Is there a U.S high cash holdings puzzle after the financial crisis?

Lee Pinkowitz, René M. Stulz, and Rohan Williamson*

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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 financial crisis amount to 10% of cash holdings, which represents an increase in abnormal cash holdings of 87% from before the crisis. Strikingly, abnormal cash holdings do not increase more for U.S. firms than for firms in advanced countries from before the crisis to after the crisis. The increase in abnormal cash holdings of U.S. firms is concentrated among highly profitable firms. Though abnormal cash holdings of multinational firms increase sharply in the early 2000s, they do not from before the crisis to after and they do not evolve differently over that time from the abnormal cash holdings of foreign multinational firms. Further evidence shows that the tax explanation for the cash holdings of U.S. multinational firms cannot explain these large abnormal holdings. In sum, while the high cash holdings of U.S. firms before the crisis are a U.S. puzzle, the increase in cash holdings of U.S. firms from before the crisis to after is not.

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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 financial crisis amount to 10% of cash holdings, which represents an increase in abnormal cash holdings of 87% from before the crisis. Strikingly, abnormal cash holdings do not increase more for U.S. firms than for firms in advanced countries from before the crisis to after the crisis. The increase in abnormal cash holdings of U.S. firms is concentrated among highly profitable firms. Though abnormal cash holdings of multinational firms increase sharply in the early 2000s, they do not from before the crisis to after and they do not evolve differently over that time from the abnormal cash holdings of foreign multinational firms. Further evidence shows that the tax explanation for the cash holdings of U.S. multinational firms cannot explain these large abnormal holdings. In sum, while the high cash holdings of U.S. firms before the crisis are a U.S. puzzle, the increase in cash holdings of U.S. firms from before the crisis to after is not.

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 a variety of 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.[4] For instance, an article in the New York Times concludes that "the dominant explanation for the increased liquidity of nonfinancial corporations appears to be the growing role of multinational corporations and the profits of their foreign operations."[5]

In this paper, we investigate whether the cash holdings of American companies are abnormally high after the financial crisis compared to before and whether these cash holdings can be explained by the theories summarized in the previous paragraph. Many of these theories apply to U.S. firms only, so that to evaluate them one has to compare the evolution of cash holdings across the world. The simplest approach to evaluate changes in cash holdings is to compare firm-level ratios of cash to assets (cash/assets ratios). The evidence on changes in cash holdings for U.S. firms in general from before the crisis to after the crisis is mixed using cash/assets ratios. 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 21.28% after

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[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] Note that the cash is not literally kept abroad in a lot of cases, but it is kept from the parent company. A foreign subsidiary could keep its cash at a bank in New York, but this cash could not be repatriated to the parent without adverse tax consequences.
[5] "The growing corporate cash hoard," by Bruce Bartlett, The New York Times, February 12, 2013.

the crisis (2009-2010) compared to 21.60% in the pre-crisis period (2004-2006), so that the average cash/assets ratio is not higher after the crisis than before. However, when we consider the median ratio, it is higher by 1.09% after the crisis than in the pre-crisis period. The asset-weighted ratio increases by 0.82%, indicating that large firms increase their cash holdings more over that period. Kahle and Stulz (2013) document that cash holdings follow a u-shape during the crisis, with a sharp increase after the collapse of Lehman and through 2009. Our results show that after that increase firms are close to where they were before the crisis on average. The changes in cash holdings from the pre-crisis period to the post-crisis period are dwarfed by the changes in cash holdings from the late 1990s to before the crisis. Over that earlier period, the average cash/assets ratio increases by 3.84% and the median by 6.26%. Since the late 1990s, cash/assets ratios have increased across the world, but the increase in the median cash/asset ratio in the U.S. is stunning compared to the increase in the rest of the world as it increases by 111% in contrast to only 36% in the rest of the world. However, from before the crisis to after the crisis, cash/assets ratios evolve similarly across the world. Though cash/assets ratios have increased for public firms throughout the 2000s, they have not for private firms.

Cash/assets ratios are of little help in assessing whether 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.[6] 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 the large cash holdings of American firms in recent years. Bates, Kahle, and Stulz (2009) shows that changes in firm characteristics explain much of the increase in cash holdings in the 1980s and 1990s.

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

To evaluate whether changes in 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 explains cash holdings before the 2000s and use that estimated model to predict what normal cash holdings would be in 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 the model. Because we want to compare the evolution of cash holdings of U.S. firms to the evolution of cash holdings of firms in other countries, we use a sample of 45 countries to estimate how much cash firms would have each year from 2000 until 2010 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 find that U.S. cash holdings become abnormal over time. In contrast, foreign firms hold abnormally low cash during much of the 2000s. Though American firms have abnormal cash holdings of 1.93% of assets on average during the post-crisis period relative to the late 1990s, the average abnormal cash holdings of foreign firms are 0.02%. Since abnormal cash holdings of U.S. firms were 1.0% of assets in the pre-crisis period, these holdings increased by 87% from before the crisis to after. However, this increase in abnormal cash holdings of American firms is not significantly different from the increase in abnormal cash holdings of firms in advanced countries over the same period. Consequently, while the cash holdings of U.S. firms increase abnormally from the late 1990s to before the crisis compared to those of foreign firms, the increase in cash holdings of U.S. firms from before the crisis to after the crisis is not abnormal compared to the increase in cash holdings of firms in advanced countries.

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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 using a difference-in-differences approach. We find that the firms that experienced a significant increase in abnormal cash holdings from before the crisis to after the crisis are the most profitable firms. The cash accumulation of the most profitable firms is consistent with the view that they lack good investment opportunities. We find no evidence supportive of other explanations for the increase in cash holdings from before the crisis to after it.

Strikingly, U.S. multinationals experience a large increase in abnormal cash holdings compared to other firms from the late 1990s to before the crisis. In fact, there is no increase in abnormal cash holdings for firms without international activities from the late 1990s to before the crisis, so that the increase in abnormal cash holdings for that period of time is solely due to the cash accumulation of multinationals. 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. Given the prominence given to the theory that U.S. multinationals have large cash holdings because of the tax treatment of foreign profits, we investigate whether this theory explains these high cash holdings. We first show that multinationals do not experience a greater increase in abnormal cash holdings than other U.S. firms or than foreign multinationals from before the crisis to after the crisis. In other words, the increase in cash holdings from before the crisis to after the crisis cannot be explained by cash hoarding by multinationals. Additional findings suggest that the tax costs of repatriation of foreign profits 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

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tax costs 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 firms with high R&D spending, those that were already multinationals before 1998 do not hold more cash now than those that were purely domestic 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 those with attributes that lead them to hold large amounts of cash even before they become multinationals.

The paper proceeds as follows. In Section 1, we show how cash holdings evolved for U.S. public firms, private firms, and foreign firms. In Section 2, we estimate our model of normal cash holdings. In Section 3, we use our benchmark model to show how abnormal cash holdings evolve across countries after the 1990s and test hypotheses about the increase in cash holdings for U.S. firms. We examine why multinationals have such high cash holdings in Section 4. We conclude in Section 5.

Section 1. The evolution of cash holdings.

In this section, we compare the evolution of cash holdings of American public firms since the late 1990s to the evolution of cash holdings of American private firms and of foreign firms over the same period.

Section 1.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 16.17% in 1998 and 21.48% 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 21.72%. 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 median holdings, we see that they increase more than the mean holdings. Further, median holdings are higher after the crisis than in the mid-2000s. The peak median cash/assets ratio before the crisis is 13.38% in 2005, which is 92 basis points less than the peak after the crisis of 14.30%. 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 total assets. The pre-crisis peak in asset-weighted holdings is slightly lower than the post-crisis peak – 11.76% versus 11.90%.

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, which we call the base period. We call the second period, 2004-2006, the pre-crisis period. Finally, the post-crisis period is 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 the pre-crisis period to the post-crisis period has similar patterns to the change in cash holdings from the base period to

the pre-crisis period. 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 and, obviously, after the financial panic of 2008. Not surprisingly, cash holdings are higher in the pre-crisis period and in the post-crisis period than in the base period for all measures.

Much attention has been paid to the extremely large dollar cash holdings of a handful of firms. 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.[7] The cash/assets ratios of these companies are high. However, it is noteworthy that the cash/assets ratio of Apple was 59% in 2006 and 34% in 2010. We explore whether dollar cash holdings have become more concentrated. For that purpose, we compute the Gini coefficients 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.

Section 1.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 and 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"

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[7] 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.

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

Section 1.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 14,222. 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 2,943, but twenty 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 mean (or median) cash/assets ratio 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. While we examine all advanced countries together, we also examine the U.K. and Japan separately. The U.K. 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 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, the U.K., 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.

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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. Panel B of Figure 4 shows the evolution of the medians, again normalizing to 1 for 1998. With the median holdings, the increase is sharply higher for the U.S. compared to foreign countries.

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 U.K., 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.

Section 2. The model of normal cash holdings.

The comparisons presented in Section 1 were comparisons of cash/assets ratios. 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 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

estimate a model of normal cash holdings and then use this model in the next section to show how abnormal cash holdings from that model evolve across countries and firm types.

