Understanding Precautionary Cash at Home and Abroad

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Abstract

In the presence of market frictions, it is optimal for firms to stockpile cash to fund investment projects which may arise in the future. Prior work has documented that firms' precautionary savings motives predict variation in the size of firms' cash stockpiles. The dramatic run-up in cash stockpiles raises the question of why these precautionary motives have increased. In the presence of repatriation taxes, foreign and domestic cash are imperfect substitutes. We show that although precautionary motives explain variation in the level of cash held domestically, they provide little explanatory power for the level of foreign cash. Multinational firms' foreign cash balances are instead explained by low foreign tax rates and the ability to transfer profits within the firm through related-party sales. The firms with the greatest incentive and ability to transfer income to low-tax jurisdictions do so, and this results in stockpiles of cash trapped in their foreign subsidiaries.

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Understanding Precautionary Cash at Home and Abroad

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According to recent Flow of Funds estimates, U.S. nonfinancial corporations are sitting on an aggregate cash and marketable securities position of approximately $3 trillion (see figure 1). This staggering amount has led to policy makers and commentators expressing concern as to why firms are building such large stockpiles despite an economy in recovery and a low-interest-rate environment, which should induce greater investment.

The academic literature has largely focused on the precautionary motive for retaining cash. Due to information asymmetries that may exist in the capital markets at the same time that firms are in particular need of funds, incentives exist to build cash stockpiles that reduce firm dependency on external capital. This need for precautionary cash increases with uncertain investment needs (Martin and Santomero, 1997; Boyle and Guthrie, 2003). As the large run-up in cash is concentrated in arguably the least constrained firms (large, profitable firms with rated debt), prominent papers such as Bates, Kahle, and Stulz (2009) have focused more on the role of increasing investment uncertainty to explain this phenomenon. It is not clear, however, whether all cash is held for precautionary reasons. Where the cash is held can tell us a great deal about its purpose. Many firms' cash holdings are in risky and potentially illiquid securities (Duchin et al.,

[1] The statistical analysis of firm-level data on U.S. multinational companies was conducted at the Bureau of Economic Analysis, U.S. Department of Commerce, under arrangements that maintain legal confidentiality requirements. The views expressed in the paper are those of the authors and do not reflect official positions of the U.S. Department of Commerce. We appreciate the suggestions and advice of Sergey Chernenko, Chris Parsons, Rene Stulz, Stephen Karolyi, Laurent Fresard, and William Zeile as well as seminar and conference participants at American Finance Association, Dartmouth University, Federal Reserve Board of Governors, Northeastern University, Northwestern University, Midwest Finance Association, Ohio State, Rice University, the Securities and Exchange Commission, the Shanghai Advanced Institute of Finance, the Swiss Finance Institute, and the Universities of Cincinnati, Miami, Oklahoma, Pittsburgh, Oregon, and San Diego. The research assistance of Austin Magee and Sang Kim is greatly appreciated. Kristine Hankins also thanks the John H. Schnatter Institute for the Study of Free Enterprise for financial support.

2015). Investing excess cash in risky and illiquid securities is the obvious way to guarantee the firm has capital for valuable future investment opportunities or to minimize expected distress costs, but it may be unavailable for current investment needs. Further, many firms hold vast sums of cash overseas to defer the taxation of foreign earnings (Foley et al., 2007). Given the tax consequences of repatriating overseas cash, it is not clear that foreign cash is a perfect substitute for domestically held precautionary cash—particularly when invested in illiquid securities.

The challenge in the literature has been to differentiate between the cash held for precautionary reasons versus the cash held for tax reasons. Are firms really stockpiling $3 trillion because they anticipate needing that much for investment purposes but fear rationing? How much is instead being held due to tax incentives? Does the money held for tax purposes also provide precautionary benefits? These are the questions we explore in this paper.

Some have argued that firms do differentiate between cash and marketable securities so that bifurcation could be used to test these different explanations. However, highly liquid risk-free marketable securities are nearly perfect substitutes for cash in fulfilling precautionary motives. Therefore, distinguishing on that dimension is not helpful in illuminating how these two motivations intersect with each other. Instead, our approach is to separate along the dimension of where the cash is held: domestic versus foreign. We argue that domestic cash has no tax benefits arising from deferral of the repatriation tax since corporate taxes (domestic and foreign) have already been paid on these funds. Thus, the benefits of holding cash in the U.S. are to provide operational liquidity and fund precautionary savings.

On the other hand, foreign cash is almost entirely subject to incremental taxation by the U.S. Equity infusions from the U.S. parent into foreign subsidiaries do not generate tax implications if that capital is returned. However, any distribution of foreign earnings is subject to

tax at the positive rate differential between the U.S. tax rate and the foreign tax rate. The high U.S. corporate tax rate means that almost all foreign operating income would generate incremental tax upon repatriation to the U.S. (Graham, Hanlon, and Shevlin, 2015).

We do not know whether foreign cash also serves as precautionary savings. On the one hand, this money is available in times of capital rationing. On the other hand, should those funds be needed domestically, the firm would need to pay the incremental tax resulting from the repatriation that would occur in order to invest those funds domestically. Note that while firms can structure a transaction avoiding repatriation tax if the proceeds are located in one non-U.S. subsidiary and needed in another non-U.S. subsidiary, should the funds return to the U.S., they will almost always be subject to tax. Depending upon the location of the funds (some foreign countries have no tax on corporate income, making the repatriation tax rate 35%), firms may find that the incremental tax exceeds the positive NPV of the investment and they optimally forgo the investment if only foreign funds are available. If this is the case, foreign cash serves as an imperfect substitute for domestic cash. They are substitutes for funding foreign investment but not domestic investment. This generates the empirical question of how important precautionary motives are in explaining foreign cash holdings.

This separation between domestic and foreign cash is not historically possible using publicly available data sources. While some firms recently have voluntarily disclosed their foreign cash position (Harford et al., 2015), the selectively released data are limited both in scope and length. Therefore, the literature has not so far separately estimated the determinants of domestic versus foreign cash positions. The Bureau of Economic Analysis (BEA) conducts a mandatory survey of U.S. multinational companies that generates the data that are needed to

address this shortcoming.[2] From this survey, we are able to measure how much cash and marketable securities firms are holding in each foreign subsidiary. Combining this with the disclosure of their total cash and marketable securities position (from Compustat), we are able to calculate how much cash is held domestically.

We proceed by first regressing the total cash position of the firm on variables that have previously been documented to explain some of the observed cross-sectional variation in corporate cash positions (Opler et al., 1999; Bates, Kahle, and Stulz, 2009). After showing that the baseline specifications are similar to what has been found in the prior literature, we replicate these specifications separately for the cash held domestically and the cash held abroad. The results are striking. The aggregate cash position is explained by a variety of firm characteristics associated with precautionary motives, such as growth opportunities and leverage. It also is inversely related to the Faulkender and Smith (2015) effective tax rate (an average of the U.S. and foreign tax rates which firms face given the location of their foreign operations). Firms with higher average tax rates hold less cash.

Breaking out the domestic and foreign cash positions separately provides additional insight. For multinationals, the effective tax rate does not explain domestic cash levels. However, for foreign cash holdings, the estimated coefficient is highly negative, both economically and statistically. This implies that firms with lower effective tax rates hold more foreign cash, consistent with the Foley et al. (2007) argument that if firms are confronting lower tax rates abroad, their repatriation tax is higher, and this incentivizes the stockpiling of foreign cash. A firm's strategic choice to reduce its effective tax rate is something we will discuss below, but this divergence between drivers of foreign and domestic cash is consistent with firms moving cash

[2] The company-level data from this mandatory survey, which by law are confidential, are collected for the purpose of producing publicly available aggregate statistics on the operations of multinational companies.

abroad when there is less need for precautionary cash. Importantly, proxies for precautionary motives are not relevant for explaining foreign cash. Precautionary motives are the main drivers of firms' domestic cash levels. The variables used in the prior literature to measure firms' capital constraints and risk, and which have predicted total cash, also predict domestic cash. A firm's effective marginal tax rate (the foreign tax rate it faces) has little ability to explain the firm's domestic cash holdings. Our results show that the factors that explain domestic and foreign cash holdings are quite distinct.

After isolating the precautionary motives for holding cash, we are able to delve further into the tax motives. Often, overseas cash held by U.S. firms is referred to as trapped. Yet there is broad evidence that intellectual property royalties and transfer payments facilitate the offshoring of income to low-tax jurisdictions (Grubert and Mutti, 1991; Levin and McCain, 2013; Kanter, 2014). Firms with intellectual property, whether it consists of patents, trademarks, or licensing deals, may be able to adjust the ownership and within-firm pricing of the IP to transfer revenues from higher-taxed regions to affiliates in low-tax havens. This transfer pricing is a deliberate relocation of earnings to affiliates and contrasts with the notion that trapped overseas cash is a byproduct of international business activity. Specifically, we calculate how much the revenue of the firm's subsidiaries is generated by sales to other subsidiaries. Under the hypothesis that firms structure the location of their intellectual property to take advantage of low corporate income tax rates in some foreign jurisdictions, we expect firms with subsidiaries in low-tax jurisdictions to do more internal (affiliated) sales. This enables them to move earnings to lower-tax countries, but also results in larger cash and marketable securities portfolios held abroad—now "trapped" in low-tax subsidiaries. That is exactly what we find. Further examination reveals that this result is entirely explained by firms engaged in significant R&D.

The result does not hold for firms which are not engaged in R&D. Firms with intellectual property have the greatest ability to control their taxes using within-firm transfers.

The rest of this paper is organized as follows. Section 1 describes our data and empirical strategy. Section 2 presents our results, while the channel of affiliated sales and transfer pricing is explored in section 3. The final section concludes.

Empirical Strategy and Data

Empirical Design

Our objective is to better understand the increases in firms' liquidity positions that have been observed recently. In particular, we explore how much of the significant cash positions of firms is explained by concerns about the accessibility of external capital (precautionary savings) relative to the portion that is arising from international tax considerations. To distinguish between these factors, we estimate the factors which explain a firm's level of domestic and foreign cash, and thus can test whether the motivations that drive firms to stockpile cash are the same for domestic and foreign cash.

Our approach is to first establish a baseline regression specification that draws from many of the factors that have been previously identified to explain cash holdings. We estimate the total cash holdings of firms (as a percentage of their book assets) as a function of standard determinants of cash similar to Bates, Kahle, and Stulz (2009). Specifically, we control for firm size (as measured by the natural log of sales), whether the firm has a bond rating, asset tangibility (the PP&E-to-book assets ratio), profitability (return on assets), R&D to sales, advertising to sales, market-to-book, book leverage, and capital expenditure to assets. After reconciling our estimates with those that have been previously documented for total cash, we

move to separately estimating this specification for the cash that is held in the U.S. and for the cash that is held abroad. The domestic cash specification is estimated both for all firms and just for those that have international operations (multinational corporations, or MNCs).

