coefficients

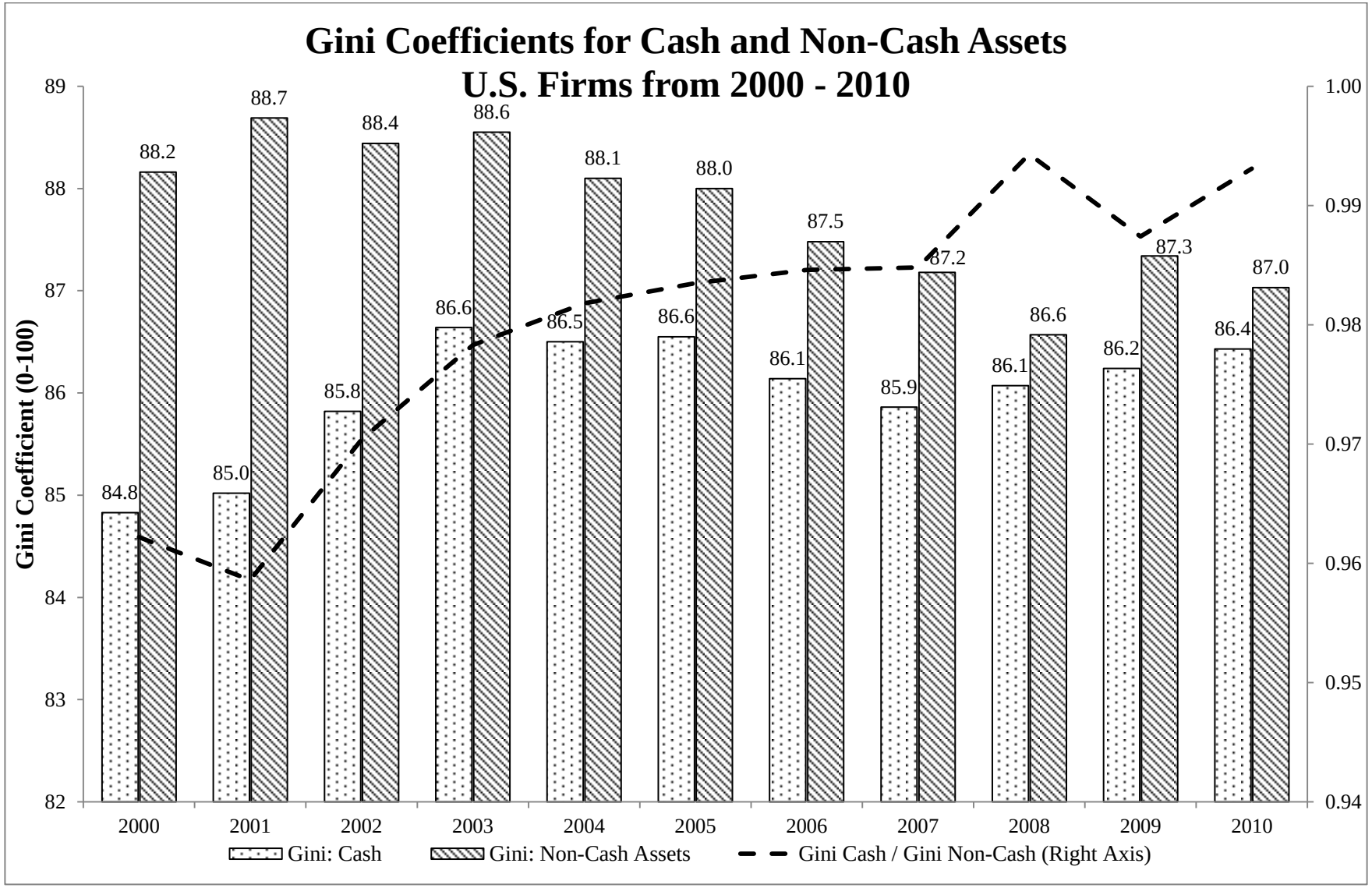

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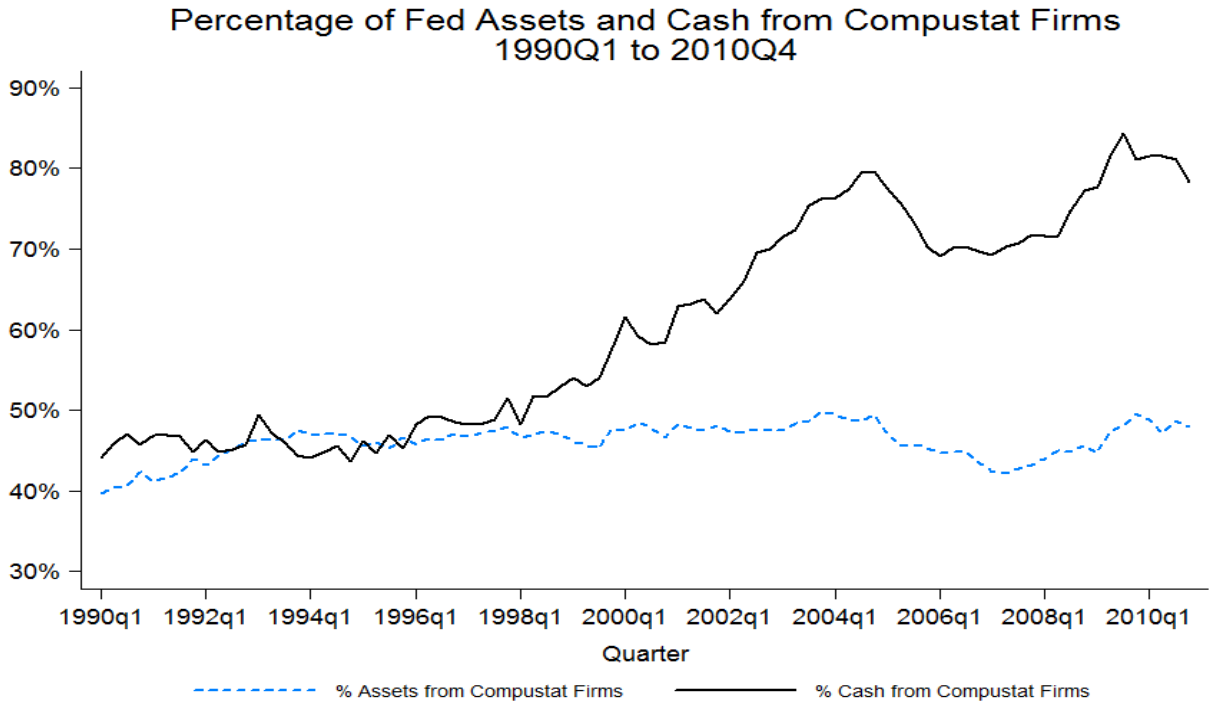
Figure 3

Public firms (Compustat) and private firms (Federal Reserve Flow of Funds data – Compustat). Only corporations (nonfarm nonfinancial corporate businesses) are included from the Federal Reserve Flow of Funds data .