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. Importantly, there is no indicator variable in the model for multinational corporations and there is no variable capturing the geographic location of profits. Consequently, differential cash holdings of multinational firms that result from their multinational status show up as abnormal cash holdings in the model.

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/assets 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/assets 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 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 U.K. 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

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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. The only noteworthy difference is that cash flow has a positive coefficient in Bates, Kahle, and Stulz (2009), while here it is either significantly negative or insignificant. 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 2002, 2008, and 2009. The regression has more explanatory power early in the sample, but not dramatically so.

Section 3. Evolution and determinants of abnormal cash holdings.

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 the base period 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.[8] 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.

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 base period. In the second part of this section, we investigate which types of U.S. firms experience the greatest increase in abnormal cash holdings. We then compare the abnormal cash holdings of types of U.S. firms to similar foreign firms.

Section 3.a. Evolution of abnormal cash holdings across the world during the 2000s.

In Table 6, we show the estimates of abnormal cash holdings across the world relative to the base period. 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 1.86% for the U.S. in 2002. Abnormal cash holdings fall after 2002, hovering around 1% until 2008 when they reach their peak of 2.44%. 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 1.77% in 2010.

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[8] 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.

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 1.03% in the pre-crisis period, and 1.93% in the post-crisis period.

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 significantly different from zero in only one year, 2008, when they reach 1.39%. These abnormal cash holdings are significantly lower than the U.S. abnormal cash holdings in every year. The same result holds for abnormal cash holdings in advanced countries. We turn next to two advanced countries separately. First, we see that abnormal cash holdings in the U.K. are insignificantly different from U.S. firms in all years but three, namely 2004, 2009, and 2010. The U.K. experiences a very sharp decrease in abnormal cash holdings in the last year of the sample. It is interesting to note that the U.K. 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 also moved to taxing only domestic income in 2009, but in contrast to the U.K. 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 6 show abnormal cash holdings for developing countries and for countries from the Eurozone. The abnormal cash holdings of developing countries are never significantly different from zero and are significantly lower from the abnormal cash holdings from U.S. firms in four years, including the last two years of the sample period. The abnormal cash holdings of firms in the Eurozone countries are always lower than those of U.S. firms, but these abnormal cash holdings are significantly different from zero only in 2006.

Panel B compares abnormal cash holdings for the pre-crisis period and the post-crisis period. Except for the developing countries and the U.K., firms from all of our sets of countries have significantly lower abnormal cash holdings than U.S. firms during the pre-crisis period. During the post-crisis period, all of

our sets of countries have significantly less abnormal cash holdings than U.S. firms. Further, during that period, only the U.S. and Japan have abnormal cash holdings that are significantly different from zero.

Finally, Panel C in Table 6 compares changes in abnormal cash holdings between the U.S. and our sets of foreign countries. We see that from the base period to the pre-crisis period, abnormal cash holdings increase less than in the U.S. for all our comparison groups. In contrast, from the pre-crisis period to the post-crisis period, the increase in abnormal cash holdings in the U.S. is not significantly different from the abnormal cash holdings change in the advanced countries or those in the Eurozone. However, from the pre-crisis period to the post-crisis period, cash holdings increase more in the U.S. than in developing countries and in the U.K., but increase less in the U.S. than in Japan.

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 base period to the post-crisis period. 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.

Section 3.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 poor investment opportunities hypothesis implies that firms with high cash flows have higher cash holdings after the crisis because they do not find worthwhile investments for the cash they are generating. The agency view of cash holdings suggests that, everything else equal, firms with poorer governance experience greater increases in abnormal cash holdings because they are not as likely to return cash to shareholders. The often-heard view mentioned in the introduction concerning the implications of the tax treatment of foreign income predicts that abnormal cash holdings should have increased more for multinationals if the adverse tax consequences of repatriation lead firms to build up

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cash holdings abroad rather than repatriate cash to pay dividends. The view that regulatory changes, especially Sarbanes-Oxley, led firms to increase cash holdings as it made firms risk-averse predicts that firms that are more affected by Sarbanes-Oxley have higher cash holdings everything else equal. We examine these possible explanations for cash holdings, but also consider other possible explanations.

To examine possible explanations, we use a difference-in-differences design. More specifically, we test for differences in changes in abnormal cash holdings between comparison groups. This approach is best illustrated with our first test. We start by examining whether firms with higher cash flow increased cash holdings more. 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. In the absence of good investment opportunities, firms with higher cash flow would accumulate more cash. If these firms have good governance, they would eventually return that cash to shareholders, but it would not make sense for them to do so in the short run when they think that investment opportunities are likely to arise eventually. To the extent that the drop in investment opportunities is only partially captured by the cash regression, we expect firms with high cash flow to increase abnormal cash holdings. We see that the high cash flow firms do not accumulate abnormal cash holdings from the base period to the pre-crisis period, but that they do so from the pre-crisis period to the post-crisis period. In fact, the increase in abnormal cash holdings of the high cash flow firms from the pre-crisis period to the post-crisis period is the highest increase in abnormal cash holdings of any group of firms we report in Panel A of Table 7. We then test whether firms with high cash holdings experience a change in abnormal cash holdings that is significantly different from the change in abnormal cash holdings for the firms with cash flow in the lower quartile of the cash flow distribution of firms. We find that the difference is significantly negative for the change from the base period to the pre-crisis period, so that over that period high cash flow firms decrease their abnormal cash holdings compared to low cash flow firms. However, the difference in the changes from the pre-crisis period to the post-crisis period is significantly positive.

To 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

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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 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 have higher abnormal cash holdings than the firms in the top quartile. Abnormal cash holdings of firms in the bottom quartile increased more from the base period to the pre-crisis period than abnormal cash holdings of firms in the top quartile. Such a difference is contrary to the predictions of the agency theory. However, weakly governed firms experience a greater increase in cash holdings from the pre-crisis period to the post-crisis period than the better governed firms. Since the firms with a high GIM index do not appear to have abnormal cash holdings after the crisis while the firms with a low GIM index do, we are leery to view the finding that firms with a high GIM index increased their abnormal cash holdings more from the pre-crisis period to the post-crisis period as evidence in favor of the agency theory. A more plausible explanation is that the increase in abnormal cash holdings of high GIM index is due to the fact that this subset of firms includes high cash flow firms.

We saw in Section 1 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 4.8 percentage points for high R&D firms from the base period to the post-crisis period, but only by 0.50 percentage points for firms with no R&D. At the same time, abnormal 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. Our definition of a multinational firm is that a firm becomes a multinational once it has 25% of its sales abroad according to Compustat Historical Segment data. 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. Admittedly, the 25% threshold is arbitrary. We discuss in the next Section results for alternative definitions of multinational firms. We define domestic firms as firms that have no foreign sales and no foreign income. [9] 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.

In recent years, multinationals' cash holdings are large compared to the cash holdings of comparable domestic firms, so that international diversification does not seem to affect cash holdings in the same way as industrial diversification. As shown in Panel A of Table 7, after the crisis, multinationals hold 3.0% 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 abnormal 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.[10] A major source of intangible assets is R&D. We already know from Panel A of Table 7

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[9] Note that when we consider subsamples of multinational and domestic firms, these subsamples do not include all firms in our sample because firms with less than 25% of sales abroad are neither in the multinational nor in the domestic firm subsamples.

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

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 7 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.

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 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 from before the crisis to after the crisis compared to firms with no long-term debt. We investigate in more detail whether the increase in abnormal cash holdings of firms with long-term debt is concentrated among high cash flow firms with

long-term debt. We find that this is the case. Similarly, firms without long-term debt but with high cash flow do not increase their abnormal cash holdings.

We now consider the role of regulation as a possible explanation for the increase in cash holdings. 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 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. Surprisingly, these firms do not increase their cash holdings significantly more from the end of the 1990s to the pre-crisis period as expected if the adoption of SOX would have led them to hold more cash.

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 and, especially, increase significantly from before the crisis to after the crisis.

Section 3.c. Did certain U.S. firms increase their abnormal cash holdings more than comparable foreign firms?

The evidence of Section 3.b. shows that high R&D spending firms and multinational firms increase their abnormal cash holdings the most from the late 1990s to after the crisis.[11] 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 7.

As in Panel A, we start with firms that are in the top quartile of the distribution of cash flow to assets. Remember that we assign firms to a group in the year before the start of the period considered. We use US breakpoints. We find that high cash flow firms have similar abnormal cash holdings between the U.S. and abroad after the crisis. However, U.S. high cash flow firms increase cash holdings more from pre-crisis to post- crisis. With high R&D spending firms, foreign firms hold more cash at the end of the 1990s than U.S. firms. However, the sign of the difference flips post crisis, so that U.S. firms hold more cash than foreign firms. The explanation for this change is not that U.S. firms accumulate more cash. Rather, the explanation is that foreign firms decrease their abnormal cash holdings between the pre-crisis period and the post-crisis period while U.S. firms do not. Turning to multinationals, we see that U.S. multinationals have higher abnormal cash holdings than foreign multinationals after the crisis and before. However, the difference does not change significantly from before the crisis to after, so that there is no difference in the change in abnormal cash holdings from before the crisis to after the crisis between U.S. and foreign multinationals.