Since precautionary savings are motivated by concerns about financial constraints, our examination includes additional factors that have previously been employed to identify the extent to which firms may be currently financially constrained or concerned about becoming constrained in the future. Following Faulkender and Petersen (2012), we measure the likelihood that firms' internally generated cash may have been insufficient to fully fund their investment opportunities. Specifically, we take the percentage of the previous three years of the firm's earnings before interest, taxes, depreciation, and amortization (which is after advertising and R&D) less capital expenditures. The higher this percentage, the more likely it is that firms have had investment opportunities that have been forgone. Arguably firms with sufficient operating cash flow to fund investment should not be capital constrained. Anticipating such investment needs, these firms are more likely to build precautionary savings reserves when capital markets are accessible.

We follow the recent literature and include two distinct measures of risk in our precautionary savings specifications. Following Bates, Kahle, and Stulz (2009), we include the industry cash flow risk. For each two-digit SIC group, we calculate a 10-year moving average of the standard deviation of cash flow from assets. This measure captures historical evidence of cash flow volatility. We also include a forward-looking measure of risk which affects the need for precautionary cash. We capture changing product market threats using the product market fluidity measure from Hoberg, Phillips, and Prabhala (2014), which is found to affect cash balances. The fluidity measure uses text analysis of product descriptions of both a firm and its

rivals to measure the dynamics of a firm's product market competition. Higher overlapping word use indicates a greater threat and, thus, fluidity is a forward-looking measure of risk (details are available on Hoberg's website).

Moving to the tax motivations of cash holdings, we follow Faulkender and Smith (2015) and use an international blended tax rate. The measure is a weighted average of the marginal statutory tax rate (based on the firm's EBIT). The weights are the percentage of EBIT (earnings before interest and taxes) generated in each affiliate in the corresponding fiscal year in the specified tax jurisdiction of that affiliate (subsidiary). So if 50 percent of EBIT in 2006 were generated in the United States, 30 percent in the Irish foreign affiliate, and the remaining 20 percent in the German affiliate, the estimated tax rate for 2006 for this firm is

$$\tau_{\text{Firm},2006} = 50\%\,\tau_{\text{US},2006} + 30\%\,\tau_{\text{Ireland},2006} + 20\%\,\tau_{\text{Germany},2006}\,. \qquad (1)$$

This blended tax rate represents our estimate of the tax rate confronting firms prior to using interest expense to shield such income from taxation. As this weighted average rate increases, we would expect the firm to hold less foreign cash because the realized deferral benefits are lower. Stated differently, it is the firms that generate the greatest amount of earnings in low-tax jurisdictions that would most benefit from deferring repatriation and stockpiling the foreign earnings in cash and marketable securities. Finding a negative relationship between a firm's worldwide average tax rate and its cash holdings would provide evidence consistent with this hypothesis (e.g., Foley et al., 2007).

The next question is to determine which kinds of firms are best able to manage their operations in a way that mitigates taxes and thus results in trapped cash. Anecdotally, there is evidence that the effect is particularly pronounced in firms with high intellectual property that are able to utilize transfer pricing and royalty payments to move earnings from high-tax to low-

tax jurisdictions. We therefore would expect that the firms that have significant sales from one subsidiary to another, relative to external sales, are those most able to engage in this type of international tax planning. We construct a measure equal to the percentage of the firm's total revenue accounted for by sales of its foreign subsidiaries to either the parent company or to related subsidiaries. We hypothesize that the tax effect should be greatest among those firms that are particularly adept at using affiliated sales to move income across various tax jurisdictions.

Data Sources

The challenge associated with engaging in any of these analyses is the lack of publicly available data regarding the international operations of firms. The information disclosed in firms' 10-Ks is entirely too coarse to understand where firms are operating, the tax jurisdiction to which they are subject, and the amount of cash and marketable securities they hold in these various locations. Fortunately, the Bureau of Economic Analysis (BEA) conducts an annual survey of U.S. multinationals that contains numerous balance sheet and income statement items for each foreign affiliate of a U.S.-based multinational firm. The U.S. multinationals are required by law to complete the survey. We use the BEA multinational affiliate data to measure the portion of a firm's total cash which is held domestically or in one of its international affiliates.

Specifically we employ data from the BEA's benchmark (BE-10) and annual surveys (BE-11) of U.S. multinational companies, which include information on the assets and profitability of the foreign affiliates of multinational firms.[3] Because we are interested in the

[3] The benchmark (BE-10) survey, conducted every five years (1994, 1999, 2004, and 2009), has more comprehensive coverage of the accounting data for the smaller foreign subsidiaries than the annual (BE-11) survey, which is conducted in interim years. The BEA estimates these accounting items for the intervening four years between the comprehensive surveys. Our results are robust to confining our analysis to only the years in which the more comprehensive survey is conducted.

cash allocations of firms as well as variation in the foreign tax rates multinational firms confront, our firm-year observations are limited to the years during which the necessary data were gathered. These data are available from 1998 to 2008. Using these data, we are able to measure the amount of cash and estimate the marketable securities held in their foreign subsidiaries. The annual survey (BE-11) explicitly includes the amount of cash in each foreign subsidiary as well as inventory and "other current assets." To estimate the marketable securities which are contained in other assets, we subtract out an estimate of the subsidiaries' accounts receivable from other assets by assuming the accounts receivable-to-sales ratio is the same across the firm. Our estimate of the cash and marketable securities is thus[4]

$$\text{Cash}+\left[\text{Other current assets}-\left(\frac{\text{Accounts Receivable}_{\text{firm}}}{\text{Sales}_{\text{firm}}}\right)\text{Sales}_{\text{Subsidiary}}\right]. \qquad (2)$$

This approach assumes the rest of other assets is marketable securities, as a first pass. The difference between the total cash position of the firm and the sum of the cash in its foreign affiliates is our estimate of the domestic cash position of firms each year.[5] We replicate our results using only cash, opposed to our estimate of cash and marketable securities from equation 2, and the results are essentially the same. These results are available in the online appendix.

We also use these data to construct our estimate of the average worldwide tax rate confronting these firms (equation 1). Following Faulkender and Smith (2015), we use tax code

[4] If this value is less than the reported cash value, we use the reported cash value.

[5] As the benchmark (BE-10) surveys differ from the annual BE-11 surveys, we estimate cash and marketable securities differently in these years. In the benchmark years, our estimate is cash plus other current receivables plus other current assets (which includes certificates of deposit) plus other equity investments (which includes the noncurrent portion of marketable securities, cash on deposit, CDs, and additional equity investments). In the annual surveys (BE-11) these variables are combined in other current assets along with accounts receivables. Thus in the annual survey, we subtract out an estimate of accounts receivable for consistency (see equation 2). In a small number of cases, our estimate of foreign cash is greater than total cash. In these cases, we define total cash as equal to foreign cash and domestic cash as zero. Dropping these observations does not alter our main results.

information for foreign jurisdictions provided by Comtax for the years 2006 to 2008. For the period 1998 to 2005, we utilize data from the KPMG Corporate and Indirect Tax Survey. For all other control variables, we use the Compustat data that are provided by Standard & Poor's based upon annual 10-K filings. Control variables—including firm size (the natural logarithm of sales), profitability (EBIT over book assets), asset tangibility (the ratio of PP&E to book assets), growth opportunities (measured by the ratio of R&D to sales and the market-to-book ratio), and whether the firm has a bond rating any month during the fiscal year—are from Compustat. All of these measures are winsorized at the 1st and 99th percentiles.

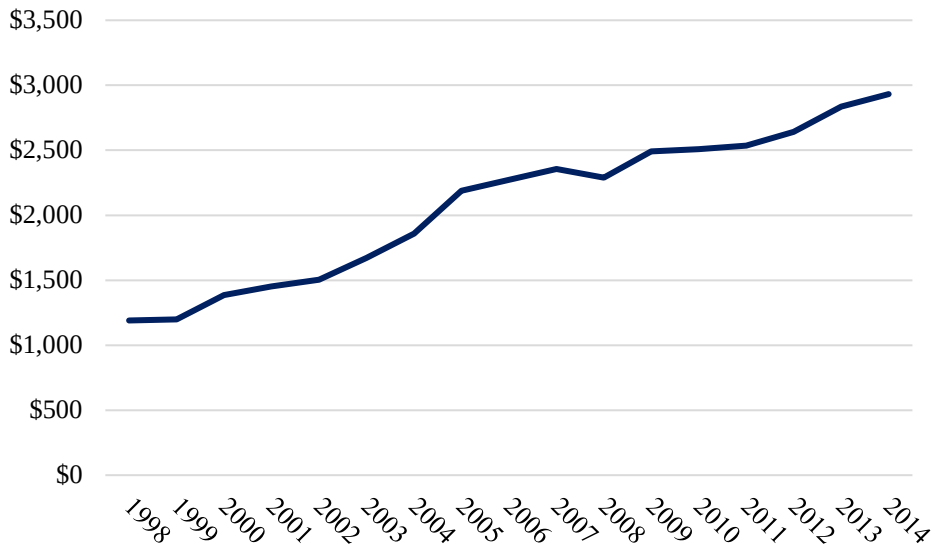
Summary Statistics: Location and Magnitude of Cash Holdings

We know firms have significant cash holdings. Based on the Federal Reserve's Flow of Funds, the total cash and marketable securities on the balance sheet of U.S. firms has risen from under $1 trillion in 1998 to over $3 trillion by 2014 (see figure 1). Relative to GDP cash has risen almost 50 percent over this time period. This consistent and persistent rise in cash levels is difficult to reconcile with a purely precautionary motive. For the rise in cash to be solely due to the precautionary motivations the risk which firms face must have been rising consistently over the last two decades. The increase in risk prior to the financial crisis (2008) would have to be similar to the rise after the financial crisis to explain figure 1.

For the average firm, most of their cash is held domestically (see table 1, full sample). This observation arises for two reasons. First, a large fraction of the firms in Compustat do not have foreign operations, and thus their foreign cash is zero. When we examine multinational firms (MNCs), the amount of cash held abroad is larger but is still only 42 percent for the average firm (see table 1, multinationals sample). A second reason it appears that most cash is

held domestically is the correlation between firm size and having foreign operations. The larger size of firms with foreign operations means that the fraction of cash held abroad is even larger when we weight the data by firm size or when we look at cash opposed to cash relative to assets for each firm (table 1). Although the average firm holds 42 percent of its cash abroad (weighting firms equally), 64 percent of the cash of MNCs is held abroad over our sample period (weighting each dollar equally). This implies that the cash holdings are concentrated.

Figure 1: Aggregate Corporate Cash – Flow of Funds



Notes: The data are from the Federal Reserve Flow of Funds, Table L. 102 Nonfinancial Business (December 15, 2015). We summed rows 2 through 11. This includes checking and savings accounts of nonfinancial businesses as well as investment in debt securities (e.g., commercial paper, government bonds, and loans). The data are from 1998 to 2014.

Foreign and domestic firms differ by more than size. Compared to domestic firms, firms with foreign operations are more profitable, have lower market-to-book ratios, are more likely to pay dividends, are more likely to have access to the bond market (e.g., a bond rating), and invest less in R&D. These are variables that are normally associated with greater capital market access,

not less. Before turning to explanations of firms' cash holdings, it is useful to examine where most of the cash is held (e.g., by industry and location).

