December 2016

PRELIMINARY AND INCOMPLETE

Understanding Precautionary Cash at Home and Abroad

Michael W. Faulkender
University of Maryland

Kristine W. Hankins
University of Kentucky

Mitchell A. Petersen
Northwestern University
National Bureau of Economic Research

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 firm's precautionary savings motives predict variation in the size of firm's cash stockpile. 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 firm's 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, and this results in stockpiles of cash trapped in their foreign subsidiaries.

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, William Zeile as well as seminar and conference participants at Dartmouth University, Federal Reserve Board of Governors, Northwestern University, Ohio State, Rice University, the Securities and Exchange Commission, the Shanghai Advanced Institute of Finance, the Swiss Finance Institute, the Universities of Cincinnati, Miami, Pittsburg, Oregon, and San Diego. The research assistance of Austin Magee and Sang Kim is greatly appreciated.

According to recent Flow of Funds estimates, US non-financial 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, 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. As detailed in Duchin et al (2015), when corporate income tax rates are lower than personal tax rates on financial income, there may be benefits from corporations deferring the payment of operating cash flows out to investors. Yet that behavior doesn't correspond with holding cash domestically when the US has one of the highest corporate income taxes in the developed world. Thus the benefits of holding cash in the US are to provide operational liquidity and fund precautionary savings.

On the other hand, foreign cash is almost entirely subject to incremental taxation by the US. Equity infusions from the US 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 US tax rate and the foreign tax rate. The high US corporate tax rate means that almost all foreign operating income would generate incremental tax upon repatriation to the US (Graham, Hanlon, and Shevlin, 2015).

We do not know whether foreign cash also serves a precautionary savings role. 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-US subsidiary and needed in another non-US subsidiary, should the funds return to the US, 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 forego 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), this selectively released data is 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 is needed to address this shortcoming.[1] 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

[1] 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.

marketable securities position (from Compustat) and 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 et al., 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 US 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 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 firm's domestic cash levels. The variables used in the prior literature to measure firm's capital

constraints and risk, and which have predicted total cash, also predict domestic cash. The firm's effective marginal tax rate (the foreign tax rates it faces), have little ability to explain 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 US 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 (and possibly cash) to affiliates and we explore whether these within firm transfers indeed contribute to the observed cash positions. 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 money to lower tax countries, but also results in larger cash and marketable securities portfolios held abroad. 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.

I. Empirical Strategy and Data

A. Empirical Design.

Our objective is to better understand the increases in firms' liquidity positions that have been observed recently. In particular, 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 US 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.

Since precautionary savings is motivated by concerns about financial constraints, our examination next includes additional factors that have previously been employed to identify the extent to which firms may be currently financial 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 in which the firm's earnings before interest, taxes, depreciation and amortization (which is after advertising and R&D) less than capital expenditures. The higher this percentage, the more likely it is that firms have investment opportunities that have been foregone. 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 et al, we include the industry cash flow risk. For each two digit SIC group, we calculate a ten 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 the author'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% of EBIT in 2006 were generated in the United States, 30% in the Irish foreign affiliate, and the remaining 20% in the German affiliate, the estimated tax rate for 2006 for this firm is:

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

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 the 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 and that are able to utilize transfer pricing and royalty payments to move earnings from high tax to low tax jurisdictions. We would therefore 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.

B. 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 firm's 10-Ks is entirely too course 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 that US multinationals that contains numerous balance sheet and income statement items for each foreign affiliate of a US-based multinational firm. The US 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.[2] Because we are interested in the 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 was gathered. This data is

[2] 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.

available from 1998 to 2008. Using this 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 contained in other assets, we subtract out an estimate of the subsidiaries accounts receivable by assuming the accounts receivable to sales ratio is the same across the firm. Our estimate of the cash and marketable securities is thus:[3]

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

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.[4] 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 this 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 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 is provided by Standard and Poor's based upon annual 10-K filings. Control variables include: firm size (the natural logarithm of

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

[4] 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 non-current 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.

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. All of these measures are winsorized at the 1st and 99th percentiles.

C. 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 US firms has risen from just over $1T in 1998 to $3T by 2014 (see Figure 1).[5] Although it initially appears that most cash is held domestically (see Table 1 – Full Sample), a large fraction of firms in Compustat do not have foreign operations and thus their foreign cash is zero. When we examine multinational firms, the amount of cash held abroad is still less than the level of domestic cash but is a much larger fraction of their total cash holdings (over 40% for the average firm). Both levels are significant percentages of the firm's assets. Another notable difference is that firms with foreign operations are significantly larger, more profitable, and have lower market-to-book ratios compared to solely domestic firms. This means the fraction of cash will be 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.

1. Industry Location of Cash.

One way to examine the differences between domestic and multinational firms is to compare industries that are primarily domestic relative to those with significant overseas earnings. In Table 2, we divide firms based on the portion of profits which are derived from domestic sources, tabulating the five industries that have the highest percentage of their earnings coming

[5] This consistent and persistent rise in cash levels is difficult to reconcile with a purely precautionary motives. 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.

from abroad (lowest domestic percentage) and the five industries with earnings most concentrated in the United States (conditional on having foreign operations).[6] We then examine the allocation of cash between domestic and foreign accounts for those with significant foreign operations and those with almost none. As can be seen by the summary statistics, the industries with most of the earnings generated domestically have higher tax rates and dramatically lower foreign cash as well as lower overall cash levels. The firms in industries with predominantly foreign income (the top five industries earn more than half of their income outside of the US), face lower tax rates. These firms also hold significant cash balances in their foreign subsidiaries in relative to their assets and relative to their domestic cash position. These univariate results foreshadow the importance of industry and asset type which we document below using more rigorous econometric analyses that follow.