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[11] 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.

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.

In summary, Section 3.b. shows that the increase in abnormal cash holdings from before the crisis is concentrated among the highly profitable firms. In this Section, we see that the increase in cash holdings of the most profitable U.S. firms are significantly higher than increase in cash holdings of foreign firms from before the crisis to after the crisis. Though U.S. multinationals do not increase their abnormal cash holdings from before the crisis to after the crisis, neither do foreign multinationals.

Section 4. An examination of the increase of cash holdings of multinationals.

We show that from the late 1990s to after the crisis, abnormal cash holdings increase for U.S. multinationals but not for U.S. domestic firms. Over that period of time, the abnormal cash holdings of US multinationals also increase sharply compared to those of foreign multinationals. This evidence raises the question of why the cash holdings of U.S. multinationals have increased so much. One important hypothesis is that US 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 7 shows that cash holdings of U.S. multinationals did not increase more than the cash holdings of comparable foreign multinationals after the crisis. Such a result might still be consistent with the tax hypothesis if the most profitable U.S. multinationals increased their cash holdings more since taxation of profits would be most relevant for these firms. In Panel A of Table 8, 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, while high cash flow multinationals accumulate more abnormal cash holdings from before the crisis to after the crisis, there is no significant difference in changes in abnormal cash holdings 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 in the pre-crisis period. However, high cash flow multinationals increase their abnormal cash holdings less than purely domestic firms from before the crisis to after the crisis.

We show in Panel A of Table 7 that high R&D multinationals experience a higher increase in cash holdings from the late 1990s to the 2000s than high R&D domestic firms. In Panel A of Table 8, high R&D domestic multinationals experience a higher increase in cash holdings during the 2000s than comparable high R&D foreign multinationals. However, there is no difference between the two groups from the base period to the pre-crisis period. The difference occurs because foreign multinationals decrease their abnormal cash holdings from before the crisis to after the crisis. Multinationals without R&D do not have positive abnormal cash holdings after the crisis. Further, they do not increase their cash holdings in the 2000s compared to purely domestic firms with no R&D. In other words, the increase in cash holdings of multinationals is primarily located among multinationals with R&D expenditures.

The number of multinational firms in our sample 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. We then restrict the set of firms to high R&D firms. We find that, among these firms, multinationals never have more abnormal cash holdings than domestic firms and never increase their abnormal cash holdings more than domestic firms. Further,

neither domestic nor multinational firms increase their abnormal cash holdings from before the crisis to after the crisis.

In Panel B of Table 8, 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.[12] 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 the next four regressions, we evaluate the relation between abnormal cash holdings and multinationality taking into account whether firms are high R&D expenditure firms or high cash flow firms. In regression (3), we interact an indicator variable for high R&D firms, namely firms in the top quartile of R&D expenditures within firms with such expenditures, and a firm's multinational status. We see that high R&D firms have higher abnormal cash holdings but multinationals do not. However, when we add a firm fixed effect in regression (4), neither the multinational indicator variable nor the interaction between the multinational indicator variable and the high R&D indicator variable are significant. Similarly, there is no relation between the high cash flow status of a firm and abnormal cash holdings through the 2000s. The interaction between a firm's multinational status and its high cash flow status is not significant in regressions (5) and (6). It

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[12] 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.

follows from this that becoming multinational is not associated with an increase in abnormal cash holdings.

In Table 9, we conduct two separate event studies. The first study investigates how abnormal cash holdings changed for 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 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 Faulkender 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.

The second event study in Table 9 shows how abnormal cash holdings evolve around the year a firm becomes a multinational firm in our sample. The first row shows the mean abnormal cash holdings from year -2 to year +3. There is no significant increase in abnormal cash holdings from year 0 to year 3. We show next a similar result for high R&D and low R&D firms as well as for high cash flow and low cash flow firms. High cash flow firms in the year they become multinational have significant positive abnormal cash holdings in years 2 and 3 and their abnormal cash holdings increase by roughly 2%. One might argue that there is an economically significant increase in abnormal cash holdings for these firms even though there is no statistically significant increase. However, it is worth noting that these firms have significant abnormal cash holdings in year -2 that are not different from their abnormal cash holdings in year +3.

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 1.93% of assets. We call cash holdings that cannot be explained by cash holding patterns from the late 1990s abnormal cash holdings. We find that abnormal cash holdings increased throughout our sample period, but for different reasons from the base period, the late 1990s, to before the crisis and from before the crisis to after the crisis. The increase from the late 1990s to before the crisis is U.S. made in that foreign firms do not experience such an increase. The increase in abnormal cash holdings during that period 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. From before the crisis to after the crisis, the increase in abnormal cash holdings of U.S. firms is not significantly different from the increase in cash holdings of foreign firms. Consequently, the increase in cash holdings from before the crisis to after the crisis is not a U.S. puzzle. We find that over that period cash holdings increase most for highly profitable firms, which is consistent with the view that these firms lacked good investment opportunities. Importantly, however, neither U.S. multinationals nor foreign multinationals increased their abnormal cash holdings from before the crisis to after the crisis, so that the increase in abnormal cash holdings over that period cannot be explained by cash hoarding by multinationals.

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. *Baseline* represents 1998-2000, *Pre-Crisis* represents 2004-2006, and *Post-Crisis* represents 2009-2010.

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

Year	N	Mean Cash	Median Cash	Asset-Weighted Cash
1998	3,414	16.17%	6.32%	6.52%
1999	3,319	18.19%	6.56%	7.55%
2000	3,155	19.02%	7.01%	7.78%
2001	2,941	19.82%	8.79%	8.29%
2002	2,837	19.86%	9.96%	9.43%
2003	2,882	21.05%	12.03%	10.62%
2004	2,922	21.72%	12.96%	11.76%
2005	2,893	21.69%	13.38%	11.09%
2006	2,875	21.39%	12.33%	10.06%
2007	2,856	21.37%	11.39%	9.77%
2008	2,723	19.25%	10.69%	9.74%
2009	2,734	21.07%	13.49%	11.59%
2010	2,704	21.48%	14.30%	11.90%

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

Year	N	Mean Cash	Median Cash	Asset-Weighted Cash
Baseline	9,888	17.76%	6.60%	7.34%
Pre-Crisis	8,690	21.60%	12.86%	10.93%
Post-Crisis	5,438	21.28%	13.95%	11.75%

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	28.6	29
Australia	240	763	471.6	541
Austria	43	59	52.2	52
Belgium	49	88	73.6	75
Bermuda	166	365	288.1	331
Brazil	40	173	92.1	65
Canada	579	775	668.5	659
Cayman Islands	27	264	127.8	138
Chile	8	88	51.4	53
China	25	1383	555.9	369
Colombia	5	14	8.8	9
Denmark	72	92	82.1	82
Finland	56	110	93.4	101
France	342	478	438.1	458
Germany	294	501	440.2	445
Greece	37	163	108.2	106
Hong Kong	87	207	124.8	110
Hungary	11	15	13.3	13
India	43	1249	484.8	434
Indonesia	93	200	133.6	135
Ireland	34	42	37.5	37
Israel	24	138	70	61
Italy	103	193	158.3	162
Japan	1175	2790	2434.2	2617
Luxembourg	6	20	13.9	14
Malaysia	383	680	523.9	534
Mexico	45	73	56.1	56
Netherlands	91	138	119.7	119
New Zealand	38	70	56.3	61
Norway	65	149	104.3	94
Pakistan	26	111	65.3	51
Peru	8	52	23.8	21
Philippines	39	80	54.8	53
Poland	25	235	100.5	68
Portugal	32	40	36.2	36
Singapore	178	462	325.7	333
South Africa	95	187	145.7	155
South Korea	182	650	383.1	363
Spain	77	91	85.2	86
Sweden	106	236	190.4	207
Switzerland	120	165	148.8	154
Taiwan	95	1245	611.2	722
Thailand	131	327	228.5	238
Turkey	32	108	68.2	67
United Kingdom	718	1017	900.1	916
United States	2704	3414	2942.7	2882

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, Developing, and Euro, the standard errors for the t-tests are based on the cross-sectional distribution of country means (or medians). For the U.K. and Japan, the standard error is determined with firm level data. The results in the categories All and Advanced exclude the US. *Baseline* represents 1998-2000, *Pre-Crisis* represents 2004-2006, and *Post-Crisis* represents 2009-2010.