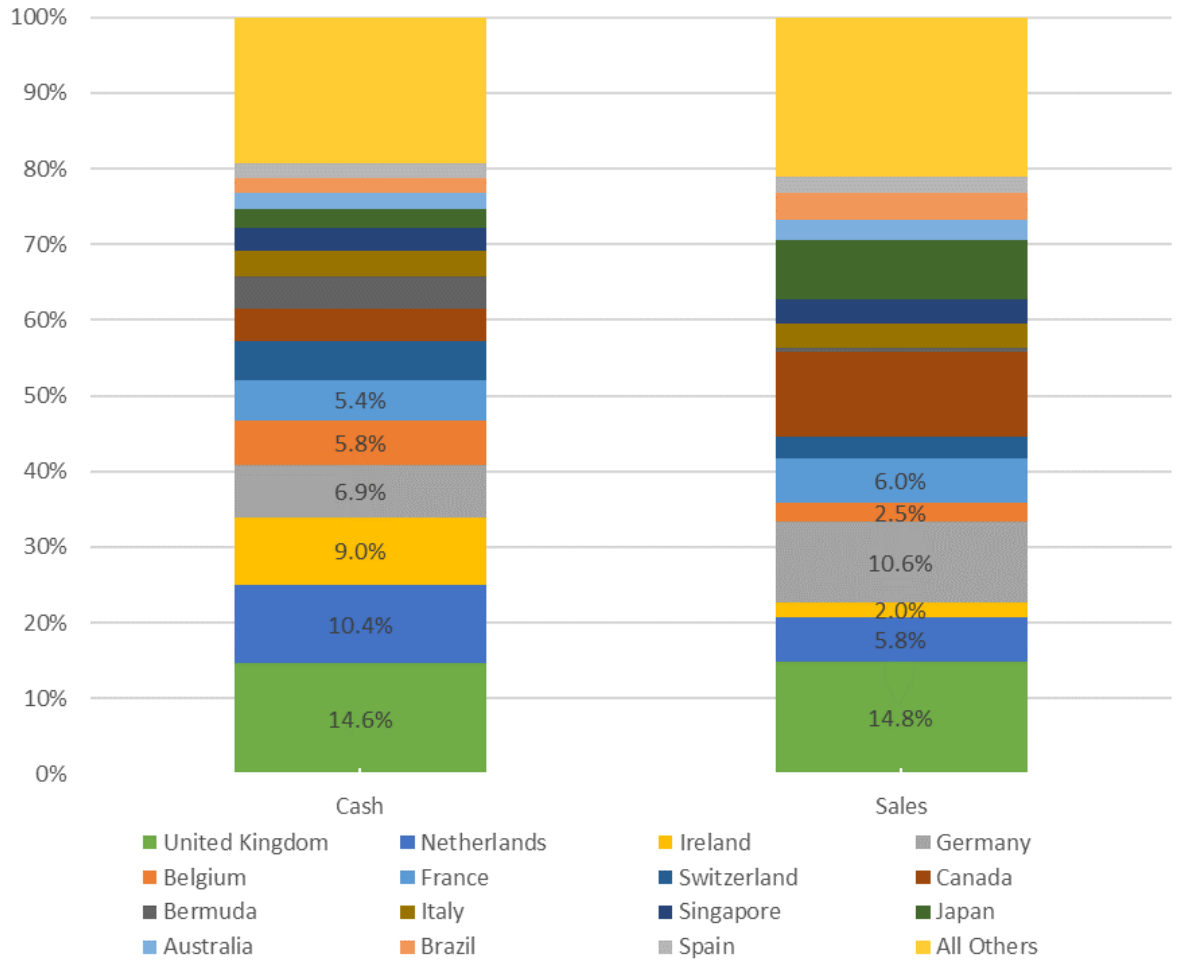
Table 1: Summary Statistics

Variable	Full Sample		Multinationals	
	Mean	Standard Deviation	Mean	Standard Deviation
Foreign Cash to Assets	0.015	0.248	0.089	0.147
Domestic Cash to Assets	0.210	0.245	0.122	0.179
Total Cash to Assets	0.225	0.249	0.211	0.206
Effective Tax Rate	0.347	0.022	0.330	0.051
Ln(Sales)	4.788	2.505	6.656	1.982
Firm Has Bond Rating	0.209	0.406	0.453	0.498
PPE to Assets	0.276	0.247	0.250	0.193
Return on Assets	−0.018	0.322	0.104	0.152
Firm Pays Dividends	0.325	0.468	0.480	0.500
R&D to Sales	0.199	0.597	0.073	0.245
Market-to-Book	3.179	3.151	2.275	2.128
Book Leverage	0.380	0.502	0.372	0.384
Capital Expenditure/Assets	0.066	0.093	0.049	0.053

Notes: This table contains the means and standard deviations of the foreign, domestic, and total cash-to-assets ratios as well as the control variables used in the analysis. The statistics are provided for both the full sample over the panel's sample period as well as for only those in the BEA multinational survey. Data definitions can be found in the text.

Lower tax rates in some foreign jurisdictions create an incentive to earn income and thus stockpile cash in these countries. However, firms also earn income and thus may stockpile cash in a country for strictly economic reasons (this is where the business and investments are located). Our data allow us to identify not only that the cash is held abroad but also to identify the countries in which the foreign subsidiaries are located. In figure 2, we report the percentage of foreign cash held in the top 15 countries in 1998 in the bar graph on the left. The bar graph on the right reports the fraction of sales by the foreign subsidiaries of U.S. MNCs that originate in each country. The countries are sorted in both bar graphs by the fraction of foreign cash in the country, with the countries with the most cash listed at the bottom of the bar. Among the

Figure 2: Distribution of Cash and Sales across Subsidiary Countries (1998)

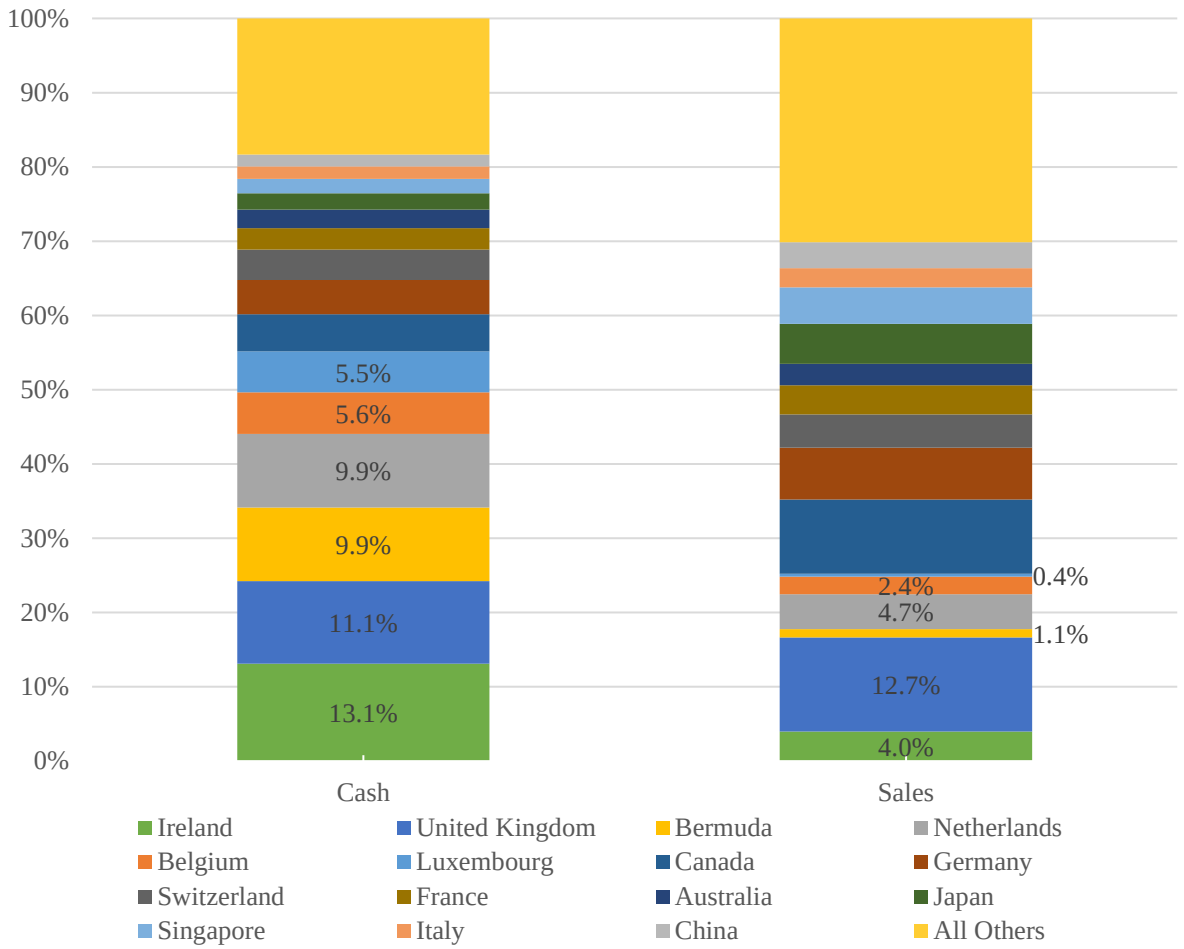


Notes: The percentage of foreign cash (left bar graph) and sales (right bar graph) which is held in the foreign subsidiary of U.S. multinationals in 1998 is graphed above. All foreign countries in the data set are included, and the 15 countries with the highest level of cash are labeled. In both columns the countries are sorted by the fraction of cash held in 1998. Thus foreign subsidiaries in the United Kingdom held the most cash in 1998. The United Kingdom subsidiaries held 14.6 percent of foreign cash, and 14.8 percent of foreign sales were made by subsidiaries located in the United Kingdom.

countries with high cash balances, we see large economies (e.g., the United Kingdom, Germany, France, Canada, and Japan), where we would expect U.S. multinationals to conduct significant business, as well as smaller countries (e.g., the Netherlands, Ireland, Belgium, and Bermuda), which we might expect to be a smaller fraction of U.S. firms' foreign operations. The fraction of foreign cash and the fraction of foreign sales are relatively similar across countries. For example,

subsidiaries located in the United Kingdom hold the largest fraction of foreign cash in 1998 at 14.6 percent, and these subsidiaries generated 14.8 percent of all foreign sales in 1998.

