

U.S. Repatriation Taxes and Corporate Cash Holdings

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Table of Contents

List of tables.....	5
Summary	6
1. Introduction	7
2. Theory & previous literature.....	8
2.1 Transaction costs	8
2.2 Investments.....	9
2.3 Corporate governance	11
2.4 Taxation	17
2.5 Conclusion	21
3. Research question & hypotheses.....	23
3.1 Hypotheses	23
4. Data.....	24
4.1 Variables.....	24
4.2 Selection and availability	28
5. Results.....	29
5.1 Cash holdings and repatriation tax burdens	30
5.2 Cash holdings, repatriation tax burdens and growth opportunities	34
5.3 Cash holdings, repatriation tax burdens and corporate governance	36
6. Discussion & analysis	38
6.1 Implications	39
6.2 Limitations.....	40
6.3 Opportunities for future research	41
7. Conclusion	42
8. Literature.....	44
9. Appendices.....	47
9.1 Descriptive statistics	47
9.2 Correlations.....	48
9.3 Residual normality tests.....	49

List of tables

Table 1 Summarized overview of the theory on corporate cash holdings.....	22
Table 2 Definitions of variables used	25
Table 3 Cash holdings and repatriation tax burdens	31
Table 4 Changes in cash holdings and repatriation tax burdens	33
Table 5 Cash holdings, repatriation tax burdens and growth opportunities	35
Table 6 Cash holdings, repatriation tax burdens and corporate governance	37
Table 7 Descriptive statistics of variables used	47
Table 8 Correlations of variables used.....	48
Table 9 Jarque-Bera tests for normality of residuals	49

Summary

Previous literature has explained and demonstrated a number of determinants of the level of cash retained by corporations. Variation in corporate cash holdings can be viewed as the result of a trade-off between the costs and benefits of retaining cash. Cash holdings can be helpful in avoiding transaction costs and may serve as a precaution to the underinvestment problem. Costs stem from the fact that cash may increase the agency problem between the board and shareholders, from the double taxation of passive investment income and from opportunity costs. Managers may prefer a higher level of cash than the optimal amount from a shareholder perspective.

More recent studies have suggested that specific characteristics of the U.S. tax system can help explain high cash holdings. The U.S. levies a corporate income tax on foreign income, but foreign taxes paid are credited and the tax can be deferred until profits are repatriated. Firms may thus defer returning cash in order to delay paying taxes. In the absence of good investment opportunities, firms may choose to retain cash in order to defer returning profits and facing taxes. Some previous literature has identified an empirical link between the repatriation tax burden and cash holdings.

In this thesis, I further investigate how tax costs related to repatriating foreign income affect corporate cash holdings in U.S.-based firms. Using regression analyses on public U.S. firms over the 2010-2015 period, I confirm the hypothesis that firms facing a high repatriation tax burden hold more cash on average when controlling for typical other effects. Cash holdings are not found to be less sensitive to repatriation tax burdens in firms with large growth opportunities. Furthermore, this relationship is not found to be significantly dependent upon certain corporate governance indicators.

My results underscore the importance of the link between repatriation tax burdens and cash holdings, implying that firms hold cash abroad in order to defer paying taxes instead of returning cash to shareholders or investing. This likely costs the U.S. treasury money and leads to financial policy decisions that would otherwise be suboptimal. The results also show that this relationship is independent of motives related to corporate governance and growth opportunities.

Keywords: Cash holdings, repatriation taxes, corporate governance, growth opportunities

JEL Classification: G32, G35, H25, G34, F23

1. Introduction

Firms may distribute excess cash to shareholders through dividends or share buybacks or may use the cash for investments. The amount of cash that firms retain in lieu of shareholder distributions or immediate investments (corporate cash holdings) has been the subject of discussion of a significant amount of research, yielding different explanations. Recently, popular media have devoted attention to companies such as Apple, Inc. that for multiple consecutive years hoard very large amounts of cash. Most academic literature focuses on transaction costs, capital market imperfections and the agency problem to explain corporate cash holdings. More recently, tax reasons have been added to the list of determinants. Unlike most other Western countries, the United States levies an income tax on foreign income. However, this tax can be deferred until the moment of repatriation, inducing firms to retain cash abroad. Most significantly, Foley et al. (2006) show that U.S.-based firms that face high repatriation tax burdens hold more cash on average. In this thesis, I further investigate this relation and test the sensitivity of this effect to agency and growth opportunity effects.

Apart from the academic relevance, understanding the drivers behind corporate cash holdings can be relevant for corporate finance practitioners when determining the amount of excess cash, an important element in corporate valuation. It can also show policy makers the (distortionary) effects of tax policy.

This thesis is organized as follows. Chapter 2 discusses the theory and previous literature on corporate cash holdings, with an emphasis on repatriation taxes. In Chapter 3 sets out the research question and hypotheses. Chapter 4 discusses the data sources used and the construction of research variables. The results are presented in Chapter 5. I analyze the results, its implications and limitations in Chapter 7. The thesis concludes in Chapter 8.