2. Geographic Location of Cash.

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 investments and business is located). Our data allows 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 fifteen countries (sorted by percent of foreign cash) 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 US MNC that originate in each country. The countries are sorted by the fraction of cash in both cases, with the countries with the most cash listed at the bottom of the bar. Among the countries with high cash balances, we see large economies (e.g. the United Kingdom, Germany, France, Canada, and

[6] We excluded firms with only domestic operations when constructing Table 2, so that we could examine firms with foreign operations and thus which have the option of stockpiling cash domestically or in a foreign subsidiary.

Japan) where we would expect US 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 US's firm's 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 14.6% of the cash and generate 14.8% of the sales in 1998.

The allocation of foreign cash changes by 2008 (see Figure 3). Ireland moved from third 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 they have significantly higher percentage of cash than percentage of sales. For example, Irish subsidiaries hold 13.1% of the cash, but generate only 4.0% 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 drops from 32% to 12.5% in Ireland, from 35% to 24.3% in the Netherlands, and even Germany's rate drops from 56.6% to 30.9%.[7] The greater difference between US 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 Figure 2 and 3. We now turn to an analysis of the determinants of cash holdings both domestic and foreign.

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

II. Determinants of Cash Holdings and Location

A. 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 firm's 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, we find evidence of a precautionary motive for stockpiling cash when we look at the total cash firm's hold independent 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/book assets), pay dividends, conduct less R&D, and that 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 the firm's earnings that are realized overseas and the tax rate in the countries in which those earnings are generated.

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 regression 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). Specifically, firms that engage in significant R&D and have high market-to-book ratios hold larger domestic cash positions. These results are consistent with the types of firms engaging in intangible investment, and who therefore may be most likely to be rationed, holding more domestic cash to mitigate potential underinvestment that may result from such rationing. Firms that are larger, with more tangible assets, pay dividends, and have more debt in their capital structure – the types of firms previously argued to be least likely to face external capital constraints – hold less domestic cash.[8]

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). It is still the case that firms with more tangible assets hold less cash, although the coefficient is 66% 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

[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.

example, the R&D coefficient has decreased in absolute terms by almost two orders of magnitude and flipped signs. 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 MNF or not), but not of a firm's foreign cash holdings.

B. Tax Rate Effects.

When we examined total cash holdings, we found that the tax rate was negatively correlated with firm's 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 for MNF.[9] The effect of taxes which we found for total cash is driven by the foreign cash holding of MNFs. MNFs with lower effective tax rates hold more cash abroad as is expected given the cross-sectional variation in the cost of repatriation 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.

C. Capital Constraints.

[9] 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% of book assets greater then foreign firms. MNFs have less cash, all else being equal, held domestically, and have more cash held abroad (by construction). MNF's 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 in the summary statistics of Pinkowitz, Stulz, and Williamson (2015) which suggest MNF hold more cash.

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 reexamine our results adding in the Faulkender and Petersen (2012) measure of capital constraints that captures whether 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,

As expected, firms more likely to be capital constrained hold higher domestic cash levels. The estimated coefficient suggests that the cash to assets ratio is 13.2 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 their internally generated cash flow (Table 4 – column I). Firms which are more constrained also hold more foreign cash, but the coefficient is 80% smaller (0.024/0.132-1, 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.

D. 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 firm's 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% 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% of the increase is in domestic cash. Holding the cash domestically gives the firms the greatest flexibility in deploying the capital. Firms more secure in their product market are the ones able to stockpile cash abroad. 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 less domestic cash and but result is smaller and not always statistically significant.

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 firm's cash positions, predict only the domestic portion. Firm's 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 non-financial 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 firm's cash.

III. Moving Cash Abroad.

A. The Mechanics of Transfer Pricing.

If the precautionary savings motivation, which has long been the dominant explanation for non-financial 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. Looking at the total cash position of firms, Foley et al. (2007) identifies that the higher the difference between the US 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 confirms 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 US 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? Why aren't all (multinational) firms

sitting on large foreign cash positions? To answer this question, we need to examine the sources of variation in the foreign cash position of firms. 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 difficulty 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 US 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 they deem "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 firm's total cash position, 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 both 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 are useful in predicting domestic cash, even among multinationals (Table 5 – columns III and IV).

The roll of foreign tax rates and related party sales is most apparent when we examine MNF's 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 6 – column V). The coefficient on the cross product (tax rate times 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 cash balances.

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 firm's ability to place subsidiaries in low tax jurisdictions and/or use related party sales 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 (non-zero 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 not statistically different form zero). The effect we documented for foreign firms (Table 5 – column V) appears only among firms with R&D expenditures. 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% and related sales rise from 0 to 18% (the inter-quartile range) the cash to net book assets rises by 5 percentage points.

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 to each other in ways that allow for inferences regarding cash to be made by using one group as a control group for the other. These results also suggest that policy proposals to address the offshoring of earnings and the resulting cash stockpiles that are

created should target R&D firms engaging in transfer pricing, without necessarily overhauling the entire tax code. Since the results are more acute for this subsample, policy proposals targeting such industries and activities may prove more effective at curbing some of these activities.

The way we measure the effective tax rate it depends both upon the foreign tax rates (how much lower are they than the US rate) and how much of the firm's income (EBIT) is earned in the foreign jurisdictions. We bifurcate the effective tax rate variable into the portion arising from the percent 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 MNF, the effect on foreign cash is ten times larger than the effect on domestic cash. We also see that income is sticky; cash is held where it is earned. The more income that is earned in the US, the more domestic cash the firm has (Table 6 – column III). The more income earned in foreign subsidiaries, the more foreign the firm has. That said, foreign cash is stickier; the coefficient on US 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 US.

B. Changes versus levels.

Our analysis began with the observation that the amount of cash held by US 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 period (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 MNC (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 US GDP has risen by 30% (1.3 times larger). The foreign cash of MNCs has increased much faster. It is 5 times bigger by the end of our sample period (see Figure 5).