Figure 3: Distribution of Cash and Sales across Subsidiary Countries (2008)

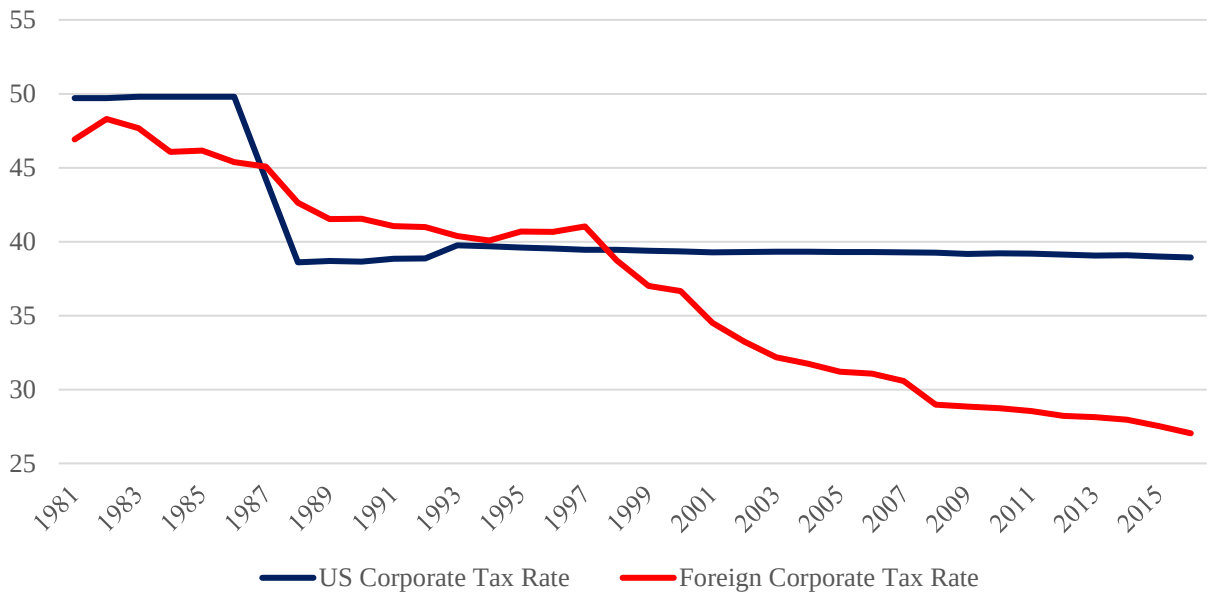


Notes: The percentage of foreign cash (left bar graph) and sales (right bar graph) which is held in the foreign subsidiary of U.S. multinationals in 2008 is graphed above. All foreign countries in the data set are included, and the 15 countries with the highest level of cash are labeled. In both columns the countries are sorted by the fraction of cash held in 2008. Thus foreign subsidiaries in Ireland held the most cash in 2008. The Irish subsidiaries held 13.1 percent of foreign cash, and 4.0 percent of foreign sales were made by subsidiaries located in Ireland.

The allocation of foreign cash changed by 2008 (see figure 3). Ireland moved from third-highest allocation of foreign cash to first (9.0% of foreign cash to 13.1%). Other countries that moved up in the rankings include Bermuda (4.2% to 9.9% of foreign cash) and Luxembourg

(less than 1.9% to 5.5%). These three countries have significantly higher percentage of cash than percentage of sales. For example, Irish subsidiaries held 13.1 percent of the cash, but generated only 4.0 percent of the sales in 2008. Part of the shift between 1998 and 2008 is firms increasing their stockpile of cash in countries that had low tax rates even in 1998. Part of the shift is due to some countries lowering their corporate tax rate and thus becoming more desirable locations to earn income on a tax basis (see figure 4). For example between 1998 and 2008, the effective tax rate dropped from 32 percent to 12.5 percent in Ireland and from 35 percent to 24.3 percent in

Figure 4: Corporate Tax Rates: U.S. and Foreign Rates



Notes: The figure graphs the top U.S. corporate tax rate and the average corporate tax rate across the following foreign countries: Australia, Belgium, Canada, Ireland, Italy, France, Germany, Japan, Luxembourg, the Netherlands, Switzerland, and the United Kingdom. These are the countries in the top 15 of cash holdings (see figure 2) where the tax-rate data were available from the OECD website.[6]

[6] http://www.oecd.org/tax/tax-policy/tax-database.htm#C_CorporateCaptial (before 2000) and http://stats.oecd.org//Index.aspx?QueryId=58204 (2000 and after). The data for Japan are not reported before 1990 and for Luxembourg before 2000. These countries are excluded from the average in these years.

the Netherlands, and even Germany's rate dropped from 56.6 percent to 30.9 percent.[7] The greater difference between U.S. tax rates and foreign tax rates and possibly firms' greater ability to shift income across countries may have led to the changes we see between figures 2 and 3.

Table 2 highlights these changes in tax rates. It presents the statutory tax rate for every country included in figures 2 and 3 for both 1998 and 2008. The four (or six) locations with the most cash change over time. In 1998, multinationals concentrate cash holdings in countries with average tax rates above 35 percent, but, by 2008, the cash is concentrated in locations with an average tax rate below 21 percent. There also is a growing disconnect between sales and cash. In 1998, cash and sales are similar in countries where multinationals hold the most cash. By the end of the sample, sales are less concentrated in those locations with high cash holdings. We now turn to an analysis of the determinants of cash holdings both domestic and foreign.

Determinants of Cash Holdings and Location

Precautionary Motives

Our first set of regressions examines the total cash and marketable securities of the firms in our sample as a function of firm characteristics that have previously been shown to explain the cash position of firms. As we investigate the determinants of firms' cash holdings, we will examine variation across firms with and without foreign operations. Among the firms with foreign operations, we can examine the determinants of their domestic and foreign cash holdings. Consistent with prior work such as Bates, Kahle, and Stulz (2009), we find evidence of a

[7] These tax rates are taken from the OECD website and represent the top corporate tax rate: http://stats.oecd.org//Index.aspx?QueryId=58204 and http://www.oecd.org/tax/tax-policy/tax-database.htm#C_CorporateCaptial.

Table 2: Cash, Sales, and Geography

1998				2008			
	Cash	Sales	Tax Rate		Cash	Sales	Tax Rate
United Kingdom	14.60%	14.80%	27.30%	Ireland	13.10%	4.00%	12.50%
Netherlands	10.40%	5.80%	35.00%	United Kingdom	11.10%	12.70%	26.10%
Ireland	9.00%	2.00%	32.00%	Bermuda	9.90%	1.10%	0.00%
Germany	6.90%	10.60%	56.60%	Netherlands	9.90%	4.70%	24.30%
Belgium	5.80%	2.50%	37.20%	Belgium	5.60%	2.40%	31.10%
France	5.40%	6.00%	41.70%	Luxembourg	5.50%	0.40%	0.00%
Switzerland	5.10%	2.90%	27.80%	Canada	5.00%	10.00%	30.90%
Canada	4.30%	11.10%	44.60%	Germany	4.60%	7.00%	30.90%
Bermuda	4.20%	0.60%	0.00%	Switzerland	4.10%	4.50%	7.80%
Italy	3.50%	3.10%	33.00%	France	2.90%	3.90%	34.40%
Singapore	2.90%	3.20%	26.00%	Australia	2.50%	2.90%	30.00%
Japan	2.60%	7.80%	51.60%	Japan	2.20%	5.40%	43.00%
Australia	2.10%	2.80%	36.00%	Singapore	1.90%	4.90%	18.00%
Brazil	2.00%	3.60%	25.00%	Italy	1.70%	2.60%	27.50%
Spain	1.90%	2.10%	35.00%	China	1.60%	3.50%	25.00%
All Others	19.30%	21.00%		All Others	18.30%	30.20%	
Top 4 Countries	40.90%	33.30%	37.70%	Top 4 Countries	44.00%	22.50%	15.70%
Top 6 Countries	52.10%	41.80%	38.30%	Top 6 Countries	55.10%	25.30%	20.40%

Notes: This table contains statistics at the country-subsidiary level as well as aggregated for the four (or six) countries with the most cash. It reports the percentage of foreign cash (first column for each time period) and sales (second column) which is held in the foreign subsidiary of U.S. multinationals. All foreign countries in the data set are included, and the 15 countries with the highest level of cash are reported individually for each time period. In both 1998 and 2008, the countries are sorted by the fraction of cash held in that year. Thus foreign subsidiaries in the United Kingdom held the most cash in 1998, and 14.8 percent of foreign sales were made in subsidiaries located in the United Kingdom. In 2008, foreign subsidiaries in Ireland held the most cash in 2008, but only 4.0 percent of foreign sales were made by subsidiaries located in Ireland. Tax rate is the country's statutory tax rate as per Faulkender and Smith (2016).

Table 3: Baseline Cash Regressions

	I	II	III	IV	V
	Total Cash	Total Cash	Domestic Cash	Domestic Cash	Foreign Cash
	All Firms	MNC	All Firms	MNC	MNC
Effective Tax Rate	-0.720*	-0.701*	0.085	0.060	-0.761*
	(0.072)	(0.074)	(0.047)	(0.048)	(0.076)
Ln(Firm Sales)	-0.016*	-0.006[1]	-0.017*	-0.012*	0.006[1]
	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)
Has Bond Rating	0.010[1]	0.003	0.007	-0.005	0.008
	(0.004)	(0.008)	(0.003)	(0.007)	(0.006)
PPE/Book Assets	-0.319*	-0.270*	-0.311*	-0.198*	-0.072*
	(0.006)	(0.017)	(0.006)	(0.013)	(0.014)
Return on Assets	0.027*	-0.077[1]	0.032*	-0.009	-0.068[5]
	(0.006)	(0.029)	(0.005)	(0.023)	(0.032)
Firm Pays Dividends	-0.013*	-0.028*	-0.015*	-0.035*	0.007
	(0.003)	(0.006)	(0.003)	(0.005)	(0.005)
R&D/Sales	0.136*	0.202*	0.136*	0.202*	0.001
	(0.003)	(0.017)	(0.003)	(0.018)	(0.011)
Market/Book	0.004*	0.009*	0.004*	0.009*	-0.000
	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)
Book Leverage	-0.097*	-0.104*	-0.096*	-0.103*	-0.001
	(0.003)	(0.009)	(0.003)	(0.008)	(0.006)
Capital Exp/Sales	0.082*	0.217*	0.075*	0.149*	0.068
	(0.011)	(0.042)	(0.011)	(0.035)	(0.036)
Domestic Firm	-0.016*		0.057*		
(1 if yes)	(0.004)		(0.004)		
Observations	78,103	13,113	78,103	13,113	13,113
R^2	0.392	0.305	0.412	0.336	0.094

Notes: The table contains regressions of the ratio of the firm's cash to book assets on a set of firm characteristics. Cash is total cash (columns I and II), domestic cash (columns III and IV), and foreign cash (column V). The entire sample is included in the regression in columns I and III. Only multinational firms (MNCs) are included in the sample in columns II, IV, and V. Each regression contains year dummies. Standard errors are clustered by firm. Statistical significance at the 0.1, 1, and 5 percent levels is reported as superscripts *, 1, and 5, respectively.

precautionary motive for stockpiling cash when we look at the total cash firms hold, independently of where they hold it. The results are broadly consistent if we examine all firms (see table 3, column I) or only multinational firms (firms with foreign profits; see table 3, column

II). Firms that are larger, have greater asset tangibility (PPE to book assets), pay dividends, conduct less R&D, and have lower market-to-book ratios and higher leverage ratios all hold less cash. Traditionally, these results have been interpreted as consistent with the precautionary savings motivation as these characteristics are associated with firms that are less likely to be capital rationed and would therefore derive less benefit from stockpiling cash. These patterns hold for both the full sample as well as the subsample of multinational firms, and the coefficients are broadly of the same magnitude. In addition, the coefficient on our estimated tax-rate variable is negative and statistically significant, consistent with Foley et al. (2007), implying that those firms confronting lower average tax rates hold more (trapped) cash. Remember however that variation in our estimated tax rate comes entirely from the portion of a firm's earnings that are realized overseas and the tax rate in the countries in which those earnings are generated. Although this coefficient is consistent with foreign taxes influencing the total amount of cash a firm holds, as we will discuss below, the story is richer.