2. Theory & previous literature

The optimal amount of cash to be held by a firm can be seen as a trade-off between costs and benefits. The costs of holding cash are opportunity costs, i.e. the foregone return of alternative investments, agency costs and tax costs. Benefits stem from the avoidance of transaction costs due to temporary cash flow mismatches (the transaction costs motive) and the ability of the firm to take advantage of value-creating investments despite the inability to raise external financing due to capital market imperfections (the precautionary motive). Additionally, maintaining cash holdings might provide benefits from deferring U.S. taxes on income from foreign activities (repatriation taxes). The agency problem between shareholders and managers may cause firms to hold an amount of cash that differs from the optimal amount of cash.

This chapter discusses the predicted determinants of cash hoarding across four themes. First, the transaction costs motive of cash holdings is discussed. The second section of this chapter examines the precautionary motive for cash holdings. Section three considers the implications of the agency problem for cash holdings. Lastly, various ramifications of the U.S. tax system for cash holdings are examined in section four.

2.1 Transaction costs

All firms need some amount of cash to allow for timing mismatches between income and expenditures. If firms did not maintain some cash buffer, they would have to liquidate assets every time they need to make a payment, incurring high transaction costs. Such transaction costs could include for example the payments to middlemen for selling assets but also the loss of value when the sale of an asset is forced to take place in a short amount of time, leading to a bargain price. Holding some amount of cash mitigates these high costs of financial distress.

Baumol (1952) has developed a formal model for the transactions demand for cash. He shows that under simple assumptions and given the presence of both transaction costs for obtaining cash and a positive opportunity cost for holding cash, a rational person (or corporation) would hold cash in proportion to the square root of the value of his transactions. His demand for money would furthermore increase in the face of higher transaction costs and would decrease as the opportunity cost of holding cash is lower.

2.1.1 Cash flow volatility

When firms have regular incoming cash flows, this stream can of course be used to make required payments, thus limiting the need to maintain large cash reserves. However, even

in profitable firms, received bills may become due before the firm's customers pay theirs, so that cash holdings remain important as a mitigant of transaction costs.

As cash flows become more volatile, the risk of mismatches between cash inflows and outflows in a given period increases, providing a greater reason to maintain cash reserves to mitigate transaction costs. It can thus be expected that firms with more volatile cash flows keep a higher amount of cash as a buffer.

Harford (1999) takes highly varying cash levels as a percentage of sales across industries as a sign that the transaction costs motive for cash holdings is a function of business characteristics. He develops a regression model that explains differences in cash levels to a certain extent using variances in business characteristics and economic circumstances that relate to liquidity risk, explaining on average 18.1 percent of the variance in cash holdings within 19 industry groups.

Consistent with the transaction costs motive for cash holdings, Bates et al. (2009) find that the increase of cash holdings in U.S. firms between 1980 and 2006 can be partially explained by rising cash flow volatility as well as decreasing inventory levels. Inventories provide liquidity in the short term that may substitute for cash. Foley et al. (2006) also find greater cash holdings in firms with a higher standard deviation of operating income.

2.1.2 Scale

Larger firms are generally considered less risky, *ceteris paribus*. Exposure to a higher amount of operations, customers and geographies implies a lower risk profile, as diversification leads to a lower variance of cash flows. As predictable positive cash flows can reliably offset a large portion of cash outflows, the need for holding large amounts of cash decreases. The transactions costs motive would thus be of lesser importance as firms are bigger.

Consistent with this hypothesis, empirical studies have shown that there are economies of scale in cash holdings. For example, Mulligan (1997) finds an elasticity of cash balances with respect to sales of approximately 0.8. Both Opler et al. (1999) and Foley et al. (2006) find a large significant negative relation between firm size and cash holdings across a variety of model specifications.

2.2 Investments

Firms can fund investments by raising equity or debt or they can use retained cash generated by operations. Under the pecking order theory as popularized by Myers & Majluf (1984), shareholder value maximizing managers prefer to finance investments

with internal funds over external financing. Their reasoning follows from the fact that managers have more information about a company than investors. If managers attempt to maximize shareholder value, they would issue stock when they see that the trading stock price overvalues the company. However, because the market is aware of the information asymmetry, outsiders would recognize the decision to issue new shares as a signal that shares are overvalued and the stock price would immediately drop to reflect this. Taking into account this effect, a significant cost should be ascribed to any considered equity issue. This reasoning can also be extended to the issue of debt, albeit to a lesser extent because information asymmetry plays a smaller role. Therefore, debt is relatively more attractive source of financing than equity, but internal funds are the most attractive.