Tax explanations can explain the time pattern of the increase in cash and where the greatest increase occurs (foreign cash of MNC). Tax rates have fallen in many foreign countries relative to the US which increases the incentive to earn and store cash in foreign subsidiaries (see Figure 4). Even if the difference between US and foreign tax rates is constant, however, this can lead to a rise in the cash balances as each year firms have an incentive to earn income in low tax foreign jurisdiction and thus add to the stockpile of foreign cash. 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 reran our regressions using the change in the cash to asset ratio. The results are reported in Table 7.

As expected, the results are much noisier and the estimated coefficients are smaller. Change in the effective tax rates do not predict changes in cash level. The regression contains year dummies, thus the coefficients are being estimated off of changes in the tax rates across foreign countries and firm's differential exposure to each foreign country. However, for MNF which conduct R&D, the higher the percent of their sales which are affiliated (to other subsidiaries or to the US parent), the more foreign cash they hold. The coefficient on the interaction of the tax rate and related sales is negative and statistically significant as well (p-value < 0.05). Thus lower effective tax rates do not increase a firm's foreign cash if they have no related sales, but the higher

the related sales the greater the effect of lower taxes on foreign cash holdings (see Table 7 – column VII).

C. Subsidiary level regressions.

The analysis thus far has treated the firm's foreign subsidiaries as a single entity. In reality, firms have multiple foreign subsidiaries in different countries with potentially very different tax rates. Thus not only does the firm have a tax incentive to move income out of the US and into foreign subsidiaries with low tax rates, but they also have an incentive to move income into the foreign subsidiaries with lower tax rates, all else being equal. Firm's invest in and earn income in countries because that is where the business opportunities are. That is why we found the faction 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 US tax rates (Figure 4), we see the cash has gravitated to countries with low tax rates in much larger factions than the sales generated in those countries (see Figure 3).

Since our date reports the cash levels in each of the firm's foreign subsidiaries, we are able to rerun the regressions in Table 5 using subsidiary level instead of firm level observations. The lower the tax rate, the higher the cash held in the subsidiary (see Table 8, column I). This is true even if we include firm dummies (column II), firm-year dummies (column III), or country 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 (and across) years. We replicated the results of Table 5 in columns V-VII, when we also include affiliated sales (percent of sales by the subsidiary to other subsidiaries or the parent) and the interaction of affiliated sales and the tax rate. 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% and increasing the percent of affiliated sales from 0 to 18% (the inter-quartile 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.

IV. Conclusion

US 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 stock piling 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 firm's cash balances.

The challenge with interpreting these results is not all cash is in one universally accessible account. Due to the structure of the US tax code, cash held in a US firm's foreign subsidiaries is not readily accessible nor a perfect substitute for cash held in the US. The firm must pay an incremental tax to access cash held in foreign subsidiaries located in low tax jurisdiction. As a large fraction of the cash held by US 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 factors 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.

References

Bates, T. W., K. M. Kahle, and R. M. Stulz., 2009, Why Do U.S. Firms Hold So Much More Cash than They Used To?, *Journal of Finance* 64, 1985–2021.

Boyle, G. W. and G. A. Guthrie, 2003, Investment, Uncertainty, and Liquidity, *Journal of Finance* 58, 2143–2166.

Duchin, R., T. Gilbert, J. Harford, and C. M. Hrdlicka, 2015, Precautionary Savings with Risky Assets: When Cash Is Not Cash, Working paper.

Dobridge, Christina and Paul Landefeld, 2015, "Is the Cash Locked Out? Evidence from U.S. Multinational Tax Filings" Federal Reserve Board of Governors working paper.

Faulkender, M. W., and J. M. Smith, 2016, Taxes and Leverage at Multinational Corporations, *Journal of Financial Economics*, forthcoming.

Faulkender, M.W. and M. A. Petersen, 2012, Investment and Capital Constraints: Repatriations under the American Jobs Creation Act, *Review of Financial Studies*, 25, 3351-3388.

Foley, C.F., J. C. Hartzell, S. Titman, G. Twite, 2007, Why Do Firms Hold So Much Cash? A Tax-based Explanation, *Journal of Financial Economics* 86, 579–607.

Graham, J., M. Hanlon, and T. Shevlin, 2015, Barriers to Mobility: The Lockout Effect of U.S. Taxation of Worldwide Corporate Profits, *National Tax Journal* 63 (forthcoming)

Grubert, H., and J. Mutti, 1991, Taxes, Tariffs and Transfer Pricing in Multinational Corporate Decision Making, *Review of Economics and Statistics* 73, 285-293.

Grubert, H., 2003, Intangible Income, Intercompany Transactions, Income Shifting, and the Choice of Location, *National Tax Journal* 56, 221-242.

Harford, J., Klasa, S. and Maxwell, W. F., 2014, Refinancing Risk and Cash Holdings, *Journal of Finance* 69, 975–1012.

Harford, J., C. Wang, and K. Zhang, 2015, Foreign Cash: Taxes, Internal Capital Markets and Agency Problems, Working paper

Hoberg, G., G. Phillips, and N. Prabhala, 2014, Product Market Threats, Payouts, and Financial Flexibility, *Journal of Finance* 69, 293–324.

Levin, C, and J. McCain, 2013, "Offshore Profit Shifting and the U.S. Tax Code - Part 2 (Apple Inc.)", Senate Permanent Committee on Investigations Memo

Kanter, James, 2014, E.U. Accuses Starbucks and Netherlands of Making Unfair Tax Deal, The New York Times, November 14, 2014, page A3.

Martin, J. S. and A. M. Santomero, 1997, Investment Opportunities and Corporate Demand for Lines of Credit, *Journal of Banking & Finance* 21, 1331-1350.

Opler, T., L. Pinkowitz, R. Stulz, and R. Williamson, 1999, The Determinants and Implications of Corporate Cash Holdings, *Journal of Financial Economics* 52, 3–46.

Pinkowitz, L., R. Stulz, and R. Williamson, 2016, Do U.S. Firms Hold More Cash than Foreign Firms Do? *Review of Financial Studies* 29, 309-348.