Given the results are consistent with the previous literature, we now can examine whether the determinants of cash holdings are the same for domestic and foreign cash holdings. In the remaining columns of table 3, we run the regressions for domestic and foreign cash separately. The first thing to note is that many of the variables which are related to precautionary motives are relevant only for explaining the domestic cash held by multinationals. The precautionary savings motivations are a significant determinant of the observed variation in the domestic cash and marketable securities positions of firms, whether we look at all firms (table 3, column III) or only multinational firms (column IV). As with total cash, firms that are larger, pay dividends, have greater asset tangibility (PPE to book assets), and have more debt in their capital structure

hold less domestic cash.[8] Firms that engage in significant R&D and have high market-to-book ratios hold significantly larger domestic cash positions.[9] These results are consistent with the types of firms most likely to be rationed, holding more domestic cash to mitigate potential underinvestment that may result from such rationing.

Interestingly, these precautionary savings motivations do not explain variation in foreign cash holdings. We see that many of the firm characteristics that explained domestic cash (column IV) and are often interpreted as associated with precautionary savings motivations have little predictive power in explaining a firm's foreign cash positions (table 3, column V). The coefficients either shrink, lose statistical significance, or in one case (firm size) flip signs. Firms with more tangible assets hold less foreign cash, although the coefficient is 77 percent smaller. Our growth proxies (the R&D-to-sales ratio and the market-to-book ratio) and whether a firm pays a dividend have estimated coefficients that are appreciably smaller economically and no longer statistically different from zero (even though the standard errors are the same or smaller). For example, the R&D coefficient has decreased to effectively zero. In addition, variables explaining capital rationing like whether the firm pays dividends and its leverage ratio have shrunk in magnitude and are no longer statistically significant. Precautionary motives are an important determinant of a firm's domestic cash holdings (whether a firm is multinational or not), but not of a firm's foreign cash holdings.

[8] If we do not include the firm's leverage, these results are even stronger (the coefficients are larger in magnitude). Results are available from the authors.

[9] Based on the estimates from table 3, column III (all firms), increasing the market-to-book ratio by 3.151 (the standard deviation from table 1, column II) increases domestic cash by 1.3 percent of the book value of assets (0.004 * 3.151), while increasing R&D by one standard deviation (0.597 from table I, column II) leads to an 8.1 percent increase in cash to assets. These numbers can be compared to the average domestic cash-to-asset ratio of 21 percent (table 1).

Tax Rate Effects

When we examined total cash holdings, we found that the tax rate was negatively correlated with firms' cash holdings. Firms with higher tax rates hold less cash. When we examine domestic and foreign cash we find very different results. Higher tax rates are associated with slightly higher, not lower, domestic cash levels whether we examine the entire sample (column III) or only multinationals (column IV). The coefficient switches signs, drops appreciably in magnitude, and is no longer statistically different from zero.[10] The effect of taxes which we found for total cash is driven completely by the foreign cash holding of MNCs. MNCs with lower effective tax rates hold more cash abroad as is expected given the cross-sectional variation in the cost of repatriating foreign earnings. The coefficient estimate in column V implies increasing the effective tax rate by 5.1 percentage points (the standard deviation from table 1) reduces the cash-to-assets ratio by 3.9 percentage points.[11]

Capital Constraints

To the extent that the precautionary savings motivation explains cash holdings, these findings should be particularly acute for the firms most likely to confront capital constraints. Thus, we

[10] In the total sample regressions, we also include a dummy variable which is equal to one if the firm is domestic (has no foreign operations) and zero otherwise. The coefficient in column III is 0.056, meaning domestic firms have cash holdings which are 5.6 percent of book assets greater then foreign firms holding all other variables constant. MNCs have less domestic cash, all else being equal, and have more cash held abroad (by construction). Since the average Effective Tax Rate is higher for domestic firms than MNCs, if we included this effect the result would be even larger. MNCs' total cash, controlling for firm characteristics, is slightly smaller than domestic firms (β=−0.015; table 3, column I). The simple averages in table 1 show the same result. This is inconsistent with the summary statistics of Pinkowitz, Stulz, and Williamson (2015), which suggest MNCs hold more cash.

[11] How much of the rise in cash we see in figure 1 is due to changes in the independent variables versus a systematic rise in cash (unrelated to change in the explanatory variables)? The time dummies, which are included in table 3, can help answer this question. For the regressions based on the full sample (columns I and III), the time dummies imply an increase in the cash-to-asset ratio of about 2 percent above and beyond any changes in the precautionary savings or tax variables. The time dummies in the foreign cash regression (column V) show variability over the sample period (from −0.5 percent to 1.0 percent, but there is no systematic increase over the sample period. Thus, any change in the level of foreign cash is driven by changes in the independent variables.

reexamine our results by adding in the Faulkender and Petersen (2012) measure of capital constraints that captures whether a firm's investment expenditures exceed their internally generated funds. Recognize that if firms' operations are sufficient to fund all of their investment opportunities, then they need not rely on external capital or an internal stockpile. However, for those firms with investment expenditures in excess of their internally generated funds, they are likely to stockpile cash when capital markets are accessible and then hold this cash and marketable securities should they need it to fund investment in the future. We add this variable to our baseline specification and examine the results for domestic versus foreign cash in table 4.

Firms which are more likely to be capital constrained hold higher domestic cash levels. The estimated coefficient suggests that the cash-to-assets ratio is 13.1 percentage points higher for those firms which invested more in each of the last three years than their realized operating cash flow in those corresponding years relative to a firm whose investment never exceeded its internally generated cash flow (table 4, column I). Firms which are more constrained also hold more foreign cash, but the coefficient is 82 percent smaller (0.024/0.131 – 1; see column 2). These results again suggest that the precautionary savings motivation has strong explanatory power in explaining domestic cash but is less important in explaining the variation in foreign cash positions.

Measures of Risk

Precautionary savings are more valuable to firms whose cash flows are riskier. Should firms' operations be negatively shocked, not only will their internal capital-generating capacity be impaired, this would likely coincide with facing larger costs of external funds. If firms need cash,

either to overcome a temporary shock to their operations or to fund valuable investment that will allow them to adapt to the shock, then having a large cash stockpile is more valuable.

In table 4, we examine two different measures of risk—industry cash flow volatility and product market fluidity—and again estimate how these measures correlate with domestic versus foreign cash positions. Following Bates et al., we incorporate the standard deviation of the firm's cash flow, measured over the previous five fiscal years, into our cash regression. Higher cash flow risk is positively associated with the firm's domestic cash position (table 4, column III). The effect is economically and statistically significant. Cash flow risk has a smaller and statistically insignificant effect on multinational firms' foreign cash (column IV). We examine the product market fluidity of the firm as a more forward-looking measure of investment uncertainty in columns V and VI. This variable measures the competitive product market threat to the firm and has been documented by Hoberg, Phillips, and Prabhala to affect cash holdings. Product market fluidity risk is positively associated with the domestic cash position of firms, consistent with the precautionary motivation. Its estimated association with foreign cash is actually negative, and the coefficient is 67 percent smaller in magnitude, indicating that greater product market competition is correlated with lower foreign cash holdings. Although total cash is higher (the sum of the coefficients in columns V and VI is positive), more than 100 percent of the increase is in domestic cash.

The effect of taxes is the same as we saw in table 3. Even after controlling for risk and capital constraints, firms with lower effective tax rates (from low-tax foreign jurisdictions) hold significantly more foreign cash. They hold more domestic cash, but the effect is smaller and not always statistically significant.

Table 4: Capital Constraints and Additional Risk

	I	II	III	IV	V	VI
	Domestic Cash	Foreign Cash	Domestic Cash	Foreign Cash	Domestic Cash	Foreign Cash
Effective Tax Rate	0.102[5]	-0.764[*]	0.057	-0.772[*]	0.118[1]	-0.768[*]
	(0.047)	(0.077)	(0.049)	(0.078)	(0.048)	(0.079)
Years Constrained (%)	0.131[*]	0.024[5]				
	(0.012)	(0.011)				
StDev(Cash Flow)			0.132[*]	0.039		
			(0.036)	(0.026)		
Product Market Fluidity					0.012[*]	-0.004[*]
					(0.001)	(0.001)
Ln(Firm Sales)	-0.007[*]	0.008[*]	-0.010[*]	0.007[1]	-0.016[*]	0.010[*]
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Has Bond Rating	-0.007	0.009	-0.006	0.008	-0.005	0.006
	(0.007)	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)
PPE /Book Assets	-0.214[*]	-0.086[*]	-0.178[*]	-0.077[*]	-0.164[*]	-0.067[*]
	(0.015)	(0.015)	(0.014)	(0.015)	(0.014)	(0.016)
Return on Assets	0.131[*]	-0.066	0.028	-0.084[5]	-0.021	-0.109[*]
	(0.023)	(0.039)	(0.024)	(0.034)	(0.025)	(0.030)
Firm Pays Dividends	-0.030[*]	0.010	-0.034[*]	0.009	-0.021[*]	0.002
	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)
R&D/Sales	0.215[*]	-0.005	0.224[*]	-0.004	0.153[*]	0.003
	(0.021)	(0.013)	(0.021)	(0.013)	(0.020)	(0.011)
Market/Book	0.012[*]	0.001	0.011[*]	0.001	0.023[*]	0.008[*]
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)
Book Leverage	-0.098[*]	-0.003	-0.098[*]	-0.002	-0.100[*]	0.006
	(0.008)	(0.006)	(0.008)	(0.006)	(0.010)	(0.007)
Capital Exp/Sales	-0.024	0.041	0.144[*]	0.059	0.033	0.026
	(0.044)	(0.050)	(0.042)	(0.040)	(0.043)	(0.040)
Observations	12,339	12,339	12,375	12,375	11,625	11,625
R^2	0.364	0.107	0.342	0.102	0.409	0.122

Notes: The table contains regressions of cash to book assets on a set of firm characteristics as in table 3. The sample includes only MNCs. Cash is defined as domestic cash in columns I, III, and V and foreign cash in columns II, IV, and VI. In the first two columns we include a measure of capital constraints: the percentage of years the firm is financially constrained. This is the percentage of years over the last three during which each firm's internal cash flow (EBITDA − taxes − capital expenditure) was insufficient to finance its investment. In columns III–VI, we add two measures of cash flow risk. The first measure is the standard deviation of cash flow for the firm for the preceding five years. The second measure is product market fluidity as measured by Hoberg, Phillips, and Prabhala (2012). Each regression contains year dummies. Standard errors are clustered by firm. Statistical significance at the 0.1, 1, and 5 percent levels is reported as superscripts *, 1, and 5, respectively.