It may even be favorable to forego value creating investments if these can only be funded through the issue of new debt or equity, as the cost resulting from information asymmetry may be greater than the net present value (NPV) of the investment by itself. This implies that retaining cash holdings may in fact create shareholder value as it mitigates these costs and allows firms to profitably seize good investment opportunities and prevents them from foregoing otherwise valuable opportunities. Thus, firms that plan to make large investments may choose to hoard cash instead of using it to pay dividends or to pay down debt.

2.2.1 Investment opportunities

Opler et al. (1999) find support for this motive for maintaining cash holdings in their empirical research on public U.S. corporations over the years 1971 through 1994. They find that firms that have a good set of investment opportunities, as evidenced by a high market-to-book ratio, hold relatively more cash as a percentage of net assets. This suggests that firms do keep cash reserves in anticipation of future investment opportunities. Furthermore, they find that larger firms and firms with better credit ratings hold lower cash percentages of cash, indicating that capital market access plays an important role in explaining corporate cash reserves.

Foley et al. (2006) find that firms hold higher amounts of cash when they have high market-to-book ratios and high R&D expenditures. Given that these determinants are indicative of good investment opportunities, these results support the idea that firms hold cash to allow the financing of future investment opportunities.

Bates et al. (2009) attribute part of the increase in U.S. corporate cash holdings between 1980 and 2006 to the fact that R&D investment has become relatively more important

than capital expenditures. As R&D investments do not directly yield a tangible product, external financing for R&D is costlier than for capital expenditures, and the precautionary motive thus becomes more important.

More recently, Pinkowitz et al. (2016) attribute the fact that U.S. firms hold more cash on average than similar companies abroad to the high and unmatched R&D intensity of American firms.

Pinkowitz & Williamson (2007) take a different methodological approach to this issue and assess how cash holdings are valued in the market. They find that on average a dollar of cash is not valued significantly more or less than a dollar. However, cash holdings are valued at a premium to their nominal value in firms with good growth options, as indicated by high sales growth, high R&D expenditures and high capital expenditures. The value of cash increases further as the volatility of capital expenditures increases. These results provide supporting evidence that maintaining cash holdings is consistent with value maximization, provided that they are maintained in anticipation of future investment opportunities.

2.2.2 Diversification

Duchin (2010) finds that specialized firms in the U.S. hold approximately twice as much cash as a percentage of assets. He explains this phenomenon through the hypothesis that the precautionary motive for holding cash is weaker in diversified firms because both their cash flows and investment opportunities are smoother than in specialized firms, decreasing the likelihood of a mismatch between cash flows and investment opportunities. Cash flows have lower variance in diversified firms due to the imperfectly corrected results of their divisions, while the occurrence of investment opportunities across divisions are also smoother as these are also imperfectly correlated.

Consistent with this hypothesis, Duchin finds that cash holdings are lower as firms have lower correlations in investment opportunity across divisions and higher correlations between investment opportunity and cash flow. The effects remain significant after controlling for cash flow volatility and are even more pronounced in financially constrained firms and firms with high corporate governance measures.

2.3 Corporate governance

In public companies, an agency problem exists because ownership and control of the company are separated and managers have different interests than shareholders. While shareholders look for maximization of equity value, managers may shirk their duties,

expand their own perks or build a large “empire”, in order to reduce their undiversified risk and to increase their power and authority. Company risk is more of a problem for managers than it is for shareholders, as their primary source of income, and often a substantial portion of their wealth, is dependent on the fate of the company, whereas an ordinary shareholder can decrease his exposure to the non-systemic risk of a company simply and at very low cost by diversifying his stock portfolio. Without proper governance mechanisms, managers would destroy shareholder value.

Jensen (1986) has argued that free cash flows increase the scope of this agency problem, as it provides managers more opportunity and discretion to engage in value-destroying behavior. Debt can help alleviate this problem, by requiring regular and substantial payments, thus decreasing manager’s discretion over free funds. This prevents them from pursuing investments at their own discretion. Instead, they require companies to seek external financing for any investment opportunities that come up. This subjects managers to the discipline of capital markets and serves to ensure that investments are only pursued when they are in fact valuable. Grossman & Hart (1982) have argued that regular debt payments discipline management because it increases the likelihood of bankruptcy and thus forces them to maintain high revenues and low costs. Easterbrook (1984) posits that firms commit to regular dividend payouts to mitigate agency costs as it requires them to return to the capital markets for financing new projects, which improves the capital market’s monitoring function.

The reasoning of the free cash flow theory can be extended to cash holdings because cash holdings can be seen as stocks of cash flows. Managers may prefer greater cash reserves for reasons that are not consistent with shareholder interests. Greater cash reserves increase managerial discretion, allowing them to increase perks or to engage in empire-building.

2.3.1 Management entrenchment and cash hoarding

As managers are thought to prefer cash holdings more than shareholders do, firms where managers are entrenched, i.e. where managers are so powerful that they can pursue their own rather than the shareholders’ interests, can be expected to hold more cash than firms without management entrenchment.