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 ratio as well as the control variables used in the analysis. The statistics are provided for both the full sample over the panel's time period as well as for only those in the BEA multinational survey. Data definitions can be found in the text.

Table 2: Cash Distribution and Taxes by Industry

,

2-digit SIC Code	Industry Name	Domestic Profits	Effective Tax Rate	Domestic Cash	Foreign Cash
High Foreign Percentage Industries					
21	Tobacco Products	53.1%	31.2%	5.7%	12.6%
28	Chemical & Allied Products	56.4%	30.9%	3.6%	32.9%
30	Rubber & Misc. Plastics Products	58.1%	31.6%	4.2%	10.8%
35	Industrial Machinery and Equipment	59.4%	31.2%	14.0%	22.2%
34	Fabricated Metal Products	61.5%	33.8%	1.2%	20.7%
High Domestic Percentage Industries					
80	Health Services	97.5%	34.9%	5.8%	0.7%
55	Automotive Dealers & Gas Service Stations	97.6%	34.9%	0.6%	1.5%
40	Railroad Transportation	98.2%	34.8%	2.1%	0.3%
15	General Building Contractors	99.2%	35.0%	3.1%	2.1%
83	Social Services	99.7%	35.0%	1.2%	0.6%

Notes:

This table contains statistics at the industry level regarding the portion of the industry's earnings that are generated in the United States (Domestic Profits), the earnings weighted effective tax rate confronted in that industry, and their allocation of cash to domestic and foreign subsidiaries with non-zero foreign income. Percent domestic is the percentage of industry earnings among public firms that are generated in the United States. The top panel reports the five industries with the lowest percentage of earnings coming from domestic sources (highest foreign percentage) and the bottom panel reports the five industries with the highest percentage of earnings coming from domestic sources.

Table 3: Baseline Cash Regressions

	I	II	III	IV	V
	Total Cash	Total Cash	Domestic Cash	Domestic Cash	Foreign Cash
	All Firms	MNF	All Firms	MNF	MNF
Effective Tax Rate	-0.730[5]	-0.710[5]	0.096[5]	0.068	-0.779[5]
	(0.072)	(0.073)	(0.046)	(0.047)	(0.076)
Ln(Firm Sales)	-0.016[5]	-0.005[5]	-0.017[5]	-0.013[5]	0.007[5]
	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)
Has Bond Rating	0.009[5]	0.001	0.007	-0.004	0.005
	(0.004)	(0.008)	(0.003)	(0.007)	(0.006)
PPE to Book Assets	-0.319[5]	-0.268[5]	-0.312[5]	-0.200[5]	-0.068[5]
	(0.006)	(0.017)	(0.006)	(0.014)	(0.015)
Return on Assets	0.027[5]	-0.082[1]	0.032[5]	-0.007	-0.075[5]
	(0.006)	(0.029)	(0.005)	(0.023)	(0.032)
Firm Pays Dividends	-0.013[5]	-0.027[5]	-0.015[5]	-0.035[5]	0.008
	(0.003)	(0.006)	(0.003)	(0.005)	(0.005)
R&D to Sales	0.136[5]	0.203[5]	0.136[5]	0.204[5]	-0.001
	(0.003)	(0.017)	(0.003)	(0.018)	(0.011)
Market to Book	0.004[5]	0.010[5]	0.004[5]	0.009[5]	0.001
	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)
Book Leverage	-0.097[5]	-0.103[5]	-0.096[5]	-0.103[5]	0.000
	(0.003)	(0.009)	(0.003)	(0.008)	(0.006)
Capital Exp/Sales	0.081[5]	0.203[5]	0.076[5]	0.158[5]	0.045
	(0.011)	(0.042)	(0.011)	(0.036)	(0.034)
Domestic Firm (1 if yes)	-0.015[5]		0.056[5]		
	(0.004)		(0.004)		
Observations	78,025	13,035	78,025	13,035	13,035
R^2	0.392	0.304	0.412	0.337	0.103

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 & II), domestic cash (columns III and IV) and foreign cash (columns V). The entire sample is included in the regression in columns I and III. Only multinational firms (MNF) 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, or 5% levels is reported as superscripts *, 1, 5 respectively.

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[5]	0.057	-0.770[5]	0.118[5]	-0.786[5]
	(0.047)	(0.077)	(0.049)	(0.078)	(0.047)	(0.079)
Years Constrained (%)	0.132[5]	0.024[5]				
	(0.012)	(0.011)				
StDev(Cash Flow)			0.132[5]	0.033		
			(0.036)	(0.025)		
Product Market Fluidity					0.012[5]	-0.004[5]
					(0.001)	(0.001)
Ln(Firm Sales)	-0.007[5]	0.008[5]	-0.011[5]	0.008[5]	-0.016[5]	0.009[5]
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Has Bond Rating	-0.007	0.008	-0.006	0.007	-0.006	0.007
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
PPE to Book Assets	-0.216[5]	-0.083[5]	-0.180[5]	-0.075[5]	-0.164[5]	-0.067[5]
	(0.015)	(0.015)	(0.014)	(0.015)	(0.014)	(0.016)
Return on Assets	0.133[5]	-0.067	0.029	-0.084[5]	-0.021	-0.108[5]
	(0.024)	(0.040)	(0.024)	(0.034)	(0.025)	(0.030)
Firm Pays Dividends	-0.030[5]	0.011[5]	-0.035[5]	0.01	-0.021[5]	0.002
	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)
R&D to Sales	0.214[5]	-0.005	0.226[5]	-0.004	0.153[5]	0.003
	(0.021)	(0.013)	(0.022)	(0.013)	(0.020)	(0.011)
Market to Book	0.012[5]	0.001	0.011[5]	0.001	0.022[5]	0.008[5]
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)
Book Leverage	-0.098[5]	-0.002	-0.098[5]	-0.001	-0.100[5]	0.006
	(0.008)	(0.006)	(0.008)	(0.006)	(0.010)	(0.007)
Capital Exp/Sales	-0.017	0.037	0.151[5]	0.057	0.032	0.033
	(0.045)	(0.051)	(0.043)	(0.041)	(0.044)	(0.041)
Observations	12,302	12,302	12,329	12,29	11,621	11,621
R^2	0.365	0.106	0.344	0.102	0.409	0.121

Notes:

The table contains regressions of the ratio of the firm's cash to book assets on a set of firm characteristics as in Table 3. The sample includes only MNFs. 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 percent of years the firm is financial constrained. This is the percent of years over the last three during which each firm's internal cash flow (EBITDA – taxes – capital expenditure) was insufficient to finance their 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, or 5% levels is reported as superscripts *, 1, 5 respectively.