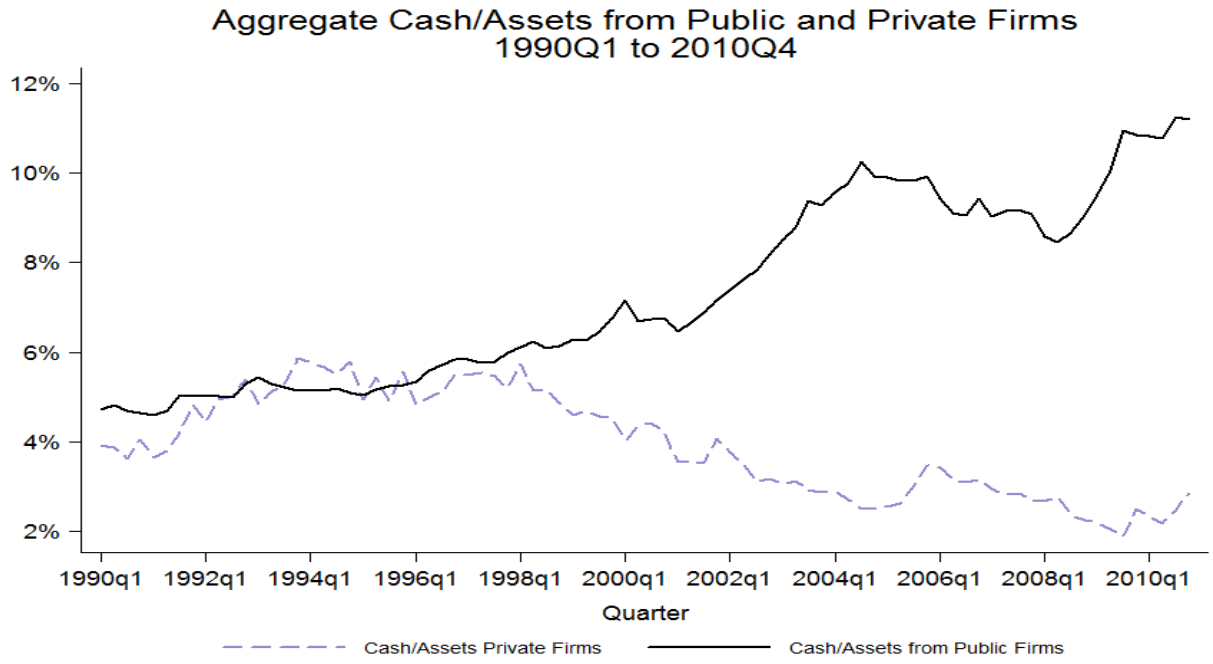


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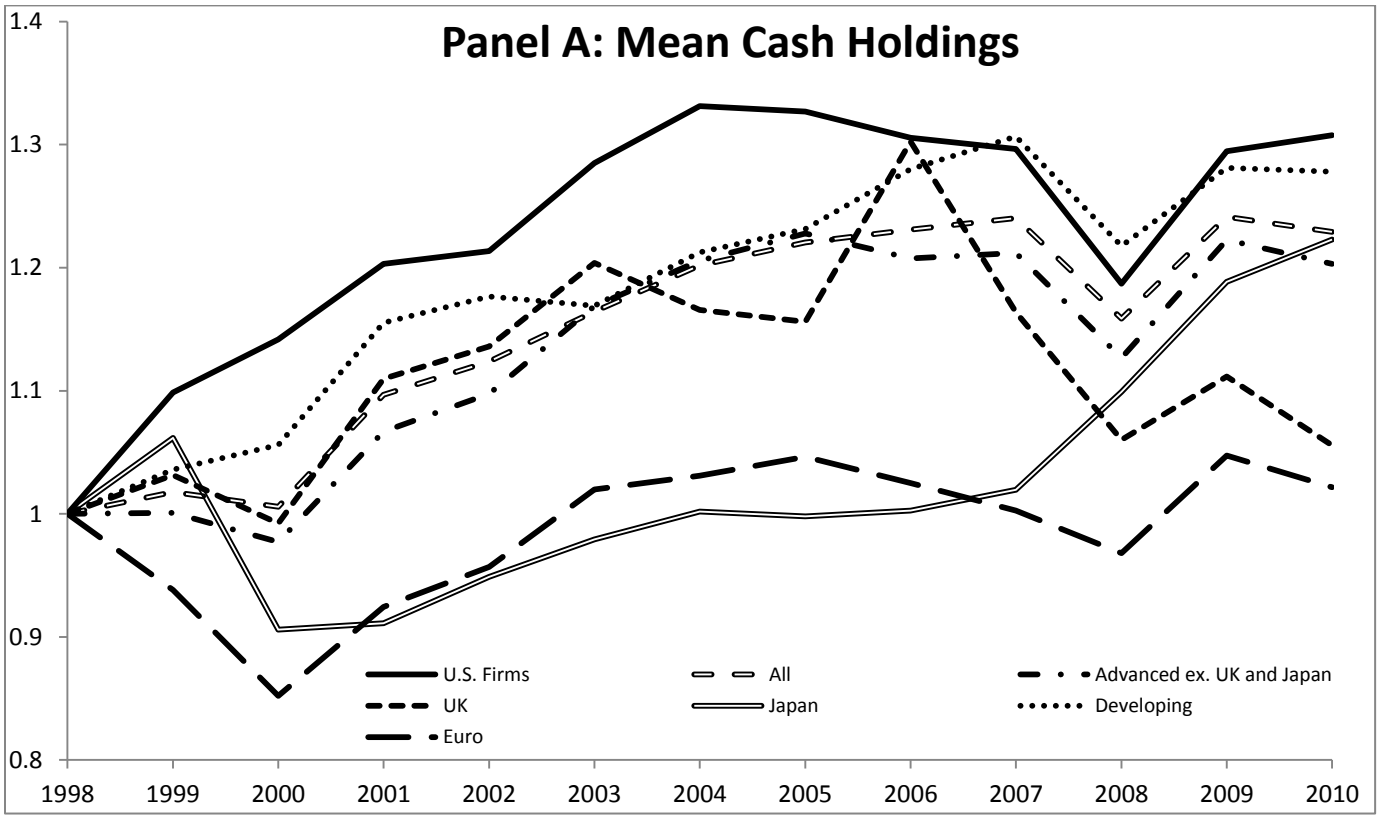
Figure 4. Mean and median cash holdings for countries across the world .