Panel A: Mean cash holdings

	U.S. Firms	All N=45	Advanced N=26	U.K.	Japan	Developing N=19	Euro N=12
1998	0.1617	0.1085***	0.1181***	0.1223***	0.1550	0.0953***	0.1198**
1999	0.1819	0.1111***	0.1192***	0.1267***	0.1654***	0.1000***	0.1123***
2000	0.1902	0.1099***	0.1161***	0.1231***	0.1411***	0.1014***	0.1009***
2001	0.1982	0.1216***	0.1283***	0.1407***	0.1424***	0.1123***	0.1109***
2002	0.1986	0.1249***	0.1321***	0.1416***	0.1484***	0.1151***	0.1152***
2003	0.2105	0.1292***	0.1408***	0.1496***	0.1532***	0.1132***	0.1227***
2004	0.2172	0.1329***	0.1442***	0.1408***	0.1568***	0.1175***	0.1237***
2005	0.2169	0.1351***	0.1467***	0.1403***	0.1564***	0.1194***	0.1259***
2006	0.2139	0.1369***	0.1463***	0.1617***	0.1575***	0.1239***	0.1249***
2007	0.2137	0.1385***	0.1467***	0.1421***	0.1600***	0.1273***	0.1223***
2008	0.1925	0.1279***	0.1360***	0.1264***	0.1730***	0.1169***	0.1171***
2009	0.2107	0.1377***	0.1469***	0.1334***	0.1874***	0.1250***	0.1263***
2010	0.2148	0.1349***	0.1436***	0.1277***	0.1936***	0.1231***	0.1232***
Baseline	0.1776	0.1096***	0.1176***	0.1240***	0.1527***	0.0987***	0.1103***
Pre-Crisis	0.2160	0.1350***	0.1458***	0.1481***	0.1569***	0.1203***	0.1248***
Post-Crisis	0.2128	0.1363***	0.1453***	0.1307***	0.1905***	0.1241***	0.1249***

Panel B: Median cash holdings

	U.S. Firms	All N=45	Advanced N=26	U.K.	Japan	Developing N=19	Euro N=12
1998	0.0632	0.0755++	0.0819++	0.0682	0.1317+++	0.0667	0.0834
1999	0.0656	0.0734	0.0763	0.0680	0.1401+++	0.0694	0.0690
2000	0.0701	0.0712	0.0716	0.0598**	0.1173+++	0.0707	0.0614
2001	0.0879	0.0781*	0.0782	0.0642***	0.1169+++	0.0779	0.0689***
2002	0.0996	0.0807***	0.0814***	0.0747***	0.1186+++	0.0797*	0.0693***
2003	0.1203	0.0871***	0.0901***	0.0847***	0.1218	0.0830***	0.0780***
2004	0.1296	0.0911***	0.0967***	0.0876***	0.1250	0.0835***	0.0836***
2005	0.1338	0.0902***	0.0970***	0.0901***	0.1233**	0.0809***	0.0813***
2006	0.1233	0.0917***	0.0961***	0.0997***	0.1245	0.0856***	0.0789***
2007	0.1139	0.0927***	0.0965**	0.0831***	0.1258++	0.0876**	0.0786***
2008	0.1069	0.0860***	0.0894**	0.0789***	0.1379+++	0.0814***	0.0774***
2009	0.1349	0.0984***	0.1052***	0.0870***	0.1563+++	0.0892***	0.0908***
2010	0.1430	0.0973***	0.1038***	0.0828***	0.1604+++	0.0885***	0.0902***
Baseline	0.0660	0.0716	0.0748	0.0654	0.1287+++	0.0672	0.0684
Pre-Crisis	0.1286	0.0909***	0.0967***	0.0923***	0.1243*	0.0831***	0.0812***
Post-Crisis	0.1395	0.0971***	0.1038***	0.0856***	0.1580+++	0.0879***	0.0899***

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 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, Developing, and Euro, the standard error for the t-test is based on the cross-sectional distribution of country means (or medians). For the U.K. and Japan, the standard error is determined with firm level data. The results in the categories All and Advanced exclude the U.S.

Variable	U.S. Firms	All N=45	Advanced N=26	U.K.	Japan	Developing N=19	Euro N=12
Cash/Assets	0.201 0.106	0.129*** 0.087***	0.138*** 0.090**	0.137*** 0.078***	0.161*** 0.130+++	0.117*** 0.081**	0.118*** 0.076***
Mkt / Book	2.098 1.548	1.433*** 1.151***	1.479*** 1.191***	1.694*** 1.335***	1.126*** 0.980***	1.371*** 1.096***	1.472*** 1.198***
Size	5.653 5.581	5.491 5.330**	5.588 5.412	5.057*** 4.787***	5.917+++ 5.737+++	5.358 5.217*	5.975+ 5.815
CF / Assets	0.024 0.068	0.051+++ 0.057***	0.042+++ 0.054***	0.033+++ 0.058***	0.044+++ 0.044***	0.062+++ 0.062	0.050+++ 0.058***
NWC / Assets	0.066 0.053	0.023*** 0.020***	0.021*** 0.018***	0.006*** -0.005***	0.001*** 0.012***	0.026*** 0.022***	0.021*** 0.022**
Capex	0.056 0.036	0.059 0.040+++	0.057 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++ 0.222+++	0.243++ 0.229+++	0.187*** 0.158***	0.231+++ 0.202+++	0.230 0.213++	0.259++ 0.251+++
RD / Sales	0.210 0.003	0.014*** 0.001***	0.023*** 0.001***	0.034*** 0.000***	0.017*** 0.004+++	0.003*** 0.000	0.016*** 0.001***
Dividend Payer	0.282 0.000	0.393+++ 0.289+++	0.455+++ 0.385+++	0.604+++ 1.000+++	0.843+++ 1.000	0.310 0.158+	0.416+++ 0.167
Acquisitions	0.026 0.000	0.009*** 0.000	0.012*** 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+	0.013+++ 0.001	0.011+++ 0.000+++	0.001*** 0.000+++	0.012 0.001	0.016++ 0.002
Equity Issuances	0.049 0.002	0.008*** 0.000***	0.010*** 0.000***	0.018*** 0.000***	0.000*** 0.000***	0.005*** 0.000	0.007*** 0.000
Ind Vol	0.113 0.108	0.059*** 0.050***	0.060*** 0.052***	0.065*** 0.056***	0.054*** 0.048***	0.057*** 0.048***	0.057*** 0.050***

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. *, **, *** indicate significance at the 10, 5, and 1% levels, respectively using robust standard errors clustered at the country level.

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Ind. Vol	0.504***	0.375***	0.476***	0.528***	0.625***	0.551***	0.530***	0.441***	0.436***	0.421***	0.462***	0.393***	0.440***
Mkt/Book	0.019***	0.021***	0.019***	0.027***	0.022***	0.029***	0.032***	0.033***	0.030***	0.025***	0.024***	0.031***	0.025***
Size	-0.006***	-0.005***	-0.005***	-0.006***	-0.007***	-0.007***	-0.007***	-0.008***	-0.009***	-0.009***	-0.010***	-0.008***	-0.007***
CF/Assets	-0.082**	-0.048	-0.087***	-0.157***	-0.115***	-0.028	-0.014	-0.084***	-0.082**	-0.094***	-0.028*	-0.021	0.010
NWC/Assets	-0.210***	-0.181***	-0.180***	-0.166***	-0.188***	-0.186***	-0.187***	-0.178***	-0.184***	-0.178***	-0.164***	-0.163***	-0.166***
Capex	-0.369***	-0.422***	-0.326***	-0.310***	-0.425***	-0.479***	-0.439***	-0.362***	-0.381***	-0.339***	-0.288***	-0.386***	-0.391***
Leverage	-0.311***	-0.292***	-0.304***	-0.332***	-0.357***	-0.342***	-0.325***	-0.313***	-0.327***	-0.329***	-0.300***	-0.321***	-0.313***
RD/Sales	0.076**	0.052***	0.059***	0.087***	0.089***	0.079***	0.080***	0.090***	0.082***	0.082**	0.089***	0.092***	0.085***
Dividend Payer	-0.019	-0.010	-0.013	-0.019	-0.020*	-0.012	-0.005	-0.009	-0.010	-0.012	-0.008	-0.003	-0.004
Acquisitions	-0.339***	-0.404***	-0.409***	-0.251***	-0.375***	-0.423***	-0.425***	-0.388***	-0.482***	-0.408***	-0.317***	-0.358***	-0.418***
Debt Issuances	0.169***	0.165**	0.181**	0.139***	0.183***	0.247***	0.239***	0.147***	0.227***	0.218***	0.107***	0.192***	0.189***
Equity Issuances	0.148***	0.288***	0.269***	0.027*	0.027	0.142***	0.119***	0.071**	0.169***	0.170***	0.043	0.053	0.154***
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R²	0.4460	0.5228	0.5116	0.4629	0.4238	0.4413	0.4419	0.4327	0.4360	0.4231	0.3637	0.3824	0.3808
N	9,915	10,843	11,337	11,700	12,261	13,427	14,407	15,263	16,629	17,161	16,699	17,270	17,968

Table 6: 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 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, Developing, and Euro, the standard error for the t-test is based on the cross-sectional distribution of country means. For the U.K. 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. Bolded entries are significantly different from zero at the 5% level using a t-test. *Baseline* represents 1998-2000, *Pre-Crisis* represents 2004-2006, and *Post-Crisis* represents 2009-2010.