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	MNF	All Firms	MNF	MNF	MNF R&D=0	MNF R&D>0
Related Sales	0.242[5]	0.228[5]	-0.054	-0.071	0.299[5]	0.016	0.451[1]
	(0.103)	(0.100)	(0.058)	(0.055)	(0.119)	(0.115)	(0.150)
Effective Tax Rate	-0.538[5]	-0.533[5]	0.055	0.017	-0.550[5]	-0.502[5]	-0.488[5]
	(0.073)	(0.075)	(0.062)	(0.063)	(0.070)	(0.095)	(0.089)
Related Sales x Tax Rate	-0.424	-0.379	0.121	0.182	-0.561	0.060	-0.975[5]
	(0.303)	(0.296)	(0.176)	(0.166)	(0.351)	(0.325)	(0.440)
Ln(Firm Sales)	-0.016[5]	-0.008[1]	-0.017[5]	-0.012[5]	0.005[5]	-0.003	0.009[1]
	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)
Has Bond Rating	0.009[5]	0.001	0.007	-0.004	0.005	-0.003	0.011
	(0.004)	(0.008)	(0.004)	(0.007)	(0.006)	(0.006)	(0.009)
PPE to Book Assets	-0.319[5]	-0.264[5]	-0.312[5]	-0.200[5]	-0.064[5]	-0.045[5]	-0.062[5]
	(0.006)	(0.017)	(0.006)	(0.014)	(0.014)	(0.013)	(0.029)
Return on Assets	0.027[5]	-0.086[1]	0.031[5]	-0.007	-0.079[5]	-0.026	-0.121[1]
	(0.006)	(0.029)	(0.005)	(0.023)	(0.032)	(0.026)	(0.043)
Firm Pays Dividends	-0.013[5]	-0.027[5]	-0.015[5]	-0.035[5]	0.008	-0.002	0.015
	(0.003)	(0.006)	(0.003)	(0.005)	(0.005)	(0.006)	(0.008)
R&D to Sales	0.136[5]	0.199[5]	0.136[5]	0.205[5]	-0.006	0.000	-0.018
	(0.003)	(0.017)	(0.003)	(0.018)	(0.011)	(0.000)	(0.014)
Market to Book	0.004[5]	0.010[5]	0.004[5]	0.009[5]	0.000	0.001	-0.001
	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Book Leverage	-0.097[5]	-0.105[5]	-0.096[5]	-0.103[5]	-0.002	0.001	-0.002
	(0.003)	(0.009)	(0.003)	(0.008)	(0.006)	(0.006)	(0.008)
Capital Exp/Sales	0.081[5]	0.208[5]	0.076[5]	0.157[5]	0.051	0.004	0.127
	(0.011)	(0.042)	(0.011)	(0.036)	(0.034)	(0.033)	(0.091)
Domestic (1 if yes)	-0.006		0.055[5]				
	(0.004)		(0.004)				
Observations	78,025	13,035	78,025	13,035	13,035	5,030	8,005
R^2	0.393	0.315	0.412	0.337	0.130	0.066	0.172

Notes:

The table contains regressions of the ratio of the firm's 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 percent 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 & III. Only multinational firms (MNF) 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, or 5% levels is reported as superscripts *, 1, 5 respectively.

Table 6: Tax Variable Decomposition

	III	IV
	Domestic Cash	Foreign Cash
	MNF	MNF
US Income (%)	0.033[5]	-0.261[5]
	(0.016)	(0.025)
Foreign Tax Rate	-0.042	-0.461[5]
	(0.049)	(0.071)
Ln(Firm Sales)	-0.011[5]	0.005[1]
	(0.002)	(0.002)
Has Bond Rating	-0.004	0.008
	(0.007)	(0.006)
PPE to Book Assets	-0.198[5]	-0.079[5]
	(0.014)	(0.014)
Return on Assets	-0.026	-0.050
	(0.025)	(0.035)
Firm Pays Dividends	-0.036[5]	0.012[5]
	(0.005)	(0.005)
R&D to Sales	0.217[5]	0.006
	(0.020)	(0.012)
Market to Book	0.009[5]	0.001
	(0.001)	(0.001)
Book Leverage	-0.106[5]	-0.003
	(0.009)	(0.006)
Capital Exp/Sales	0.141[5]	0.051
	(0.037)	(0.028)
Observations	12,683	12,683
R^2	0.348	0.173

Notes:

The table contains regressions of the ratio of the firm's domestic or foreign cash to book assets on a set of firm characteristics. Only multinational firms (MNF) are included in the sample. US 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, or 5% levels is reported as superscripts *, 1, 5 respectively.