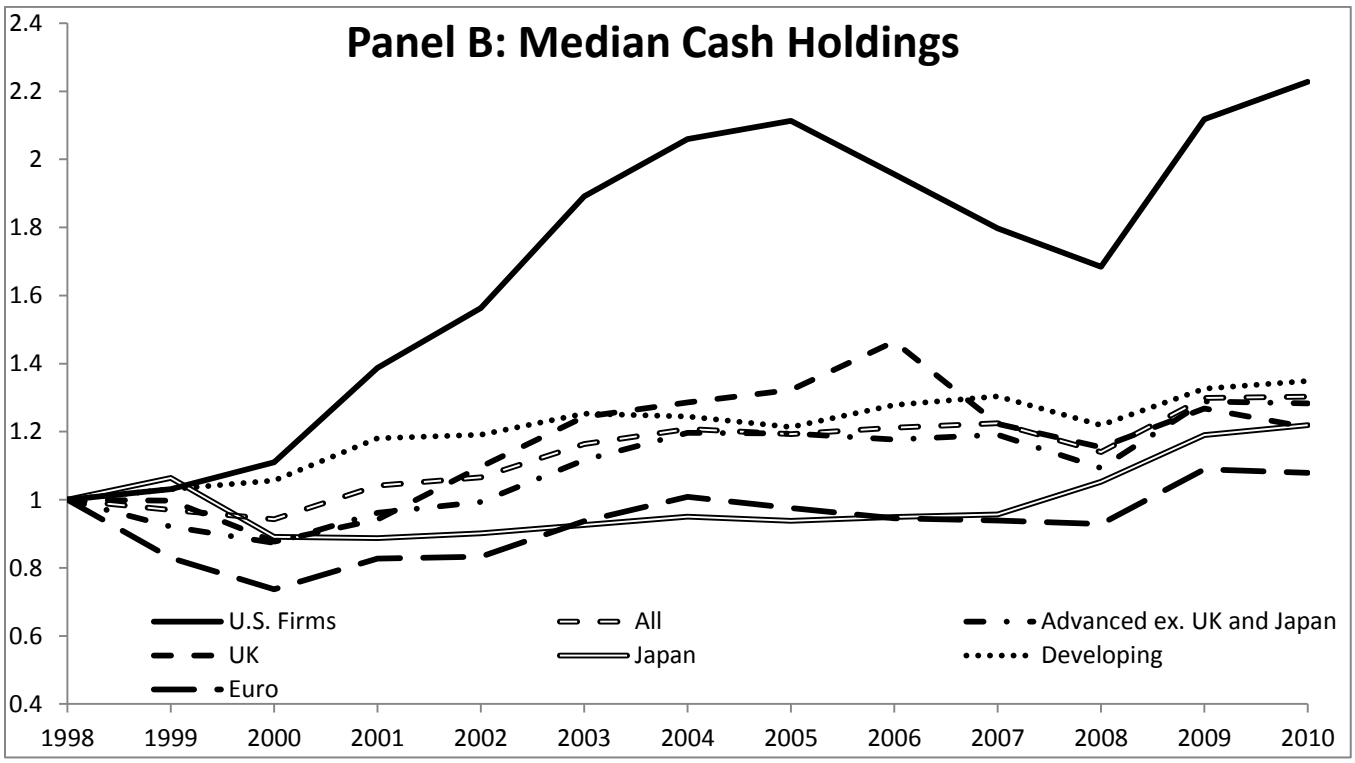


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