Panel A: Examination of Abnormal Cash Holdings by Year

	U.S. Firms	All N=45	Advanced N=26	U.K.	Japan	Developing N=19	Euro N=12
2001	**0.0111**	0.0032**	0.0014**	**0.0111**	**-0.0212***	0.0056	-0.0037**
2002	**0.0186**	0.0024***	0.0000***	**0.0123**	**-0.0224***	0.0057*	-0.0035***
2003	**0.0079**	-0.0033***	-0.0025***	0.0065	**-0.0283***	-0.0045*	-0.0065**
2004	**0.0079**	-0.0022***	-0.0022**	-0.0029*	**-0.0258***	-0.0022	-0.0087**
2005	**0.0124**	0.0020**	0.0022**	0.0046	**-0.0299***	0.0018	-0.0061***
2006	**0.0107**	0.0000**	-0.0017**	**0.0153**	**-0.0315***	0.0023	**-0.0096***
2007	**0.0105**	0.0007**	-0.0002*	0.0055	**-0.0281***	0.0020	-0.0094**
2008	**0.0244**	**0.0139****	**0.0121****	**0.0177**	**-0.0048***	0.0165	0.0063**
2009	**0.0208**	0.0037***	0.0048**	0.0013***	0.0026***	0.0022***	-0.0010**
2010	**0.0177**	0.0001***	0.0008**	-0.0070***	**0.0082****	-0.0009***	-0.0040*

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

	U.S. Firms	All N=45	Advanced N=26	U.K.	Japan	Developing N=19	Euro N=12
Baseline	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pre-Crisis	**0.0103**	0.0000***	-0.0004**	**0.0060**	**-0.0291***	0.0007	-0.0082***
Post-Crisis	**0.0193**	0.0019***	0.0028**	-0.0027***	**0.0054****	0.0006***	-0.0024**

Panel C: Examination of Changes in Abnormal Cash Holdings by Sub-Periods

	U.S. Firms	All N=45	Advanced N=26	U.K.	Japan	Developing N=19	Euro N=12
Baseline to Pre	**0.0103**	0.0000***	-0.0004**	**0.0060**	**-0.0291***	0.0007	-0.0082***
Baseline to Post	**0.0193**	0.0019***	0.0028**	-0.0027***	**0.0054****	0.0006***	-0.0024**
Pre to Post	**0.0089**	0.0018**	0.0032	**-0.0087***	**0.0345****	-0.0001*	0.0058

Table 7: Analysis of Abnormal Cash Holdings by Firm Types

Baseline represents 1998-2000, *Pre-Crisis* represents 2004-2006, and *Post-Crisis* represents 2009-2010. 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. 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 more than 25% of sales from foreign sources in any prior year starting from 1995. 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.

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

	Mean Baseline	Mean Pre-Crisis	Mean Post-Crisis	Changes Base to Pre	Changes Base to Post	Changes Pre to Post
	Quartile of cash flow/assets					
Top	0.006**	0.005*	0.026***	-0.001	0.020***	0.021***
Bottom	0.026***	0.047***	0.050***	0.021***	0.024***	0.0030
Differences	-0.020***	-0.042***	-0.024***	-0.022***	-0.004	0.018**
	Quartile of GIM Index					
Top	-0.038***	-0.018***	-0.003	0.020***	0.036***	0.016***
Bottom	-0.009*	0.039***	0.038***	0.048***	0.047***	-0.0010
Differences	-0.029***	-0.058***	-0.041***	-0.028***	-0.012	0.017*
	Quartile of R&D Expenditures					
Top	0.060***	0.107***	0.108***	0.047***	0.048***	0.0010
Bottom	-0.011***	-0.017***	-0.006**	-0.006**	0.005*	0.011***
Differences	0.070***	0.124***	0.114***	0.054***	0.043***	-0.0100
	Multinational or domestic firms					
Multinational	-0.001	0.028***	0.032***	0.029***	0.032***	0.0040
Domestic	0.003	-0.002	0.001	-0.005	-0.001	0.0040
Differences	-0.003	0.030***	0.030***	0.033***	0.033***	0.0000
	Multinational or domestic firms for top quartile RD/Sales firms					
Multinational	0.046***	0.116***	0.107***	0.069***	0.061***	-0.0080
Domestic	0.067***	0.087***	0.098***	0.019*	0.031**	0.0110
Differences	-0.021**	0.029***	0.009	0.050***	0.030*	-0.0200
	Financial Constraint - classified as being in the top 7% of SA Index					
Constrained	-0.047***	-0.037***	-0.025**	0.010	0.022*	0.0120
Unconstrained	0.000	0.014***	0.023***	0.014***	0.023***	0.009***
Differences	-0.047***	-0.051***	-0.048***	-0.004	-0.001	0.0030
	Equity Dependence					
Dependent	0.017***	0.023***	0.027***	0.006	0.010	0.0030
Independent	-0.010***	0.007***	0.019***	0.017***	0.029***	0.012***
Differences	0.027***	0.016***	0.007	-0.011*	-0.020***	-0.0090

	Mean Baseline	Mean Pre-Crisis	Mean Post-Crisis	Changes Base to Pre	Changes Base to Post	Changes Pre to Post
Firms split on long-term debt over the prior 3 years						
Had Debt	-0.010***	-0.003*	0.007***	0.007***	0.017***	0.010***
No Debt	0.074***	0.103***	0.096***	0.029***	0.022**	-0.0070
Differences	-0.084***	-0.106***	-0.089***	-0.023**	-0.005	0.017*
Affected by SOX – 3 or less measures in place of the Reg 10						
Affected	0.005	0.019***	0.030***	0.014***	0.025***	0.011*
Unaffected	-0.001	0.009***	0.018***	0.010***	0.019***	0.009***
Differences	0.005	0.010**	0.012**	0.004	0.007	0.0030
Affected by SOX – Lowest quartile of stock returns using Litvak dates						
Affected	0.008**	0.028***	0.045***	0.020***	0.036***	0.017**
Unaffected	-0.003*	0.010***	0.015***	0.014***	0.018***	0.0040
Differences	0.011***	0.018***	0.030***	0.006	0.019**	0.0120
Utilities vs. industrials						
Utilities	-0.035***	-0.042***	-0.042***	-0.007*	-0.007	0.0000
Industrials	0.000	0.010***	0.019***	0.010***	0.019***	0.009***
Differences	-0.035***	-0.052***	-0.061***	-0.017***	-0.026***	-0.009*

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

	Mean Baseline	Mean Pre-Crisis	Mean Post-Crisis	Changes Base to Pre	Changes Base to Post	Changes Pre to Post
Top Quartile of cash flow/assets						
U.S.	0.006**	0.005*	0.026***	-0.001	0.020***	0.021***
Foreign	0.001	0.023***	0.025***	0.022***	0.024***	0.0020
Differences	0.005	-0.018***	0.001	-0.023***	-0.004	0.019***
Top Quartile RD/Sales						
U.S.	0.060***	0.107***	0.108***	0.047***	0.048***	0.0010
Foreign	0.076***	0.118***	0.082***	0.041***	0.006	-0.035***
Differences	-0.017**	-0.011	0.026***	0.006	0.042***	0.036***
Multinationals						
U.S.	-0.001	0.028***	0.032***	0.029***	0.032***	0.0040
Foreign	0.012***	0.011***	0.019***	-0.001	0.007***	0.008***
Differences	-0.012***	0.017***	0.013***	0.030***	0.025***	-0.0050
Equity dependence						
U.S.	0.017***	0.023***	0.027***	0.006	0.010	0.0030
Foreign	0.001	0.004*	0.008**	0.003	0.007*	0.0040
Differences	0.017***	0.020***	0.019***	0.003	0.002	-0.0010
Firms which have long-term debt in the past 3 years						
U.S.	-0.010***	-0.003*	0.007***	0.007***	0.017***	0.010***
Foreign	0.002**	-0.015***	0.000	-0.017***	-0.002	0.015***
Differences	-0.012***	0.012***	0.007***	0.024***	0.019***	-0.005*
Large Firms – Top quintile of assets based on NYSE firms						
U.S.	-0.056***	-0.022***	-0.018***	0.034***	0.037***	0.0030
Foreign	0.002	-0.013***	-0.002	-0.015***	-0.004	0.011***
Differences	-0.058***	-0.009*	-0.017***	0.049***	0.041***	-0.0080

Table 8: Cash Holdings of Multinational Firms

Baseline represents 1998-2000, *Pre-Crisis* represents 2004-2006, and *Post-Crisis* represents 2009-2010. Panel A shows 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. Multinational is an indicator set to 1 in the years before a firm is classified as a multinational company. High RD (CF) is a dummy set to 1 if the firm is in the top quartile of R&D (Cash Flow) in the year it first became multinational.   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 Baseline	Mean Pre-Crisis	Mean Post-Crisis	Changes Base to Pre	Changes Base to Post	Changes Pre to Post
US Multinationals: By quartile of cash flow						
Top	0.000	0.017***	0.035***	0.017***	0.035***	0.018***
Bottom	0.032***	0.055***	0.064***	0.023***	0.032***	0.0090
Differences	-0.032***	-0.038***	-0.029***	-0.006	0.003	0.0090
U.S. firms in top quartile of cash flow/assets: By MNC						
MNC	0.003	0.029***	0.031***	0.026***	0.028***	0.0020
Domestic	0.011***	-0.014***	0.007	-0.024***	-0.004	0.021***
Differences	-0.007	0.043***	0.024***	0.051***	0.032***	-0.019*
Multinationals in top quartile of research and development expenses/sales						
US	0.046***	0.116***	0.107***	0.069***	0.061***	-0.0080
Foreign	0.052***	0.110***	0.064***	0.058***	0.012	-0.046***
Differences	-0.006	0.006	0.043***	0.012	0.049***	0.037***
US Zero R&D firms: Multinational or domestic firm						
Multinational	-0.007	-0.010***	-0.001	-0.003	0.006	0.0100
Domestic	-0.012***	-0.021***	-0.016***	-0.009***	-0.004	0.0050
Differences	0.005	0.011**	0.016***	0.006	0.011	0.0050
US firms: Multinational status in 1998						
Multinational	-0.003	0.010***	0.018***	0.013***	0.021***	0.0080
Domestic	0.001	0.003	0.007*	0.003	0.007	0.0040
Differences	-0.004	0.007	0.011*	0.010*	0.014**	0.0040