Corporate law statutes, charters of incorporation and corporation bylaws determine the legal relationship between shareholders and directors. Whether managers are inclined to pursue shareholder interests or are able to put their own interests first, depends for a large part on the legal framework. When it is relatively hard for shareholders to replace

managers, managers are less incentivized to behave in a way that is beneficial to shareholders. Managers may further be disciplined to create shareholder value through the market of corporate control. When companies underperform, they become an attractive takeover target for entrepreneurial buyers who seek to buy the company at a bargain and subsequently improve its performance and value, replacing the poor managers in the process. Takeover protections frustrate the functioning of the market for corporate control and thus mitigate its disciplining effect on management.

Consistent with this theory, Dittmar et al. (2003) studied the implications of shareholder rights protection on the country level and found that firms in countries with poor shareholder protection hold approximately twice as much cash as firms in countries with good shareholder protection. Furthermore, they find that the relation between investment opportunities and cash holdings weakens in poor shareholder protection countries.

At the firm level, corporate governance is regulated mostly through charters of incorporation and bylaws. Gompers, Ishii and Metrick (2003) have constructed a “Governance Index” or G-Index that shows the level of shareholder rights at the firm level. They found large abnormal returns for a hedge portfolio long firms with high shareholder rights and short firms with low shareholder rights. These results suggest that firm-level corporate governance is an important determinant of corporate performance. Based on the same underlying data, Bebchuck et al. (2009) have construed a more simplified “Entrenchment Index” or E-Index based on just six provisions that they show are just as good or even more indicative of proper corporate governance.

Karpoff et al. (2016) have found that the likelihood that a firm becomes a takeover target decreases as G-Indices and E-Indices increase, providing support for the validity of the indices. However, with regard to cash holdings, Bates et al. (2009) have not been able to find that firms scoring a higher G-Index (firms with presumably greater management entrenchment) increased their cash holdings more than firms with a lower G-Index.

2.3.2 Institutional shareholdings

Institutional shareholders may be better positioned to monitor firms than other shareholders (e.g. individual retail investors) because of their size and expertise. Thus, they may play a role in enforcing value-creating behavior and preventing management entrenchment. For this reason, it may be expected that the presence of institutional shareholders may keep down cash holdings.

Brown, et al. (2012) have researched whether institutional shareholders do in fact help control corporate cash holdings. Their results show that the effect depends on the type of institutional investors. The presence on short-term institutional owners has a positive effect on cash holdings, while long-term institutional shareholders have a negative effect on cash holdings. These results do not provide clear support for the monitoring role of institutional owners. Brown et al. find a rationale for these nuanced results in that the behavior of speculative or short-term institutional shareholders increases uncertainty over future equity issuance. This creates greater uncertainty over the possibility to finance future investments and increases the precautionary motive for cash holdings.

2.3.3 Firm size

As discussed in the previous section, the market for corporate control plays an important role in disciplining management. As firms get bigger, they become harder to take over because the amount of money needed to acquire the firm grows and fewer parties may be able or willing to provide or arrange financing for such a transaction. Thus, firm size may serve as a deterrent to takeovers and limit the disciplining effect of the market for corporate control. Managers in larger firms are therefore more likely to be entrenched and can thus be expected to hoard more cash.

Other literature has investigated the question of whether cash holdings themselves affect the working of the market for corporate control. Pinkowitz (2000) find that it the likelihood of a firm being acquired decreases with the level of cash holdings. This effect persists in firms with poor growth opportunities, in which it is thought that the benefits of cash holdings are the smallest. These results suggest that the market for corporate control does not effectively discipline firms into keeping cash holdings to a minimum. Cash holdings may even serve as a takeover deterrent, like other sources of firm size, which implies that the agency costs of cash holdings are even greater.

2.3.4 Managerial shareholdings

In addition to formal or legal corporate governance, shareholder value creation by management may be promoted or handicapped by management shareholdings in the firms they lead. Managers that hold a substantial interest in their firms have their interest more aligned with other shareholders. However, if managers own such a stake in their companies that they come to own a large share of the company, they may be able to assert their shareholders to such an extent that other shareholders are dominated, inhibiting the proper functioning of other corporate governance mechanisms. This

situation would allow managers to resist forces that would otherwise entice them to look after the interest of outsider shareholders.

Opler et al. (1999) find that cash levels increase significantly if managers have some amount of ownership, although the effect is not extended as managerial ownership increases above 5%. This is somewhat consistent with the idea that managers prefer to mitigate risk through cash reserves when they themselves have significant exposure to the firm value.