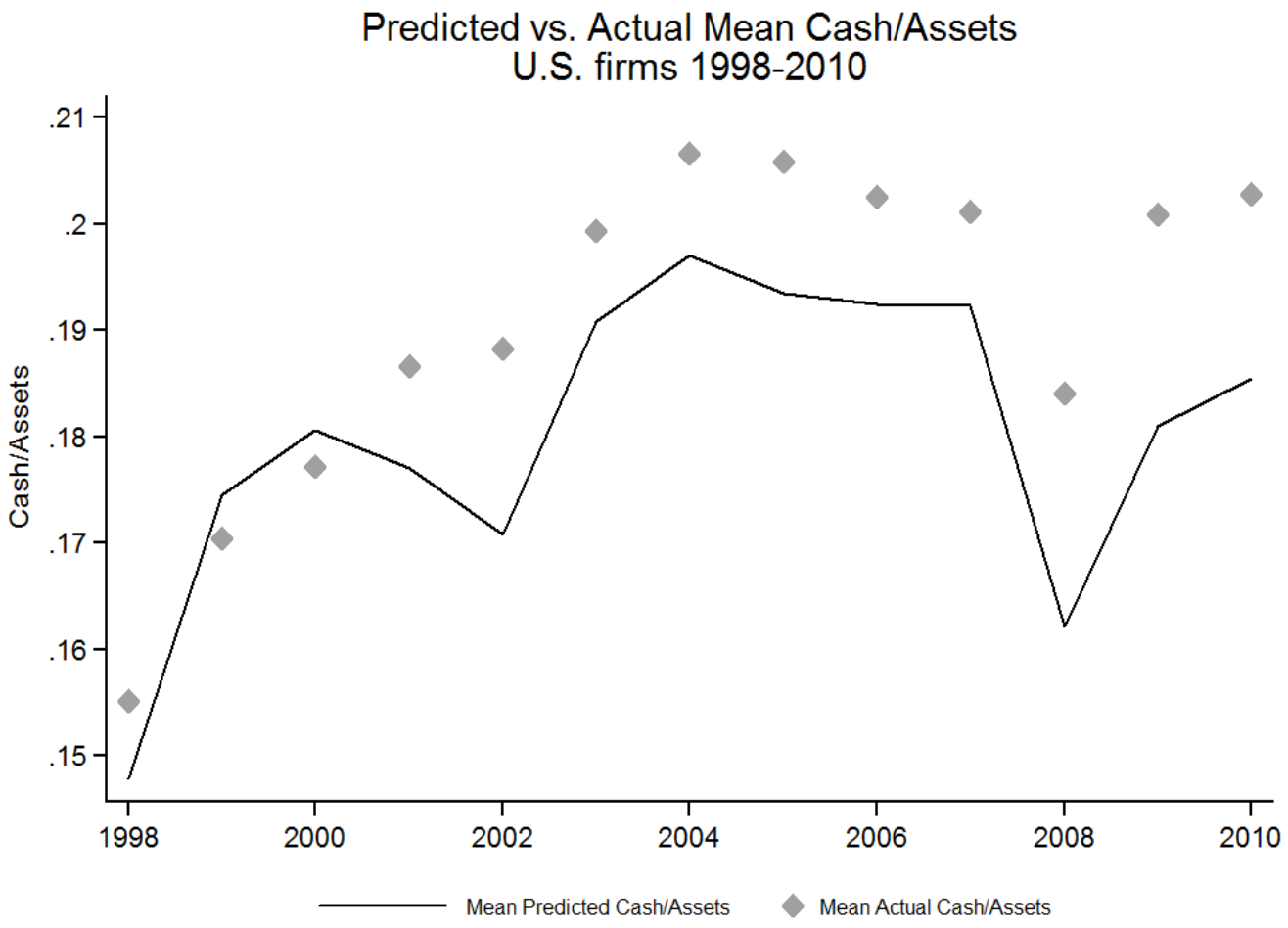
Figure 5: Predicted versus Actual Mean Cash/Asset Ratios