Panel B: Cash Holdings as Firms Become Multinational

	(1)	(2)
Dependent variable	Abnormal Cash	Abnormal Cash
Multinational	0.020*** (5.02)	0.006 (0.57)
Year fixed effects	Yes	Yes
Firm fixed effects	No	Yes
Adjusted R^2	0.0062	0.0096
N	29,922	29,922

	(3)	(4)	(5)	(6)
Dependent variable	Abnormal Cash	Abnormal Cash	Abnormal Cash	Abnormal Cash
Multinational	0.005 (1.41)	-0.007 (-0.73)	0.018*** (3.99)	0.008 (0.73)
High R&D	0.116*** (13.88)			
Multinational x High R&D in Yr 0	-0.009 (-0.87)	0.034 (1.53)		
High CF			0.003 (0.46)	
Multinational x High CF in Yr 0			0.008 (0.85)	-0.014 (-0.69)
Year fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	No	Yes	No	Yes
Adjusted R^2	0.0920	0.0100	0.0063	0.0096
N	29,922	29,922	29,922	29,922

Table 9: Event studies of abnormal cash holdings.

Panels A and B 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 base period using all firms and country dummy variables. . In Panel B, event year zero is the year in which a firm first became multinational. High RD (CF) means the firm is in the top quartile of R&D (Cash Flow) in year zero. *, **, *** 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: U.S. Tax Holiday Event Study

	2003	2004	2005	2006	2003 v 2006
U.S. Firms only					
Multinational	0.024***	0.026***	0.030***	0.028***	0.004
Domestic	-0.004	-0.009*	-0.002	-0.003	0.001
Differences	0.028***	0.035***	0.032***	0.031***	0.003
Multinationals only					
U.S.	0.024***	0.026***	0.030***	0.028***	0.004
Foreign	0.010***	0.011***	0.011***	0.009***	-0.001
Differences	0.014**	0.015***	0.018***	0.019***	0.006

Panel B: U.S. Becoming MNC Event Study

All Firms N=315	Year -2	Year -1	Year 0	Year 1	Year 2	Year 3	Year 0 to Year 3
Mean	0.025***	0.027***	0.023***	0.032***	0.038***	0.040***	0.0160

	Year -2	Year -1	Year 0	Year 1	Year 2	Year 3	Year 0 to Year 3
High RD (Yr 0) N=79	0.136***	0.138***	0.122***	0.136***	0.137***	0.137***	0.015
Low RD (Yr 0) N=116	-0.017*	-0.013	-0.014	-0.005	-0.001	0.002	0.016
Differences	0.154***	0.151***	0.137***	0.141***	0.138***	0.135***	-0.001

	Year -2	Year -1	Year 0	Year 1	Year 2	Year 3	Year 0 to Year 3
High CF (Yr 0) N=69	0.036**	0.017	0.025	0.02	0.041**	0.047***	0.022
Low CF (Yr 0) N=65	0.064**	0.091***	0.088***	0.095***	0.092***	0.081***	-0.007

| Differences | -0.028 | -0.073** | -0.064** | -0.075** | -0.051 | -0.035 | 0.029 |

Figure 1
U.S. Cash Holdings 1950-2010

U.S. Cash to Assets
From 1950 to 2010

Gini Coefficients for Cash and Non-Cash Assets
US Firms from 2000 - 2010
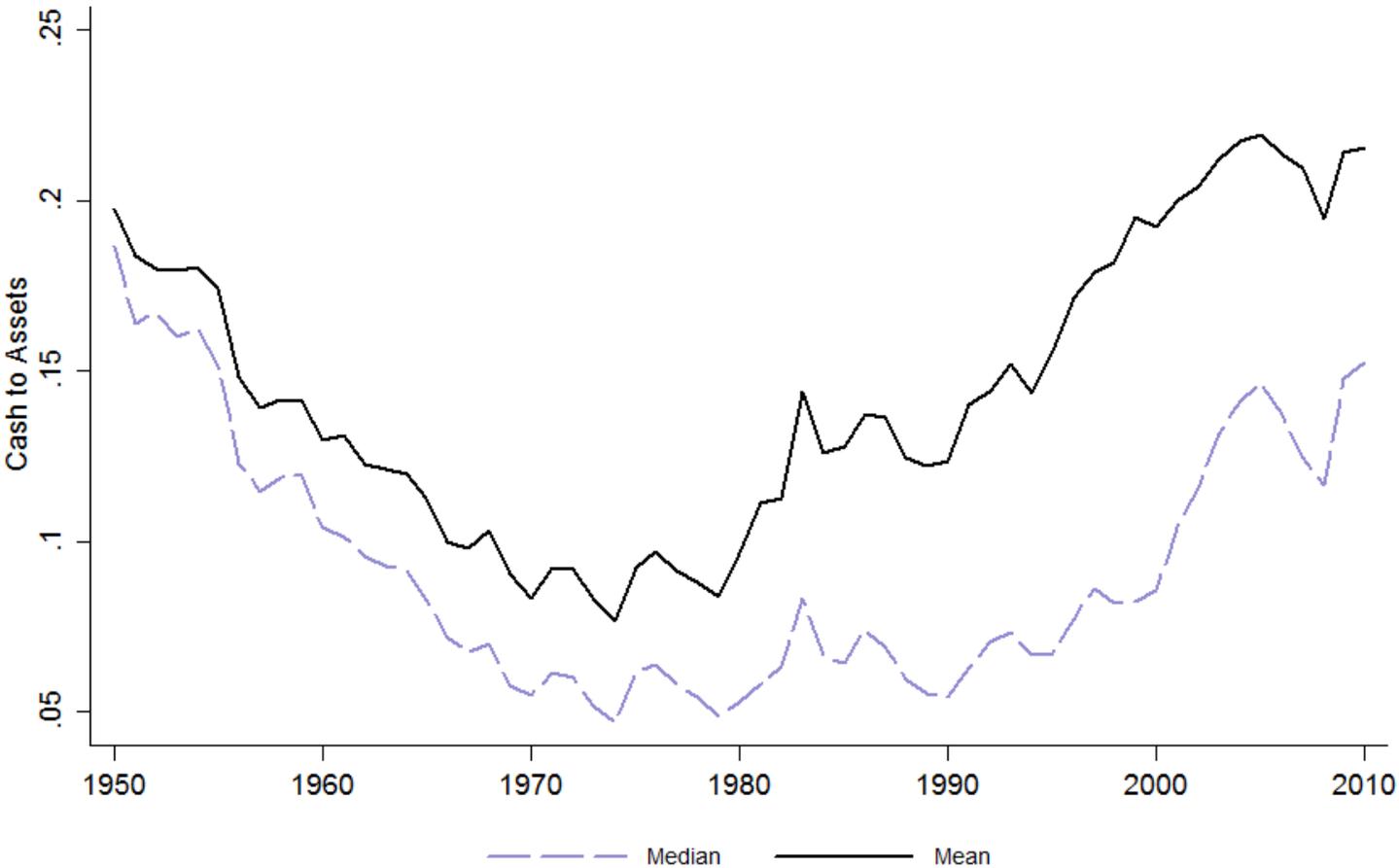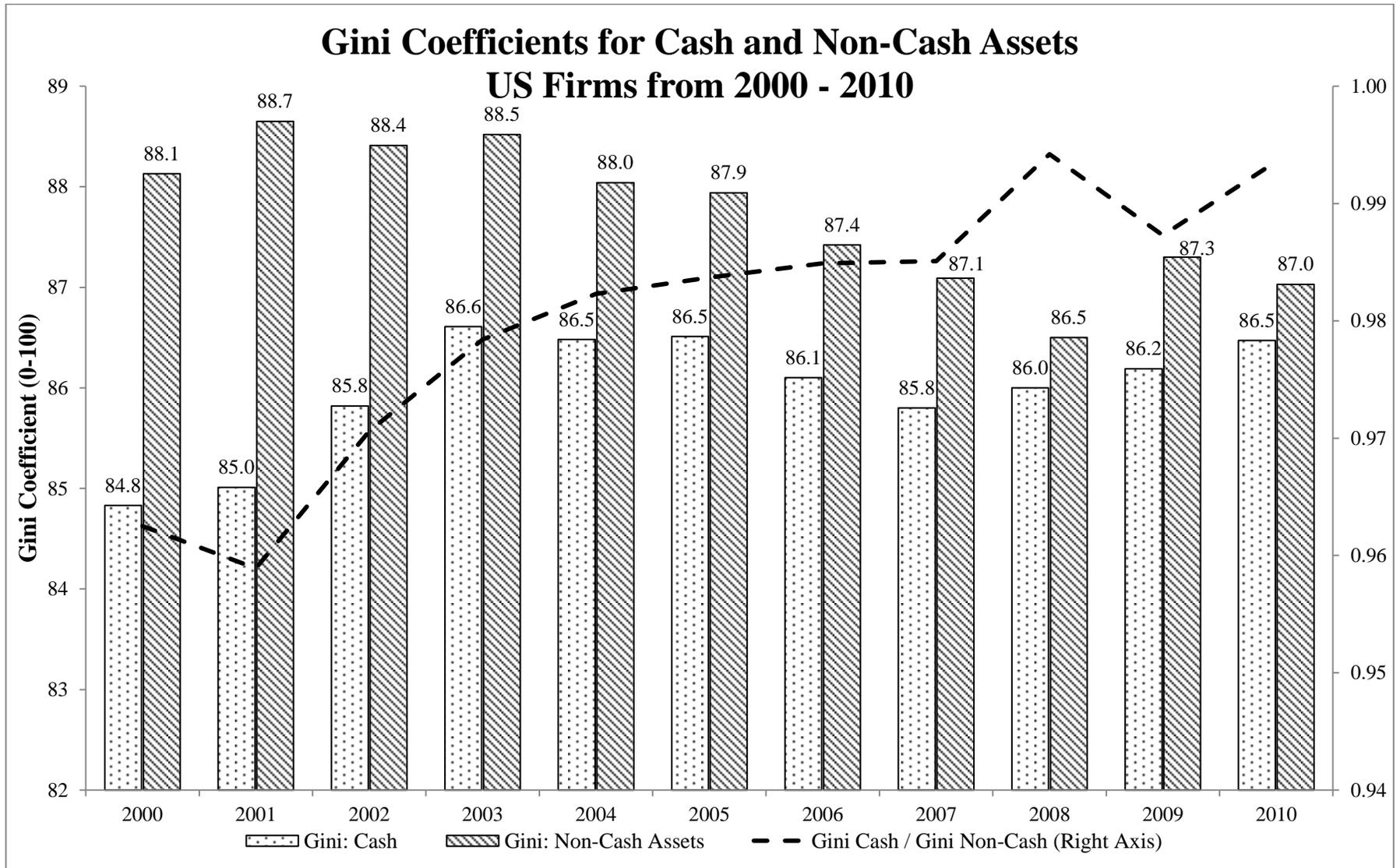
Figure 3
Public firms (Compustat) and private firms (Federal Reserve Flow of Funds data – Compustat). Only corporations (nonfarm nonfinancial corporate businesses) are included from the Federal Reserve Flow of Funds data.