Focusing on companies in the United Kingdom, Ozkan & Ozkan (2004) have studied the relationship between cash holdings and various aspects of corporate governance. They find a non-monotonic relationship between cash holdings and managerial shareholdings: cash holdings fall until management shareholdings reach 24%, then increase until managers own 64% and then fall again as managerial ownership increases further. These findings support the alignment hypothesis of management shareholdings and support the entrenchment effect to a certain extent. Furthermore, their results show that family-controlled firms hold more cash than other firms.

2.3.5 Debt

Debt plays an important role in the agency problem between shareholders and managers. As discussed earlier, the free cash flow hypothesis posits that regular mandatory debt service payments discipline management and subject firms to the discipline of the capital markets when financing is required, preventing overinvestment. The regular payments typically demanded by debt providers would be expected to keep down cash holdings.

As John (1993) points out, the existence of debt can also be indicative of good access of external financing sources. On the other hand, high levels of leverage increase the likelihood of financial distress, which would make cash holdings more valuable through their buffer function. She finds that the liquidity ratio is reduced as firms have a higher debt ratio, suggesting that the former effect dominates.

It is generally thought that bank debt is valuable in mitigating agency costs because banks provide a monitoring function that shareholders can freeride on. As they require regular (financial) updates and see to it that firms are run efficiently and profitably in order to reduce the risk of default, they provide a monitoring functioning that also profits shareholders. In a study of private small companies, Ang et al. (2002) find some evidence that monitoring by banks results in lower agency costs, providing evidence that banks do in fact function as a delegated monitor for shareholders.

However, with regard to cash holdings, the interests of debt providers and equity providers are not aligned. Debt providers will generally prefer firms to maintain high cash holdings, as this decreases the expected costs of financial distress, while they generally do not stand to gain directly from increased profitability, as equity providers do. Therefore, it would be expected that creditors would exert their monitoring function in order to encourage, rather than discourage, large cash holdings. Thus, the monitoring function of creditors would not necessarily benefit shareholders with regard to maintaining a (shareholder value-maximizing) optimum of cash holdings.

In conclusion, debt in general is predicted by free cash flow theory to have a negative effect on corporate cash holdings. Another reason to expect lower cash holdings in indebted firms is that debt may be a proxy for good access to capital markets, reducing the need for cash reserves. However, the increased likelihood of financial distress makes cash holdings more important, suggesting an opposite effect of leverage on cash holdings.

Because of the ambiguous theories on debt as a determinant of cash holdings, the role of debt must ultimately be studied empirically. Ozkan & Ozkan (2004) find a significant negative effect of general leverage on cash holding levels in addition to a distinct negative effect of bank debt. Opler et al. (1999) also find a large significant effect for a sample of U.S. firms.

2.3.6 The agency cost of cash holdings

While the literature discussed focused on the effects of corporate governance on the amount of cash held by firms, other authors have focused on the question of how the agency problem affects the value of such holdings. Here, the focus lies on the use of cash funds, which agency theorists predict to be value destroying when managers are allowed to put their own interests before those of shareholders.

For example, Dittmar & Mahr-Smith (2007) divided firms in terms of good and poor governance based on the E-Index and G-Index. They find empirically that cash in poorly-governed firm is traded at a large discount to nominal value whereas the markets place a large premium on cash in well governed firms. The first finding suggests that markets do in fact attribute a substantial agency cost to cash held by firms with entrenched managers, whereas the other finding suggests that in well governed firms, cash holdings may increase value, providing empirical support to the precautionary motive of cash holdings. The authors go on to show that poorly governed firms spend

excess cash in wasteful ways, providing additional support to the agency theory of cash holdings, whereas this effect is not found in companies deemed to be governed well.

Some research provides evidence that excess cash holdings specifically incline managers to engage in empire building. For example, Harford (1999) uses the residuals of his cash level model described earlier in paragraph 2.1.1 (i.e. the difference between actual and predicted cash levels) as an indicator of cash richness. He then finds that cash-rich firms are more likely to pursue acquisitions and that they experience a negative stock price and poor subsequent operation performance following the announcement of an acquisition by the firm. This suggests that high corporate cash holdings result in behavior that destroys value, consistent with the agency hypothesis of cash holdings and contrary to the alternative hypothesis that firms retain cash to finance value creating investments driven by capital market inefficiencies.

Pinkowitz's & Williamson's (2007) finding that a dollar of cash is not valued significantly more or less than a dollar in capital markets, suggests that the agency cost of cash is less than the benefits ascribed to cash holdings on average. However, in firms with low sales growth, low capital expenditures, low capital expenditure volatility and low cash flow uncertainty, an additional dollar of cash is valued at significantly less than a dollar, suggesting the costs of excess cash exceed the benefits. These results imply that agency costs of cash holdings do exist, but that they are on average offset by benefits. Shareholders of firms with fewer and/or predictable investment opportunities and relatively limited business risk should be wary of managers hoarding large amounts of cash, as this is likely not put to productive use.