These results confirm that domestic cash and foreign cash are not substitutes for each other. The motivations that drive each are distinct. Given the potentially significant tax costs firms face upon repatriating foreign cash, it makes sense that the precautionary savings motivations that have been previously documented to explain firms' cash positions predict only the domestic portion. Foreign cash is an imperfect store of precautionary savings. Empirically firms' foreign stockpiles appear to be minimally (if at all) related to precautionary explanations. Thus, the literature needs to be careful about assigning explanation to the aggregate cash position of nonfinancial firms as arising from expected operating or investing needs that would otherwise be rationed due to capital market frictions. That explanation appears to only apply to the domestic portion of the firms' cash.

Moving Cash Abroad

The Mechanics of Transfer Pricing

If the precautionary savings motivation, which has long been the dominant explanation for nonfinancial firms to stockpile cash, does not explain the significant run-up in the foreign cash position of firms, an alternative explanation is needed. Low foreign taxes appear to be a dominant factor. Foley et al. (2007) identifies that the higher the difference between the U.S. tax rate and the tax rate the firm confronts abroad, the larger is the increase in the firm's cash position. The baseline regression in table 3 (column I) confirmed this result. The lower the effective tax rate of the firm, the higher is its total cash position. However, the higher level of total cash is explained entirely by a higher level of foreign cash. Domestic cash holdings do not rise as the foreign tax rate falls below the U.S. tax rate (see table 3, column IV).

Our results raise the following question: if firms are able to lower their corporate income tax by owning a foreign subsidiary in a low-tax jurisdiction and generating their earnings for tax purposes with that subsidiary, why don't all firms do this? Holding cash abroad may reduce firms' financial flexibility (domestic cash is a better store of precautionary savings), but it can have significant tax benefits. To explain why all (multinational) firms are not sitting on large foreign cash positions, we need to examine the sources of variation in the foreign cash position among MNCs. Those that are able to generate larger foreign earnings (and thus foreign cash stockpiles), particularly in low-tax jurisdictions, are the ones that have a comparative advantage at reducing their tax obligations.

Transfer pricing may be an important element in the movement of earnings to low-tax jurisdiction subsidiaries. Starbucks, for example, was investigated by European Commission regulators for whether "Dutch authorities allowed Starbucks to use unfair methods to shrink its taxable income, including paying a royalty to a partnership in Britain, Alki, for a recipe for coffee-roasting" (Kanter, 2014). Underpinning transfer pricing is the nature of the intellectual property of the firm. Not only is it easier to transfer intellectual property to low-tax jurisdictions than to transfer physical capital, it is easier to avoid charges of tax avoidance with more difficult-to-value items such as patents and technology (Grubert, 2003). Thus firms with more unique assets would be more successful at lowering their effective tax rates and transferring income to low-tax jurisdictions. Given the structure of the U.S. tax code, this would generate larger foreign cash stockpiles.

To identify transfer-pricing opportunities within a firm we examine the portion of a firm's sales that it deems "related" or "affiliated" (related sales). On the annual survey, firms note the portion of a subsidiary's revenue arising from sales to the other subsidiaries of the firm

or to its parent. We sum the sales across all foreign subsidiaries of the firms and express this amount as a percentage of the firm's total revenue. We hypothesize that if transfer pricing is the mechanism that facilitates the movement of earnings to low-tax jurisdictions, then the firms that have high levels of affiliated sales and low effective tax rates are the ones that will end up with the most trapped cash abroad. The analysis is presented in table 5.

Looking at the firms' total cash positions, we find results consistent with our hypothesis. Not only do firms confronting lower effective tax rates have higher cash positions, but firms with more related-party sales also have higher cash balances. The coefficient on the cross product of related-party sales and the effective tax rate is not statistically different from zero. This pattern holds for the full sample as well as the subsample of multinationals (table 5, columns I and II). Neither the effective tax rate nor related-party sales is useful in predicting domestic cash, even among multinationals (table 5, columns III and IV).

The role of foreign tax rates and related-party sales is most apparent when we examine MNCs' foreign cash holdings. Foreign cash is most prevalent in firms with subsidiaries in low tax-rate foreign jurisdictions that are doing significant related-party sales. The coefficient on the effective tax rate is negative, the coefficient on related-party sales is positive, and both are statistically different from zero (table 5, column V). The coefficient on the cross product (tax rate multiplied by related sales) is negative (but not statistically different from zero). While low tax rates themselves are important in explaining large foreign cash positions, this effect is enhanced by low tax-rate firms' abilities to move revenue across the firm. A firm's tax rate isn't low everywhere, only in some (or all) of its foreign subsidiaries. Thus firms who have greater ability to move income to low-tax jurisdictions (through related-party sales) have the greatest opportunity to lower their taxes and also are the ones with the greatest foreign cash balances.

Table 5: Related Sales Cash Regressions

	I	II	III	IV	V	VI	VII
	Total Cash	Total Cash	Domestic Cash	Domestic Cash	Foreign Cash	Foreign Cash	Foreign Cash
	All Firms	MNC	All Firms	MNC	MNC	MNC R&D=0	MNC R&D>0
Related Sales	0.225[5]	0.211[5]	-0.048	-0.066	0.277[5]	0.005	0.451[1]
	(0.101)	(0.099)	(0.059)	(0.055)	(0.119)	(0.109)	(0.148)
Effective Tax Rate	-0.539[*]	-0.534[*]	0.048	0.012	-0.545[*]	-0.503[*]	-0.484[*]
	(0.074)	(0.076)	(0.063)	(0.064)	(0.070)	(0.097)	(0.088)
	-0.362	-0.315	0.100	0.163	-0.478	0.098	-0.872[5]
	(0.300)	(0.292)	(0.177)	(0.166)	(0.343)	(0.308)	(0.433)
Ln(Firm Sales)	-0.016[*]	-0.009[*]	-0.017[*]	-0.012[*]	0.003	-0.006[1]	0.009[1]
	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)
Has Bond Rating	0.009[5]	0.003	0.007	-0.005	0.008	0.002	0.012
	(0.004)	(0.008)	(0.004)	(0.007)	(0.006)	(0.006)	(0.009)
	-0.319[*]	-0.266[*]	-0.312[*]	-0.199[*]	-0.067[*]	-0.052[*]	-0.066[5]
	(0.006)	(0.016)	(0.006)	(0.014)	(0.014)	(0.012)	(0.029)
Return on Assets	0.028[*]	-0.081[1]	0.031[*]	-0.008	-0.072[5]	-0.002	-0.124[1]
	(0.006)	(0.029)	(0.005)	(0.023)	(0.032)	(0.027)	(0.043)
	-0.014[*]	-0.027[*]	-0.015[*]	-0.035[*]	0.008	-0.004	0.016[5]
	(0.003)	(0.006)	(0.003)	(0.005)	(0.005)	(0.006)	(0.008)
R&D to Sales	0.136[*]	0.199[*]	0.136[*]	0.203[*]	-0.004	0.000	-0.016
	(0.003)	(0.016)	(0.003)	(0.017)	(0.011)	(0.000)	(0.014)
Market/Book	0.004[*]	0.009[*]	0.004[*]	0.009[*]	0.001	-0.001	-0.001
	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Book Leverage	-0.097[*]	-0.105[*]	-0.096[*]	-0.103[*]	-0.002	0.000	-0.003
	(0.003)	(0.009)	(0.003)	(0.008)	(0.006)	(0.006)	(0.008)
Capital Exp/Sales	0.082[*]	0.222[*]	0.076[*]	0.148[*]	0.074[5]	-0.003	0.135
	(0.011)	(0.042)	(0.011)	(0.034)	(0.034)	(0.034)	(0.090)
Domestic	-0.007		0.055[*]				
(1 if yes)	(0.004)		(0.004)				
Observations	78,103	13,113	78,103	13,113	13,113	5,091	8,005
R^2	0.393	0.317	0.412	0.336	0.122	0.072	0.172

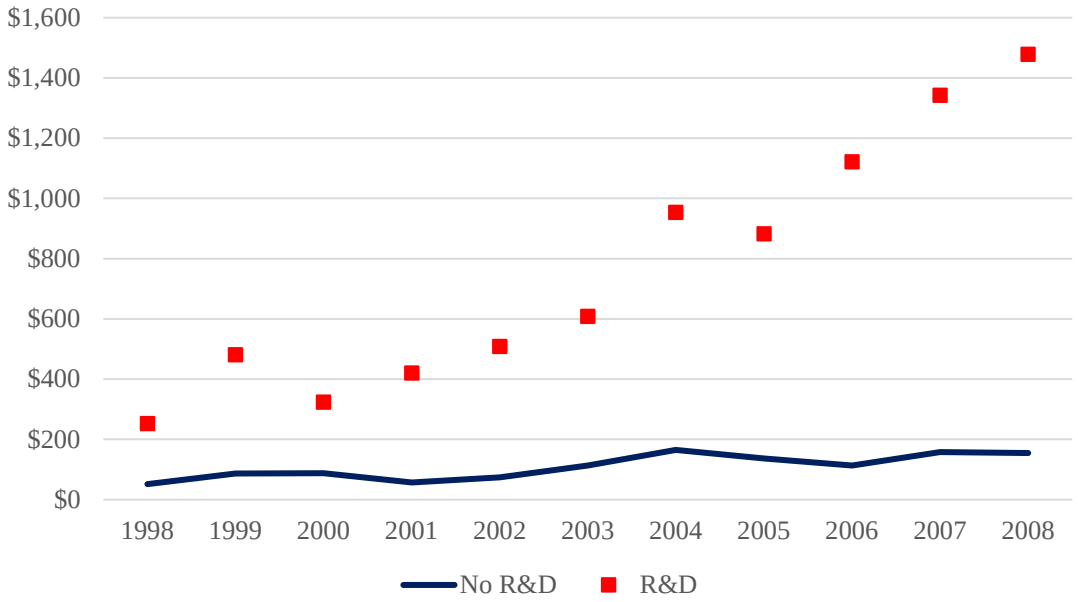
Notes: The table contains regressions of cash to book assets on a set of firm characteristics for multinational firms. Cash is defined as total cash (columns I and II), domestic cash (columns III and IV), or foreign cash (V, VI, and VII). Related sales is defined as the percentage of the firm's total sales that are sales made by its subsidiaries to other subsidiaries or to the parent. The entire sample is included in the regression in column I and III. Only multinational firms (MNCs) are included in the sample in the other columns. Column VI contains only firm-years with zero reported R&D, while column VII only contains firm-years with strictly positive reported R&D. Each regression contains year dummies. Standard errors are clustered by firm. Statistical significance at the 0.1, 1, and 5 percent levels is reported as superscripts *, 1, and 5 respectively.