Percentage of Fed Assets and Cash from Compustat Firms
1990Q1 to 2010Q4

Aggregate Cash/Assets from Public and Private Firms
1990Q1 to 2010Q4
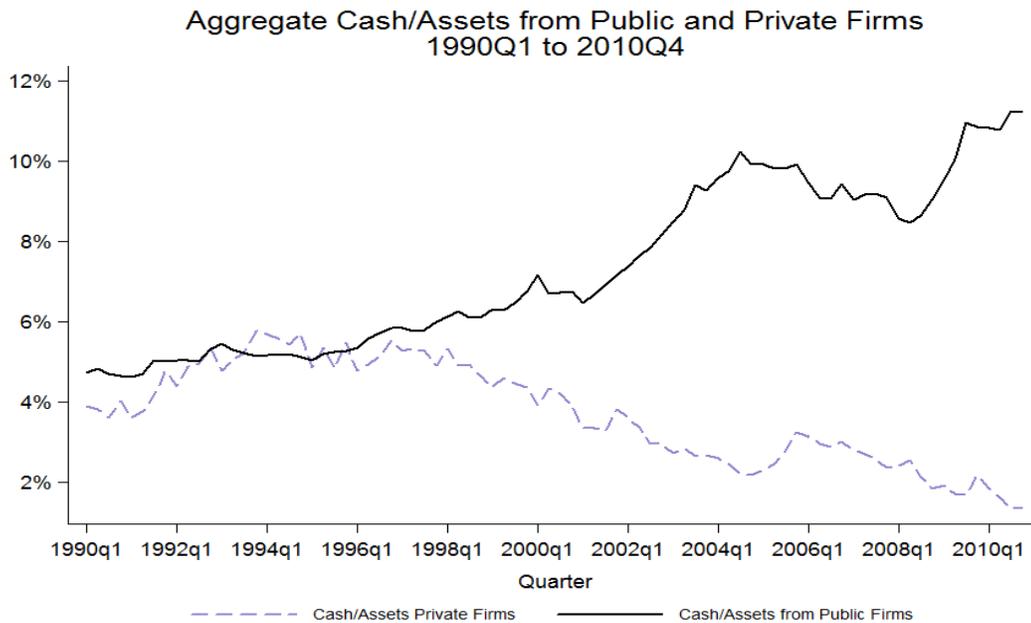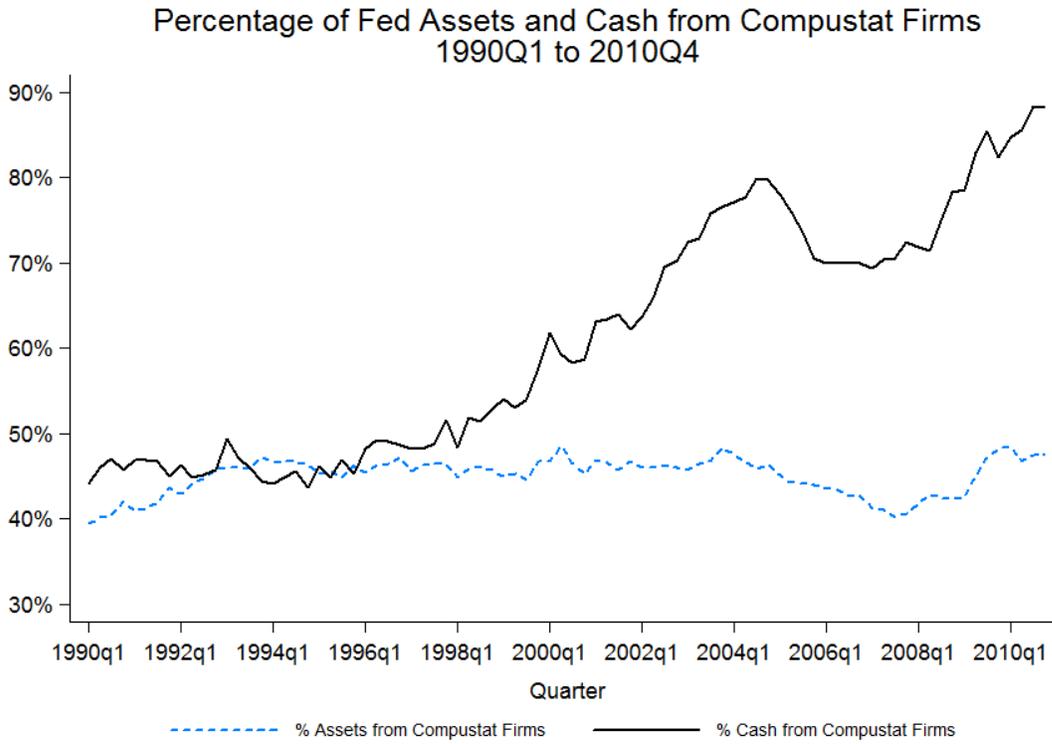
Figure 4. Mean and median cash holdings for countries across the world.