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	MNF	All Firms	MNF	MNF	MNF R&D=0	MNF R&D>0
Related Sales	0.019	0.010	-0.023	-0.006	0.066	-0.040	0.119[5]
	(0.026)	(0.025)	(0.025)	(0.024)	(0.038)	(0.055)	(0.050)
Effective Tax Rate	-0.025	-0.017	-0.052	0.047	-0.0799[5]	-0.022	-0.098[5]
	(0.032)	(0.030)	(0.030)	(0.030)	(0.038)	(0.060)	(0.048)
Related Sales	-0.022	-0.008	0.098	0.005	-0.197	0.108	-0.344[5]
x Tax Rate	(0.081)	(0.077)	(0.079)	(0.075)	(0.116)	(0.172)	(0.151)
Ln(Firm Sales)	-0.0078[*]	0.000	-0.0087[*]	-0.001	-0.0032[1]	-0.0041[5]	-0.003
	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.002)	(0.002)
Has Bond Rating	0.0037[5]	0.001	0.0032[5]	0.001	0.006	0.004	0.006
	(0.002)	(0.003)	(0.002)	(0.003)	(0.004)	(0.006)	(0.005)
PPE to Book Assets	-0.0810[*]	-0.0292[*]	-0.0765[*]	-0.012	-0.0354[*]	-0.022	-0.062[*]
	(0.003)	(0.007)	(0.003)	(0.006)	(0.010)	(0.013)	(0.015)
Return on Assets	0.1756[*]	0.1661[*]	0.1737[*]	0.1367[*]	-0.012	-0.029	-0.010
	(0.004)	(0.016)	(0.004)	(0.015)	(0.013)	(0.027)	(0.014)
Firm Pays Dividends	0.0089[*]	-0.0113[*]	0.0078[*]	-0.0070[*]	-0.0178[*]	-0.0150[1]	-0.017[*]
	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.005)	(0.004)
R&D to Sales	0.0063[1]	0.0346[5]	0.0074[*]	0.024	-0.003		-0.003
	(0.002)	(0.015)	(0.002)	(0.014)	(0.010)		(0.011)
Market to Book	0.0113[*]	0.0069[*]	0.0102[*]	0.0054[*]	0.0056[*]	0.0037[1]	0.007[*]
	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Book Leverage	-0.0248[*]	-0.0247[*]	-0.0252[*]	-0.0166[*]	-0.008	0.004	-0.016[1]
	(0.002)	(0.004)	(0.002)	(0.004)	(0.004)	(0.006)	(0.006)
Capital Exp/Sales	-0.040[*]	-0.133[*]	-0.033[1]	-0.153[*]	0.152[*]	0.154[1]	0.134[5]
	(0.010)	(0.033)	(0.011)	(0.032)	(0.038)	(0.051)	(0.059)
Domestic	0.0137[*]		0.0356[*]				
(1 if yes)	(0.002)		(0.002)				
Observations	0.101	0.074	0.092	0.053	0.158	0.170	0.159
R^2	71,215	12,142	71,215	12,142	12,142	4,613	7,529

Notes:

This table replicates the results of Table 5, but using changes in the cash opposed to the level of cash. The table contains regressions of the ratio of changes in the firm's 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 percent 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 & III. Only multinational firms (MNF) 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, or 5% levels is reported as superscripts *, 1, 5 respectively.

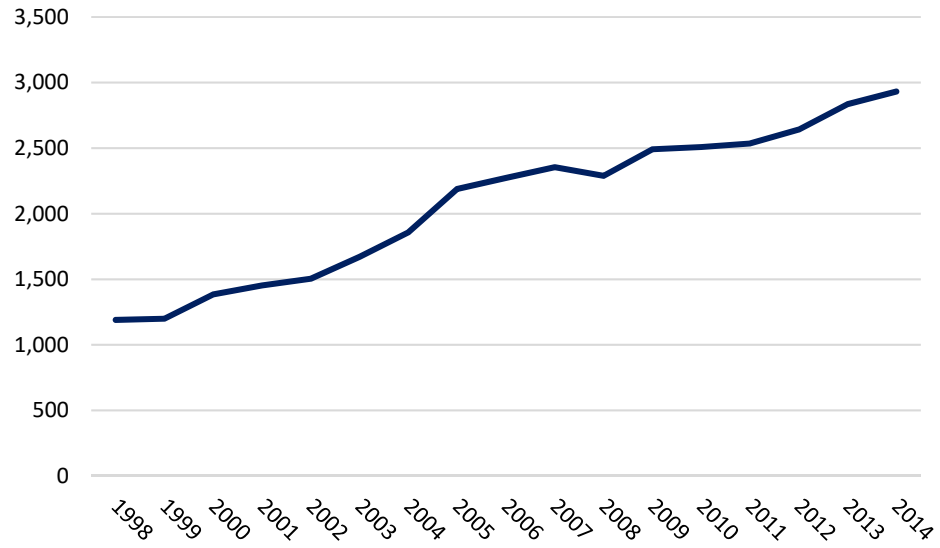
Table 8: Subsidiary Level Regressions

	I	II	III	IV	V	VI	VII	VIII
Foreign Tax Rate	-0.015[5]	-0.017[5]	-0.016[5]	-0.012[5]	-0.013[5]	-0.015[5]	-0.014[5]	-0.014[5]
	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)	(0.003)
Related Sales					0.006[5]	0.004[5]	0.004[5]	0.003[1]
					(0.001)	(0.001)	(0.001)	(0.001)
Related Sales x Tax					-0.021[5]	-0.018[5]	-0.018[5]	-0.009[5]
					(0.004)	(0.003)	(0.003)	(0.004)
Firm Dummies	No	Yes	No	No	No	Yes	No	No
Firm-Year Dummies	No	No	Yes	No	No	No	Yes	No
Country Dummies	No	No	No	Yes	No	No	No	Yes
Observations	125,428	125,428	125,428	125,413	116,309	116,309	116,309	116,308
R^2	0.001	0.219	0.251	0.051	0.002	0.233	0.265	0.055

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 is 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 percent 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, or 5% levels is reported as superscripts *, 1, 5 respectively.