Opler et al. (1997) do not find evidence they find compelling that excess cash holdings lead to value-destroying behavior per se. They find that while large cash holdings increase acquisitions activity and capital expenditures to some degree, shareholder distributions increase also.

2.4 Taxation

This section discusses two distinct implications of the (United States) tax systems for corporate cash holdings. First, I explain how taxation imposes an (avoidable) cost on corporate cash holdings that makes retaining cash less attractive. Second, I explain why under specific circumstances, cash holdings may help defer tax costs. This idea is central to the further development of my thesis.

2.4.1 The tax cost of cash holdings

A first aspect of taxation in relation to taxation to consider is the tax cost of cash holdings. Typically, a firm's profits are taxed twice. First, it is taxed at the firm level under a corporate income tax. Second, it is taxed at the shareholder's personal level as personal income when the profit is distributed (or, if the profit is retained by the firm, as capital gains to the extent that firm value increases with the retained earnings).

A value-maximizing firm that generates cash for which it has no proprietary, value-creating investment opportunities is faced with a choice to retain the earnings and invest it in zero NPV investment opportunities or to distribute the earnings to shareholders through dividends or share buybacks. Cash is typically such a zero NPV investment, it is typically kept in an (almost) risk-free bank or savings accounts that generates a minimum of interest. Because any return made by the firm on such zero NPV investments is taxed at two levels, it would be favorable to shareholders to distribute the earnings to them and providing them with the opportunity to reinvest the earnings (e.g. in a personal savings account), thereby avoiding the first level of taxation at the firm level. This explains why, in the absence of other effects, there is a tax cost to corporate cash holdings that makes corporate cash holdings inconsistent with value maximization.

2.4.2 Tax savings through cash holdings

2.4.2.1 *The U.S. repatriation tax*

The United States is one of few remaining OECD countries to apply a worldwide (as opposed to territorial) corporate income taxation basis (Dittmer, 2012). Profit generated in foreign operations of U.S. corporations is generally taxed in the same manner as profit from domestic operations. Two tax system features offer some relief, however. First, a tax credit is granted to the sum of any foreign income taxes paid. No credit is granted to the extent that the foreign tax exceeds the U.S. tax. Provided that the American tax rate is higher than the foreign rate, the total tax due will thus not exceed the U.S. tax rate because the foreign taxes will offset the U.S. tax. The second feature is that any tax due on foreign income can be deferred, with no maximum of time, until such income is legally transferred to the United States. Because of this, the taxation of foreign income is also called a "repatriation tax". The option to defer is only available to foreign operations that are incorporated as foreign corporations. It should be noted that any foreign income from passive investment is "deemed distributed" and is immediately taxable in the United States without deferral.

2.4.2.2 Effect of repatriation tax on optimal cash holdings

The taxation of foreign income, combined with the option to defer taxation until repatriation, inclines value maximizing U.S.-based firms to retain foreign profits abroad. Even when no good investment opportunities are available abroad, it may be beneficial to retain foreign cash holdings in lieu of repatriation as the benefit of tax deferral exceeds other costs associated with holding cash. Therefore, we may expect the repatriation tax to cause internationally active American firms to hold more cash than they would otherwise. More specifically, it can be expected that U.S.-based companies hold higher amounts of cash when a larger part of operations are based abroad.

Anecdotal evidence supports this idea. For example, in 2015, Apple, Inc. had accumulated over \$ 200 billion in cash, of which \$ 180 billion is held in foreign subsidiaries, according to Bloomberg (2015). At the same time, the technology company had over \$ 50 billion in debt, raised for a large part in order to pay for its capital return plan.

2.4.2.3 Prior research

Foley, et al. (2006) have established a link between repatriation taxes and cash holdings. Their empirical results suggest that the deference of repatriation taxes are an important driver of corporate cash holdings. First, they find that firms retain more cash if they are faced with relatively higher tax costs upon repatriating income. Second, they find that firms keep a larger percentage of their cash holdings abroad when they face a higher repatriation tax burden. Third, they find firms hold higher amounts of cash in affiliates that are responsible for the earnings creating high repatriation tax burdens.

Graham et al. (2010) have researched the effects of the repatriation tax through a survey of tax executives. They find results consistent with the findings of Foley et al. that companies retain cash abroad for the reason of deferring repatriation taxes. Executives confirmed that they had previously taken various measures, including costly ones, to avoid paying or deferring the repatriation tax. A substantial number of respondents confirmed that they had raised debt and invested in foreign assets with a low rate of return (such as cash). A small portion even indicated they had foregone profitable investment opportunities in the United States because the repatriation tax burden effectively locked foreign earnings out of the country.

2.4.2.4 2004 Tax holiday

In 2004, a temporary “tax holiday” was created under the “American Jobs Creation Act of 2004” allowing a one-time 85% deduction of the repatriation of foreign income. This effectively lowered the applicable marginal tax rate from typically 35% to 5.25%. The deduction applied to any repatriations above the average historical level of repatriations for the firm and was subject to the condition that any repatriated earnings would be used to finance certain domestic investments as set out by the act.