Mean Cash Holdings By Geography and Year
All Indexed to 1 in 1998

Legend: U.S. Firms — All — Advanced — UK — Japan — Developing — Euro

Median Cash Holdings By Geography and Year
All Indexed to 1 in 1998

Legend: U.S. Firms — All — Advanced — UK — Japan — Developing — Euro
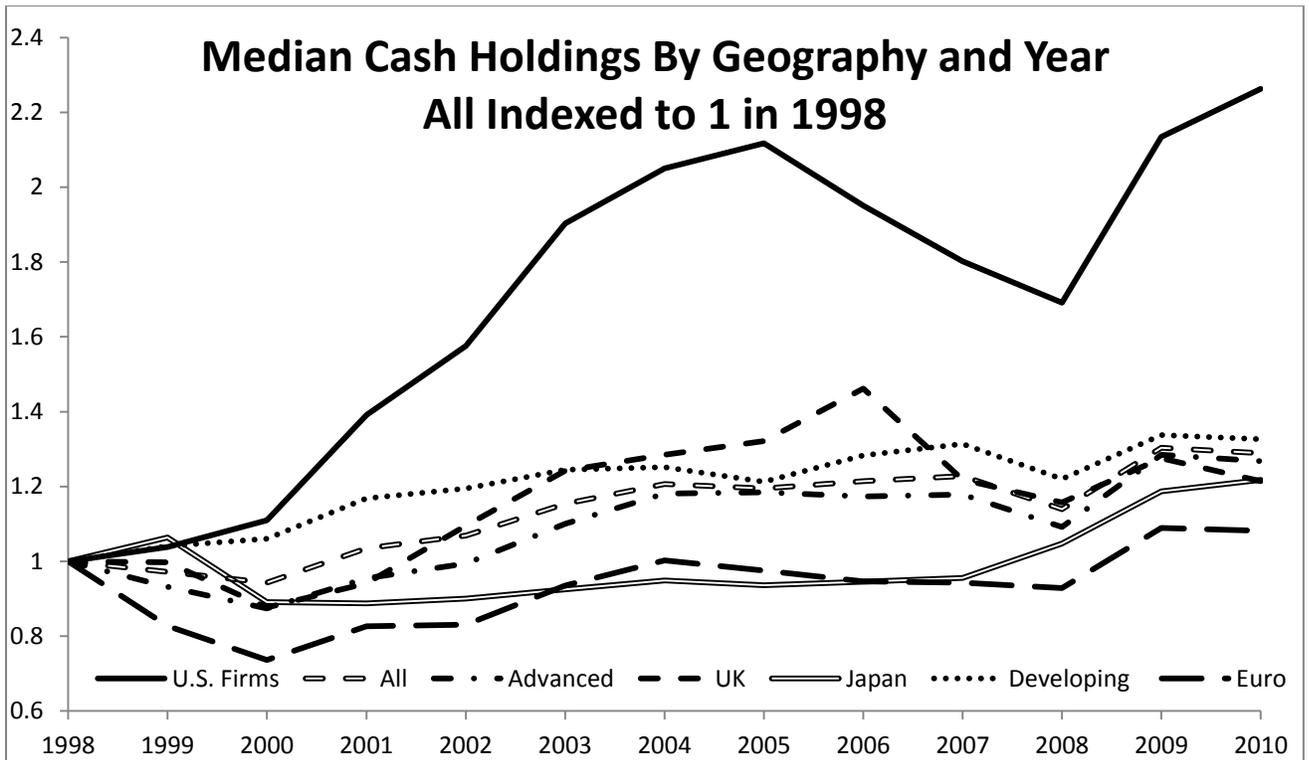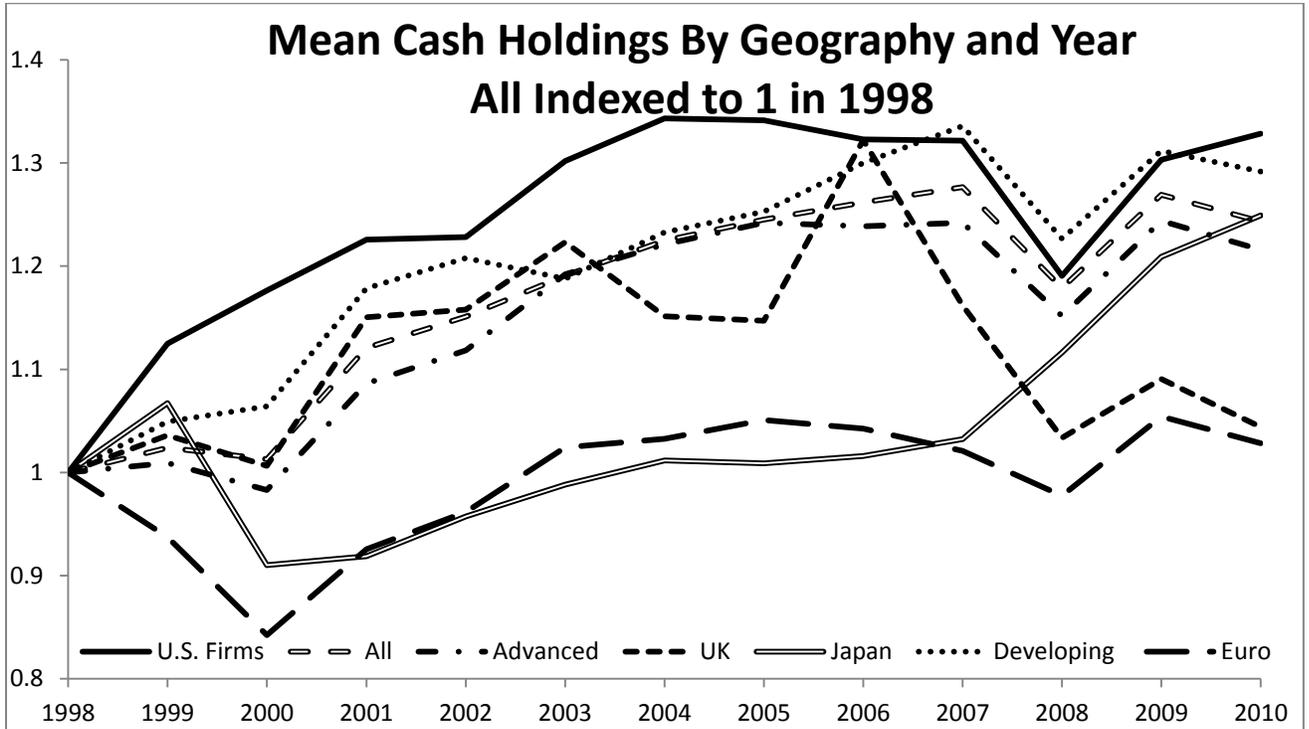
Figure 5: Predicted versus Actual Mean Cash/Asset Ratios
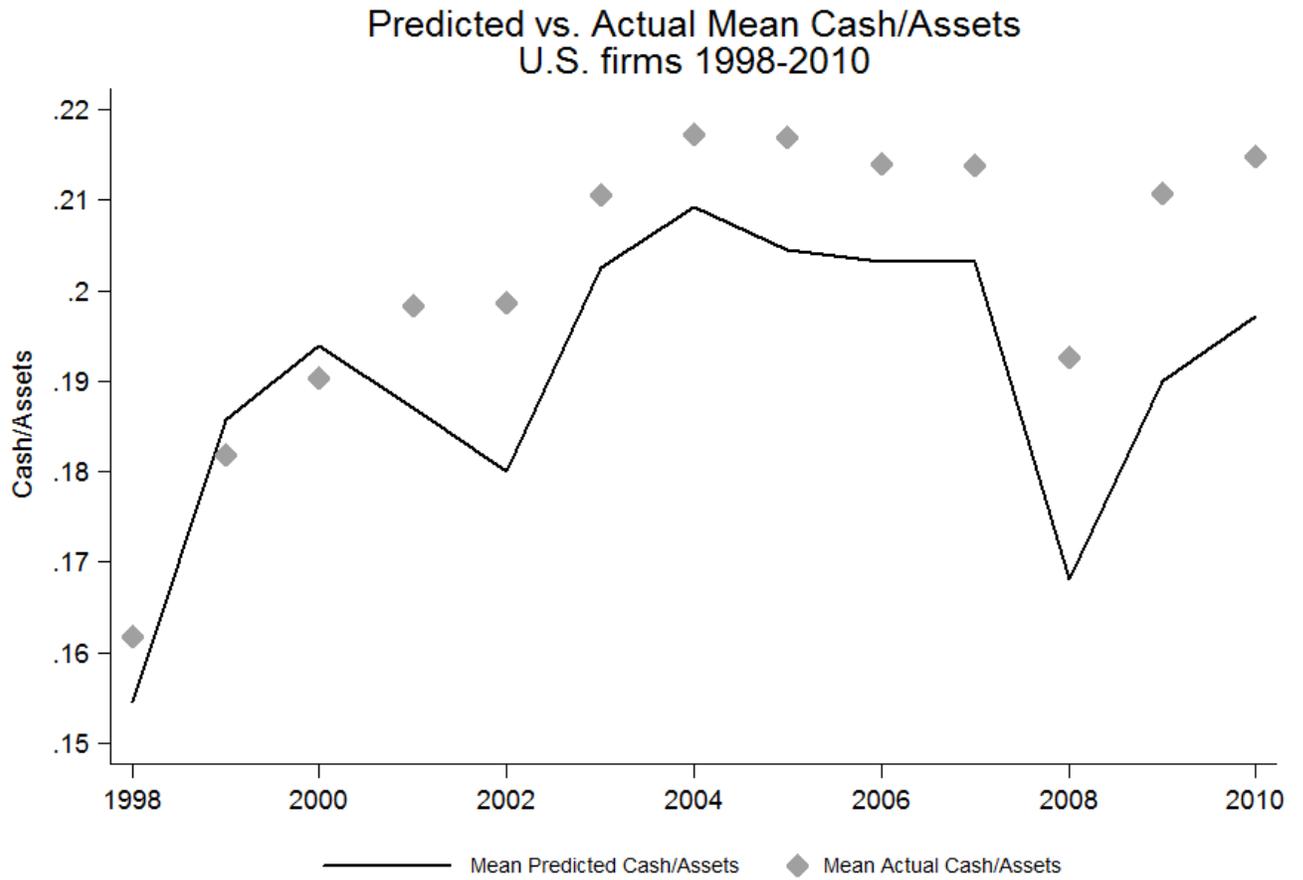
Data Appendix

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 1% 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*