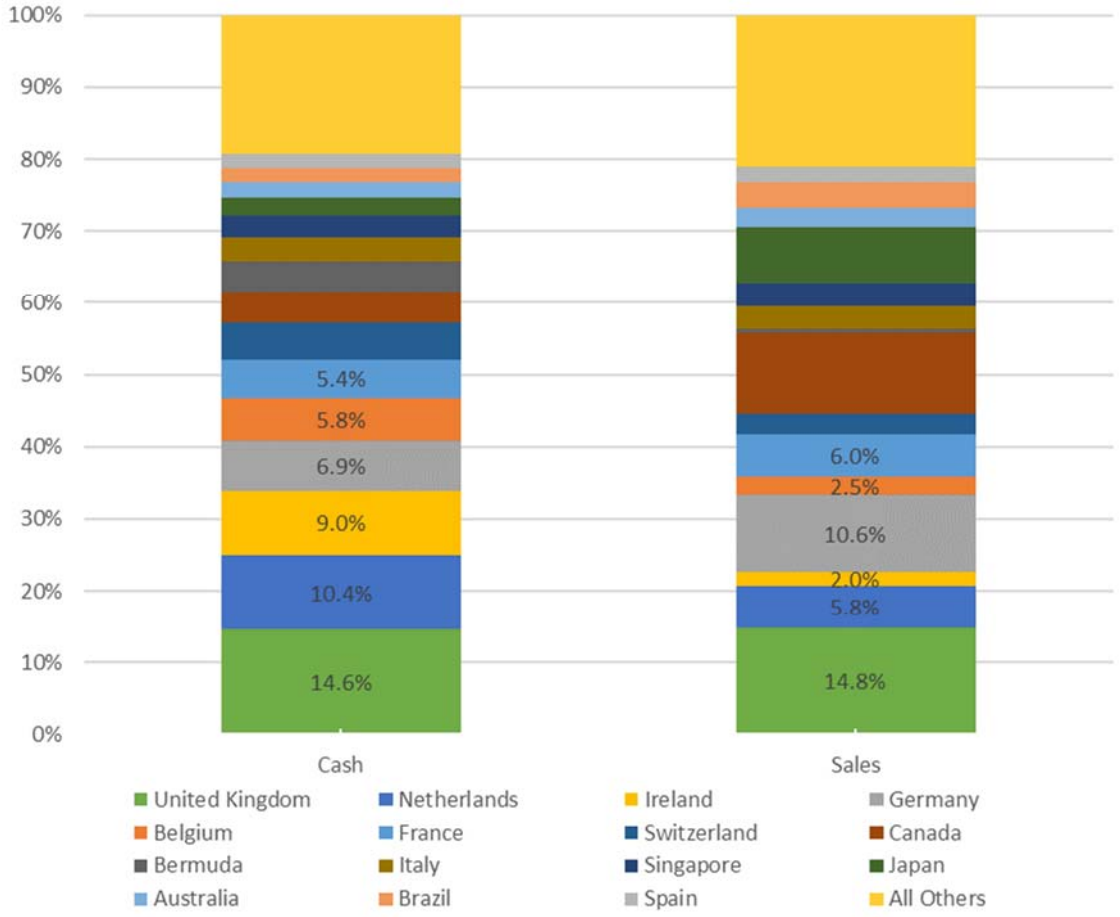
Figure 1: Aggregate Corporate Cash – Flow of Funds



Notes:

The data is 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 non-financial businesses as well as investment in debt securities (e.g. commercial paper, government bonds, and loans). The data is from 1998 to 2014.

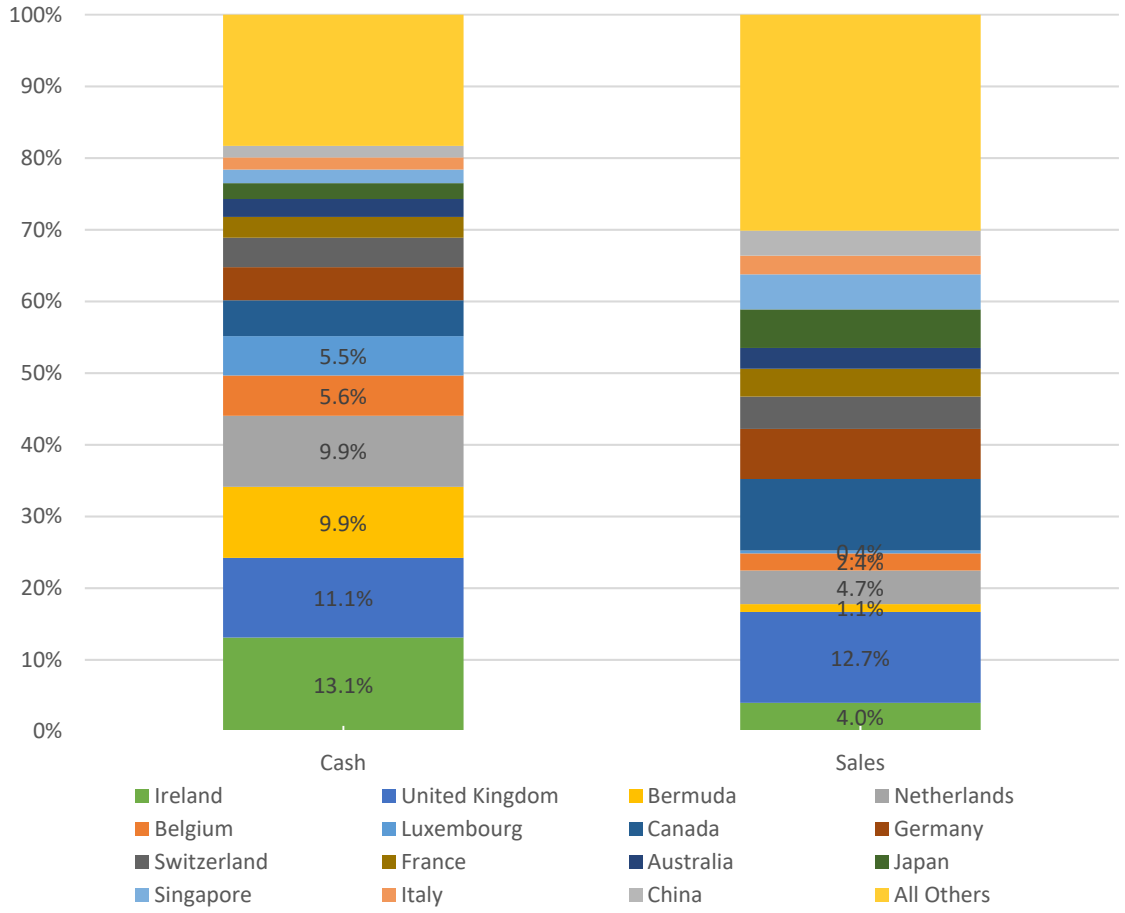
Figure 2: Distributison of Cash and Sales across Subsidiary Countries (1998)