The general results of the tax holiday are discussed by the Internal Revenue Service’s Redmiles (2008). A total of 843 corporations used the deduction for a total qualifying repatriation of \$312 billion.

2.4.2.5 Interaction with other determinants

It appears evident that deferring repatriation taxes is an important driver for firms to hoard cash. Interesting questions arise with regard to how this effect interacts with other determinants of corporate cash holdings. When firms retain cash holdings in order to defer repatriation taxes, do these cash holdings, presumably held abroad, substitute for cash holdings that would be held to finance future investment projects? Do these deferral-driven tax holdings substitute for cash holdings otherwise maintained by entrenched managers because of their personal preferences? And are managers as wasteful with this excess cash as agency theory would predict them to be? These questions so far have not been answered completely by previous research.

If poorly governed corporations with poor corporate governance prefer to hold more cash, these firms may be less sensitive to repatriation tax burdens as holding cash abroad may serve as a substitute for holding cash domestically. Because foreign cash reserves may be tapped by management at any point, albeit at a tax cost, these holdings may satisfy management’s urge for great discretion. When directors know they always have some funds available abroad, they may not feel the need to hold additional cash domestically in order to avoid the chance of financial distress.

Furthermore, firms that have good growth prospects and investment opportunities may desire to hold more cash to prevent having to forego valuable investment opportunities, but it may not matter greatly to them whether this cash is held domestically or (temporarily) locked out abroad, as long as it can easily be tapped when desired. Therefore, I would expect firms with good investment opportunities be less sensitive to repatriation tax burdens, as they may simply substitute domestic cash for cash abroad.

Foley, et al. themselves have considered some sensitivities to the relation between repatriation tax burdens and cash holdings. They find a lower sensitivity of repatriation tax burdens to cash holdings in the case of high domestic leverage and poor or no debt ratings. In other words, when firms have poor incremental capital market access, the total amount of cash held does not change much in the face of high repatriation tax burdens. They further find a higher sensitivity for technologically intensive firms. This may be explained by the fact that such firms have more opportunities for aggressive tax planning by shifting profits to low tax countries.

Hanlon et al. (2015) show that firms with cash holdings driven by repatriation tax burdens are more likely to engage in foreign, but not domestic, acquisitions. When such acquisitions occur, the market reaction is more negative than is otherwise the case. These results suggest that agency costs increase with cash holdings driven by repatriation tax deferral behavior.

2.5 Conclusion

I have reviewed the literature on the key determinants of cash holdings. From a shareholder point of view, benefits to corporate cash holdings stem from the mitigation of transaction costs as a result of illiquidity (the transaction costs motive; the avoidance of the costs of raising external capital for valuable investment opportunities, including the costs of having to forego such opportunities due to capital market imperfections (the precautionary motive); and the deferring of taxes due when repatriating foreign income. Costs stemming from corporate cash holdings are the opportunity cost of cash; the agency cost of excess cash and tax costs stemming from the avoidable double taxation of passive investment income. Because managers may have a personal preference for hoarding cash, firms may hold a higher amount of cash than the optimal amount from a shareholder perspective. Table 1 provides an overview of the theory regarding corporate cash holdings.

Table 1 Summarized overview of the theory on corporate cash holdings

Theme	Benefits (shareholder perspective)	Costs (shareholder perspective)	Other effects
Transaction	Transaction costs		
Investments	Precautionary motive		
Corporate governance		Agency cost of excess cash	Manager preference for hoarding cash
Taxation	Deferring repatriation taxes	Double taxation of passive investment income	
Other		Opportunity cost	

3. Research question & hypotheses

The previous chapter discussed the primary theories and literature on corporate cash holdings. In my quantitative research, I look to further investigate the role of repatriation tax costs in explaining corporate cash holdings. My research question is as follows:

How do tax costs related to repatriating foreign income affect corporate cash holdings for U.S.-based firms?

3.1 Hypotheses

My hypotheses are as follows:

1. Companies with higher repatriation tax burdens hold more cash *ceteris paribus*.
2. Companies with large growth opportunities have less sensitivity of corporate cash holdings to repatriation tax burdens.
3. Poorly governed firms exhibit have less sensitivity of corporate cash holdings to repatriation tax burdens.

The first hypothesis seeks to verify previous research. I will be applying the hypothesis to a recent time period in order to investigate whether the relationship still holds. The other two hypotheses seek to explore possibly interaction effects as set out in paragraph 2.4.2.5. Hypothesis 2 sees to the idea that foreign cash could substitute domestic cash in funding future investments opportunities. If that were the case, firms with good growth opportunities could retain less cash domestically when they are driven to hold more cash abroad due to tax reasons. Hypothesis 3 is based on the idea that while firms in which the agency conflict is relatively significant, foreign cash holdings may substitute for domestic cash holdings in satisfying managers' preference for greater cash holdings.