These results still do not sufficiently explain why all firms are not engaging in such related-party sales and using this mechanism to thereby lower their corporate income tax liability. There must be some restriction on firms' ability to place subsidiaries in low-tax jurisdictions and/or use related-party sales to lower taxes. One common thread in much of the anecdotal evidence about transfer pricing is that intangible assets are relatively easier to reallocate to low-tax jurisdiction countries than economic value arising from outcomes of physical capital (manufacturing, mining, timber, etc.). To further explore this channel, we divide the sample into those firms engaged in significant intellectual property development, as measured by disclosing material (nonzero and non-missing) amounts of R&D spending relative to those firms that either spend zero on R&D or whose spending is insufficient to merit reporting (see table 5, columns VI and VII).

The dual role of low foreign tax rates and the use of related-party sales does not affect foreign cash holdings of firms without significant R&D expenditure. Among these firms, lower tax rates do lead to higher foreign cash balances, but related sales have no effect (the coefficient is positive but small and not statistically distinguishable from zero). The effect we documented for foreign firms (table 5, column V) appears only among firms with R&D expenditures (column VII). It is only the firms engaging in significant R&D for whom higher related-party sales increase their foreign cash position. For these firms, not only does a lower effective tax rate increase their cash balances, but the magnitude of this effect is increasing in their related-party sales. The coefficient on the cross product is negative, economically large, and statistically significant. If the effective tax rate drops from 35 to 30 percent and related sales rise from 0 to 18 percent (the interquartile range) the cash to net book assets rises by 5.3 percentage points.

Figures 6 and 7 highlight the striking difference in cash accumulation based on both related-sales and R&D activity.

Figure 6: Foreign Cash of MNC by R&D

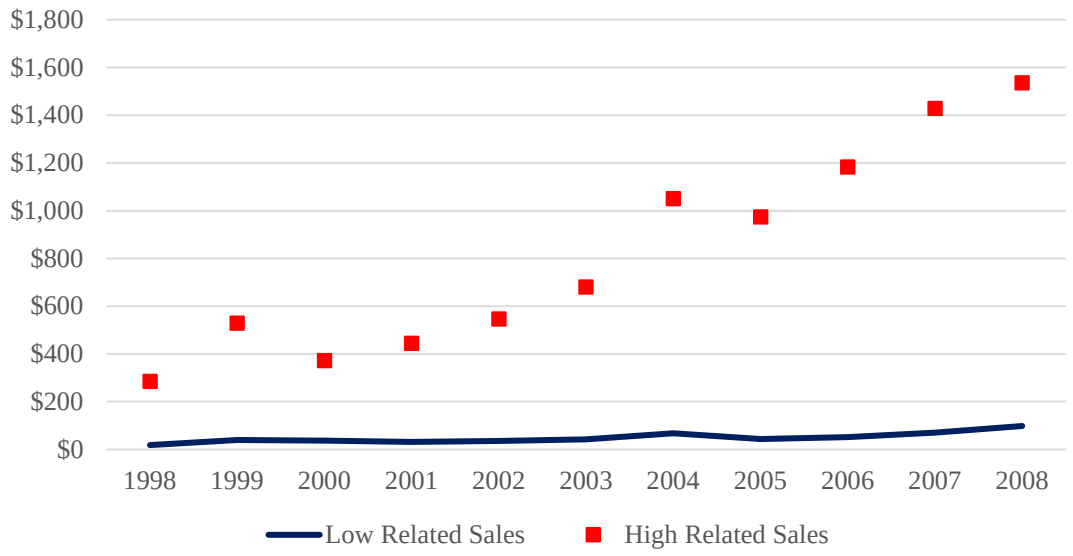


Notes: The figure graphs the domestic cash of non-MNC and both foreign and domestic cash for MNC in $B. Total cash is from Compustat and foreign cash is from the BEA (see paper for details). Domestic cash for MNC is the difference between total cash and foreign cash.

At the beginning of our sample period, when the average foreign tax rate was similar to the U.S. corporate tax rate (see Figure 2), firms with R&D held more foreign cash than firms with no R&D. Firms with significant related sales held more foreign cash than firms without. Over the next decade, there has been a dramatic rise in foreign cash among MNCs that have positive R&D and significant related sales. Among firms that have no R&D or affiliate sales we see no increase in foreign cash over our sample period. Thus, the rise in cash seems to be concentrated in foreign cash and almost exclusively among firms that invest in intangible assets (positive R&D) and that have significant inter-company sales. These results also suggest that policy proposals to address the offshoring of earnings and the resulting cash stockpiles should

focus on R&D firms engaging in transfer pricing, without necessarily overhauling the entire tax code.

Figure 7: Foreign Cash of MNC by Affiliated Sales



Notes: The figure graphs the domestic cash of non-MNC and both foreign and domestic cash for MNC in $B. Total cash is from Compustat, and foreign cash is from the BEA (see paper for details). Domestic cash for MNC is the difference between total cash and foreign cash.

These results confirm many of the anecdotal, but undocumented, accounts that intellectual property development facilitates using transfer pricing to move earnings from high-tax jurisdictions to low-tax jurisdictions, resulting in significant amounts of trapped cash. Complementing Pinkowitz, Stulz, and Williamson (2015), we present evidence that non-R&D firms and R&D firms are not comparable in terms of how much cash they hold. These results also suggest that policy proposals to address the offshoring of earnings and the resulting cash stockpiles should focus on R&D firms engaging in transfer pricing, without necessarily overhauling the entire tax code. Since the effects are more acute for this subsample, policy

proposals targeting such industries and activities may prove more effective at curbing some of these activities.

As we measure it, the effective tax rate depends upon both the foreign tax rates (how much lower are they than the U.S. rate) and how much of the firm's' income (EBIT) is earned in

Table 6: Tax Variable Decomposition

	I	II
	Domestic Cash	Foreign Cash
	MNC	MNC
U.S. Income (%)	0.042*	-0.129*
	(0.006)	(0.008)
Foreign Tax Rate	-0.050	-0.144*
	(0.026)	(0.024)
Ln(Firm Sales)	-0.011*	0.008*
	(0.002)	(0.002)
Has Bond Rating	-0.005	0.007
	(0.007)	(0.006)
PPE/Book Assets	-0.192*	-0.085*
	(0.015)	(0.014)
Return on Assets	-0.018	-0.024
	(0.028)	(0.040)
Firm Pays Dividends	-0.035*	0.011[5]
	(0.006)	(0.005)
R&D/Sales	0.257*	0.018
	(0.029)	(0.016)
Market/Book	0.009*	0.001
	(0.001)	(0.001)
Book Leverage	-0.106*	-0.004
	(0.009)	(0.006)
Capital Exp/Sales	0.199*	0.053
	(0.046)	(0.037)
Observations	12,371	12,371
R^2	0.344	0.158

Notes: The table contains regressions of the ratio of a firm's domestic or foreign cash to book assets on a set of firm characteristics. Only multinational firms (MNC) are included in the sample. U.S. Income is the percentage of the firm's earnings that were generated in the United States. Foreign Tax Rate is the subsidiary earnings weighted tax rate for the foreign subsidiaries in which the company operates. Each regression contains year dummies. Standard errors are clustered by firm. Statistical significance at the 0.1, 1, and 5 percent levels is reported as superscripts *, 1, and 5 respectively.

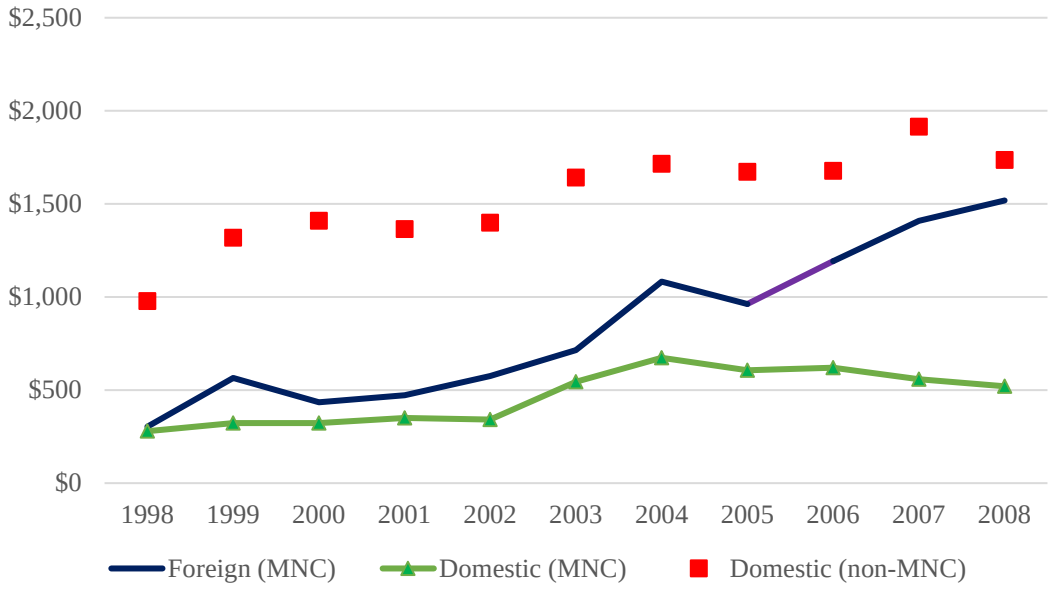
the foreign jurisdictions. We bifurcate the effective tax-rate variable into the portion arising from the percentage of the firm's earnings generated overseas versus variation in tax rates on overseas earnings in table 6. Irrespective of whether we examine the total cash, domestic cash, or foreign cash, as the foreign tax rate rises, firms hold significantly less cash. For MNCs, the effect on foreign cash is 10 times larger than the effect on domestic cash, and the tax coefficient is not statistically significant in the domestic cash regression. We also see that income is sticky; cash is held where it is earned. The more income that is earned in the U.S., the more domestic cash the firm has (table 6, column I). The more income earned in foreign subsidiaries, the more foreign the firm has (column II). That said, foreign cash is stickier; the coefficient on U.S. income is almost eight times larger in the foreign cash regressions (0.033 versus −0.261). Since the effect on foreign cash is much larger, total cash holdings also decline the more income that is earned in the U.S.

Changes versus Levels

Our analysis began with the observation that the amount of cash held by U.S. corporations has been rising for two decades. Although the predominant explanation in the literature for holding cash has been precautionary savings, this is difficult to reconcile with the rise in cash levels unless one argues the world has become an increasingly risky place over this time. The fact that the rate of increase appears to be as fast prior to the 2008 recession as following it is hard to reconcile with this explanation (see figure 1). Using our data, we can also examine the increase in cash separately for MNC and domestic (non-MNC) firms as well as examining the increase in domestic and foreign cash for MNCs (see figure 5). The domestic cash of domestic firms is 1.8 times larger at the end of our sample (2008) versus the beginning (1998), while the domestic

cash of MNCs is 1.9 times larger by the end of the sample period. Over this period U.S. GDP has risen by 30 percent (1.3 times larger). The foreign cash of MNCs has increased much faster. It is five times bigger by the end of our sample period (see figure 5).

Figure 5: Domestic and Foreign Cash



Notes: The figure graphs the domestic cash of non-MNC and both the foreign and domestic cash for MNC in $B. Total cash is from Compustat, and foreign cash is from the BEA (see paper for details). Domestic cash for MNC is the difference between total cash and foreign cash.