Notes:

The percentage of foreign cash (left bar graph) and sales (right bar graph) which is held in the foreign subsidiary of US multinationals in 1998 is graphed above. All foreign countries in the data set are included and the fifteen 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% of foreign cash and 14.8% of foreign sales were made by subsidiaries located in the United Kingdom.

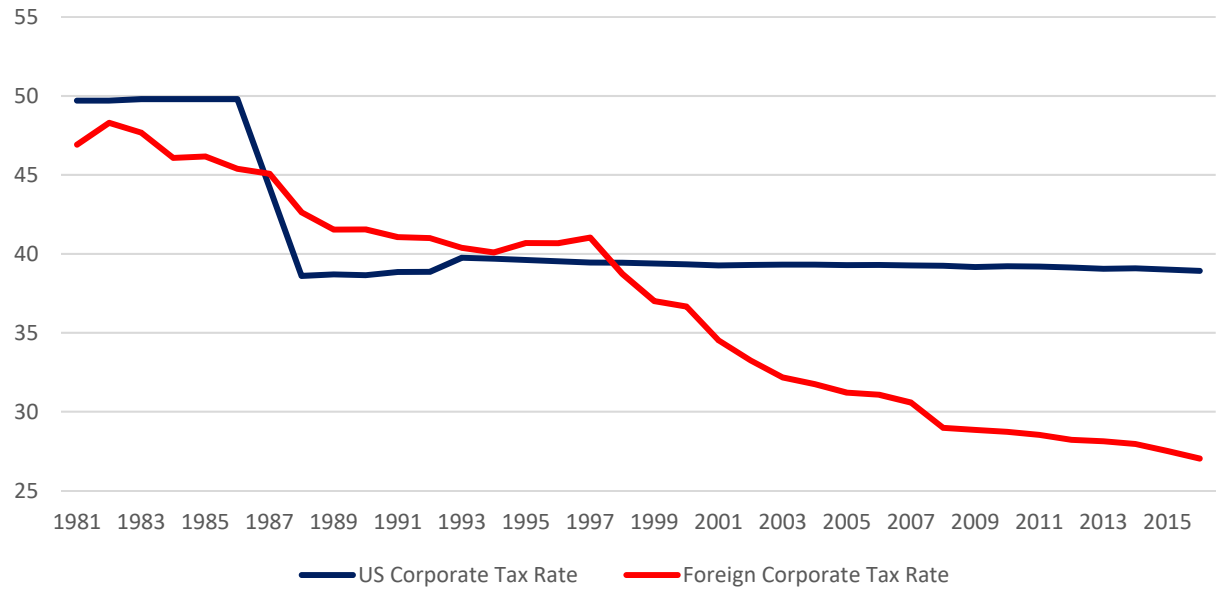
Figure 3: Distribution of Cash and Sales across Subsidiary Countries (1998)



Notes:

The percentage of foreign cash (left bar graph) and sales (right bar graph) which is held in the foreign subsidiary of US multinationals in 2008 is graphed above. All foreign countries in the data set are included and the fifteen 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 the Ireland Kingdom held the most cash in 2008. The Irish subsidiaries held 13.1% of foreign cash and 4.0% of foreign sales were made by subsidiaries located in the Ireland.

Figure 4: Corporate Tax Rates: US and Foreign Rates

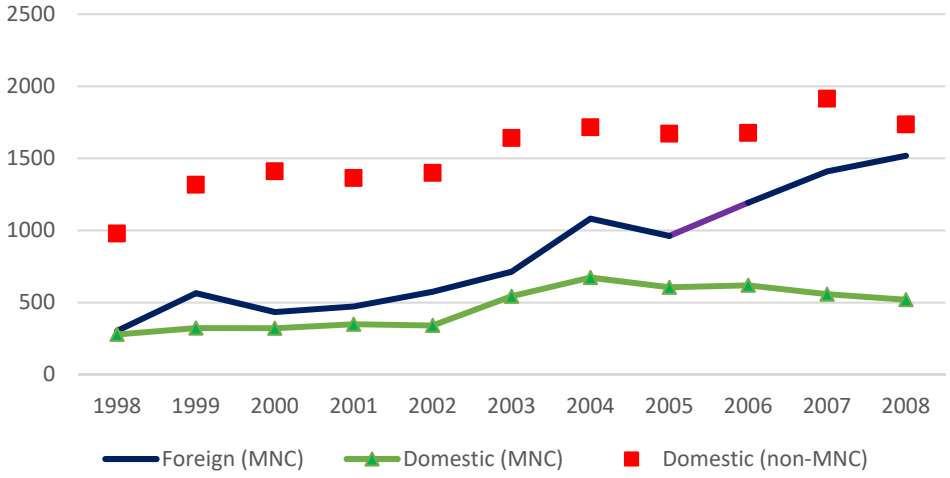


Notes:

The figure graphs the top US 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 was available from the OECD web site.[1]

[1] 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 is not reported before 1990 and for Luxembourg before 2000. These countries are excluded from the average in these years.

Figure 5: Aggregate Cash Levels



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.