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Data Appendix

To assess holdings of cash by private firms, we use aggregate data from the flow of funds accounts and subtract from it the holdings by the Compustat firms. We Use the data collected from the Federal Reserve flow of funds accounts release Z.1. We Use the data from B.102 "Balance Sheet of Nonfarm Nonfinancial Corporate Business," data items and line numbers are shown in the Data Appendix. We collect total assets (1) and determine cash and marketable securities as the sum of Foreign Deposits (7), Checkable deposits and currency (8), Time and savings deposits (9), Money market fund shares (10), Security RPs (11), Commercial Paper (12), Treasury Securities (13), Agency- and GSE-backed securities (14), Municipal securities (15), Mortgages (16), Mutual Fund Shares (19). Total assets (cash) is assumed to be the sum of both Corporate and Noncorporate Businesses.

Unless otherwise indicated, all variables are measured at time t and winsorized at the 1% tails

Variable	Description and calculation *(Compustat data codes are italicized)*
Cash/Assets	Cash to assets: *Che/at* (winsorized at the 5% tail on the high end)
CF	Cash flow to assets *((oibdp-xint-txt-dvc)/at)* winsorized at the 1% tail, lower side only
Ind. Vol	Mean, by 2 digit SIC code, of firm standard deviation of **CF** for the prior 10 years. A minimum of 3 years required to calculate firm volatility.
MB	Market to book of assets : *((at-ceq)+(csho*prcc_f))/at* winsorized at the 1% tail, upper side only
Size	Logarithm of real assets, deflated to 2000 dollars Using the CPI: log*(at/cpi)*
NWC	Non-cash net working capital to assets: *(wcap-che)/at* winsorized at the 1% tail, lower side only
Capx	Capital expenditures to assets: *capx/at*
Leverage	Short- and long-term debt to assets: *(dltt+dlc)/at* winsorized between 0 and 1, inclUSive
RD	R&D expense to sales: *xrd/sale*
Dividends	Indicator set to 1 if firm pays dividends: Set to 1 if *dvc*>0
Acquisitions	Acquisitions to assets: *aqc/at*
Debt Issues	Net debt issuance relative to assets: *(dltis-dltr)/at*
Equity Issues	Net equity issuance relative to assets: *(sstk-prstkc)/at*

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