Tax explanations can explain the time pattern of the increase in cash and where the greatest increase occurs (foreign cash of MNCs). There are two possible versions of the explanation. First, tax rates have fallen in many foreign countries relative to the U.S., which increases the incentive to earn income in foreign subsidiaries, and the cash gets trapped in the process (see figure 4). However, even if the difference between U.S. and foreign tax rates does not change, the level of foreign cash may still rise. In cases where the foreign tax rate is less than the U.S. tax rate, firms have an incentive to earn income in low-tax foreign jurisdictions each year and thus add to their stockpile of foreign cash each year. The precautionary savings

explanation is a prediction about the level of cash held, which is why we and prior researchers have run the regressions in levels. The tax explanation is a prediction about changes as well as levels. Thus to be thorough we re-estimate our regression models using the change in the cash-to-asset ratio as a dependent variable. The results are reported in table 7.

As expected, the results are much noisier and the estimated coefficients are smaller. The effective tax rates do not predict changes in total or domestic cash level. The regression contains year dummies; thus the coefficients are being estimated off of differential changes in the tax rates across foreign countries and firms' differential exposures to each foreign country. However, for MNCs which conduct R&D, the higher the percentage of their sales which are affiliated (to other subsidiaries or to the U.S. parent), the more foreign cash they hold. The coefficients on the effective tax rate and the interaction between the tax rate and related sales are both negative and statistically significant as well (p-value < 0.05). Thus lower effective tax rates do not increase a firm's foreign cash in the absence of related sales, but higher related sales magnify the effect of lower taxes on foreign cash holdings (see table 7, column VII).

Subsidiary Level Regressions

The analysis thus far has treated a firm's foreign subsidiaries as a single entity. In reality, firms have multiple foreign subsidiaries in many different countries with potentially very different tax rates, and our data allow us to observe the cash and operating in each of the firm's subsidiaries. Not only do firms have a tax incentive to move income out of the U.S. and into foreign subsidiaries with low tax rates, but they also have an incentive to move income out of foreign subsidiaries with high tax rates and into foreign subsidiaries with lower tax rates. Firms invest in and earn income in countries because that is where the business opportunities are. That is why

Table 7: Changes in Cash Regressions

	I	II	III	IV	V	VI	VII
	Total Cash	Total Cash	Domestic Cash	Domestic Cash	Foreign Cash	Foreign Cash	Foreign Cash
	All Firms	MNC	All Firms	MNC	MNC	MNC R&D=0	MNC R&D>0
Related Sales	0.049[5]	0.053[5]	-0.013	-0.003	0.049	0.006	0.077[5]
	-0.025	-0.025	-0.021	-0.02	-0.028	-0.036	-0.037
	-0.008	-0.035	0.013	0.050[5]	-0.061[1]	-0.038	-0.059*
	-0.026	-0.025	-0.023	-0.023	-0.021	-0.026	-0.029
Related Sales	-0.093	-0.113	0.034	-0.001	-0.089	0.007	-0.176
x Tax Rate	-0.076	-0.077	-0.065	-0.063	-0.083	-0.104	-0.113
	-0.005*	-0.002*	-0.005*	-0.002*	0.001	-0.001	0.002*
	0.000	-0.001	0.000	-0.001	-0.001	-0.001	-0.001
	0.010*	0.008*	0.011*	0.008*	0.001	0.001	0.001
	-0.001	-0.002	-0.001	-0.002	-0.002	-0.002	-0.003
	-0.022*	0.014[5]	-0.023*	0.019*	-0.006	-0.007	0.002
	-0.003	-0.007	-0.003	-0.006	-0.005	-0.005	-0.009
	0.055*	0.008	0.056*	0.049*	-0.054*	-0.022	-0.070*
	-0.003	-0.012	-0.003	-0.011	-0.011	-0.015	-0.014
	0.009*	0.001	0.010*	0.004[1]	0.000	0.000	0.000
	-0.001	-0.002	-0.001	-0.002	-0.001	-0.002	-0.002
R&D/Sales	-0.006*	-0.015[5]	-0.005*	-0.013	-0.004		-0.009[5]
	-0.001	-0.007	-0.001	-0.008	-0.004		-0.005
	0.003*	0.001	0.003*	0.001	0.000	-0.001	0.001
	0.000	-0.001	0.000	0.000	0.000	-0.001	-0.001
	-0.010*	-0.001	-0.010*	-0.001	0.002	0.001	0.002
	-0.001	-0.003	-0.001	-0.003	-0.003	-0.003	-0.004
	-0.157*	-0.135*	-0.160*	-0.194*	-0.003	-0.028	0.032
	-0.011	-0.038	-0.011	-0.032	-0.027	-0.037	-0.033
Domestic	-0.004*		0.013*				
(1 if yes)	-0.001		-0.001				
Observations	71,933	12,765	71,933	12,765	11,347	4,240	7,107
R^2	0.098	0.066	0.098	0.063	0.072	0.057	0.082

Notes: The table contains regressions of the ratio of changes in the firm's cash to book assets on a set of firm characteristics. The table replicates the results of table 5, but using changes in the cash opposed to the level of cash as the dependent variable. Cash is defined as total cash (columns I and II), domestic cash (columns III and IV), or foreign cash (V, VI, and VII). Related sales is defined as the percentage of the firm's total sales that are sales made by its subsidiaries to other subsidiaries or to the parent. The entire sample is included in the regression in columns I and III. Only multinational firms (MNC) are included in the sample in the other columns. Column VI contains only firm-years with zero reported R&D, while column VII only contains firm-years with strictly positive reported R&D. Each regression contains year dummies. Standard errors are clustered by firm. Statistical significance at the 0.1, 1, and 5 percent levels is reported as superscripts *, 1, and 5, respectively.

we found the fraction of cash and fraction of sales generated in foreign countries were similar in 1998 (see figure 2 and table 6). Once foreign tax rates had diverged from U.S. tax rates (figure 4), we see the cash has gravitated to countries with low tax rates in much larger fractions than the sales generated in those countries (see figure 3).

Given our data on the cash levels in each of the firms' foreign subsidiaries, we are able to run the regressions from table 5 using subsidiary-level instead of firm-level observations. Thus if a firm has three subsidiaries in three countries in 2008, we have three observations on the firm in 2008. The dependent variable is the subsidiaries' cash divided by a firm's net book value of assets. The lower the tax rate in a country, the more cash is held by the subsidiary in that country (see table 8, column I). This is true even if we include country dummies (column II), firm dummies (column III), or firm-year dummies (column IV). When we include a separate dummy variable for each firm-year combination, the tax coefficient is estimated from variation across the subsidiary tax rate within years for a given firm or across years for a given firm. We included affiliated sales (percentage of sales by the subsidiary to other subsidiaries or the parent) and the interaction of affiliated sales and the tax rate in the last four columns of table 8 (this replicates the results from table 5, V–VII). As we saw before, subsidiaries with more affiliated sales have higher cash balances. Subsidiaries with lower tax rates have higher cash balances, and the effect of the tax rate is increasing in their affiliated sales. Lowering the tax rate from 35 to 30 percent and increasing the percentage of affiliated sales from 0 to 18 percent (the interquartile range) the cash to net book assets rises by 1 percentage points. Firms with the ability to transfer price not only earn income and thus stockpile cash in foreign jurisdictions, but they also appear able to shift it to the lowest-tax foreign subsidiaries.

Table 8: Subsidiary Level Regressions

	I	II	III	IV	V	VI	VII	VIII
Foreign Tax Rate	-0.026*	-0.015*	-0.031*	-0.015*	-0.023*	-0.028*	-0.028*	-0.013*
	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)	(0.003)
Related Sales					0.006*	0.007*	0.007*	0.004*
					(0.001)	(0.001)	(0.001)	(0.001)
Related Sales x Tax					-0.020*	-0.017*	-0.018*	-0.010[1]
					(0.004)	(0.003)	(0.003)	(0.004)
Country Dummies	No	Yes	No	No	No	Yes	No	No
Firm Dummies	No	No	Yes	No	No	No	Yes	No
Firm-Year Dummies	No	No	No	Yes	No	No	No	Yes
Observations	116,281	125,428	116,281	116,280	116,281	116,281	116,281	116,280
R^2	0.116	0.218	0.330	0.152	0.116	0.302	0.330	0.152

Notes: The table contains regressions of the ratio of the subsidiary's cash to book assets on a set of firm characteristics for multinational firms used in table 5. Thus only data from MNC are included in the sample. Only a subset of the coefficients is reported in the table. Each observation represents a MNC's subsidiary in a given year. Thus a firm which has four subsidiaries will have four observations per year. Related sales is defined as the percentage of the firm's total sales that are sales made by its subsidiaries to other subsidiaries or to the parent. Standard errors are clustered by firm. Statistical significance at the 0.1, 1, and 5 percent levels is reported as superscripts *, 1, and 5 respectively.

Conclusion

U.S. firms have increased significantly the amount of cash on their balance sheets, and theory suggests why this can be value increasing. In the absence of market frictions, firms will pay out excess cash flow and then raise capital in the future when and if they need it. In the presence of market frictions, outside equity and debt capital may be too expensive or unavailable. In this environment, firms can create value by stockpiling cash and using it in the future when capital is unavailable or too expensive. Prior empirical work has focused on and documented that precautionary motives can explain a significant portion of the variability in firms' cash balances.

The challenge with interpreting these results is not all cash is in one universally accessible account. Due to the structure of the U.S. tax code, cash held in a U.S. firm's foreign subsidiaries is not readily accessible nor a perfect substitute for cash held in the U.S. The firm must pay an incremental tax to access cash held in foreign subsidiaries located in a low-tax jurisdiction. As a large fraction of the cash held by U.S. corporations is held abroad, it is important to understand the unique motivations that drive the decision to hold cash domestically or in their foreign subsidiaries. The imperfect substitutability is not symmetric. Excess cash held in the parent can fund foreign investments without paying an incremental cost, while cash held in the foreign subsidiary can only fund foreign investments without paying the tax cost.

Due to the imperfect substitutability of these different cash accounts, and the asymmetry in the substitutability, domestic cash serves as a more valuable form of precautionary savings than foreign cash. As our results demonstrate, such imperfect substitutability leads to significantly different factors explaining the observed variation in domestic relative to foreign cash. Many of the firm characteristics previously documented to explain corporate cash that are

associated with precautionary motives only explain the observed variation in the domestic cash component on corporate balance sheets. These characteristics do a relatively poor job explaining the variation in foreign cash balances.

Instead, the primary factor explaining the observed variation in foreign cash holdings appears to be tax considerations. Lower foreign tax rates are associated with higher foreign cash positions, consistent with low tax-rate jurisdictions being associated with higher effective repatriation tax rates. Firms optimally respond by deferring repatriation, leading to higher cash and marketable securities balances during the deferral period. These results are particularly acute for R&D-intensive firms engaging in significant affiliated sales. Overall, our results indicate that at least two important considerations are at work in explaining the rising level of corporate liquidity. Caution is therefore required when interpreting the policy implications of recently high levels of observed cash positions.

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