I will test both hypotheses using multiple relevant measures. With regard to the third hypothesis, I am particularly interested in the role of the present value of growth opportunities (PVGO). While previous papers include the book-to-market ratio as a proxy for growth opportunities, I investigate whether the PVGO could be useful in explaining variation of corporate cash holdings. I believe PVGO may be a more sensible measure as it is less backward-looking and less susceptible to manipulation by management and more market-based.

4. Data

This study particularly concerns United States companies with foreign activities. In order to be able to use sufficient data, the starting point is the entire universe of listed firms incorporated in the United States and as available in the Compustat database. The study covers the years 2010 through 2015 and each available firm-year combination is used as a separate observation. In addition to Compustat, data is procured from Datastream, Thomson Reuters, RiskMetrics and from the website of John Graham¹.

4.1 Variables

Table 1 provides an overview of the variables used. Throughout most analyses, the dependent variable is the natural logarithm of cash and short-term investments divided by net assets. A number of specifications focus on the changes (first differences) of the dependent variable as well as of some independent variables, instead of their levels. The main variable of interest is a proxy for the repatriation tax burden, which is discussed further below. For the sake of comparison and replicability, the choice of control variables is consistent with Foley et al. (2006). Additions to the variable catalogue are the present value of growth opportunities (PVGO), the E-Index, a poor governance dummy and a variable indicating institutional ownership.

¹ See <<https://faculty.fuqua.duke.edu/~jgraham/taxform.html>>

Table 2 Definitions of variables used

Variable	Explanation	Compustat codes
ln(Cash/Net Assets)	The natural logarithm of Cash and Short-Term Investments divided by Total Assets minus Cash and Short-Term Investments	CHE / (AT – CHE)
Repatriation tax burden	A proxy for the cost of repatriating foreign earnings, divided by Total Assets	<i>Calculated using PIFO, PIDOM and CHE</i>
Domestic pre-tax income	The domestic pre-tax income divided by total assets	PIFO / AT
Foreign pre-tax income	The foreign pre-tax income divided by total assets	PIDOM / AT
ln(Total Assets)	The logarithm of total balance sheet assets	AT
Dividend dummy	A dummy that is 1 if the firm paid a dividend in the given ye, Bkar	<i>Based on DVT</i>
Book-To-Market Ratio	The book value of equity divided by the market value of equity	SEQ / MKVALT
Standard Deviation of Income	The standard deviation of earnings before interest, taxes, depreciation and amortization (EBITDA), divided by the average EBITDA	<i>Based on EBIT</i>
Leverage	The ratio of debt to the market value of equity and debt	(DLTT + DLC) / (DLTT + DLC + MKVALT)
R&D Expenditures	The research and development expenditures divided by total assets	XRD / TA
Capital Expenditures	The capital expenditures divided by total assets	CAPX / TA
PVGO ratio	The present value of growth opportunities as a percentage of equity value	<i>Calculated using NI and MKVALT</i>
E-Index	The number of select anti-takeover defenses used (out of a maximum of 6)	
Poor Governance Dummy	A dummy that is 1 for an E-Index value above 4	
Institutional Ownership	The percentage of outstanding shares held by institutional shareholders	
Industry	The first two digits of the Standard Industry Classification (SIC) code	<i>Based on SIC</i>
Year	The fiscal year	

While the use of some variables is rather straightforward, other require some additional explanation.

4.1.1 Cash holdings

In line with similar literature, both cash and short-term investments are included in the dependent variable. Short-term investments are not cash in the narrow sense of the word, but are also highly liquid non-operating assets. In the levels specifications, the dependent variable is the natural logarithm of cash and short-term investments divided by total assets minus cash and short-term investments. In the changes specification, the first order difference is used. Ideally, I would distinguish cash held in the United States and cash held in other countries, but unfortunately companies do not typically report this split and such data is thus not publicly available.

4.1.2 The repatriation tax burden

Following Foley et al. (2006), the following proxy is used to measure the repatriation costs of foreign income:

$$\begin{aligned} \text{Repatriation tax burden} \\ &= \text{Max}(0, (\text{marginal tax rate} * \text{foreign pretax income}) \\ &\quad - \text{foreign taxes paid}) \end{aligned}$$

This formula reflects the fact that while in principle the US Treasury fully taxes foreign income, a tax credit is granted for foreign taxes paid. While the repatriation tax burden is truly a stock variable, I assume that the income earned in a year is indicative for the stock of earnings not yet repatriated. The marginal tax rates are provided by John Graham based on Graham (2008). Whenever possible, I use the nearest previous year to impute the marginal tax rate for years it is not provided for.

4.1.3 The book-to-market ratio

The book-to-market ratio is the ratio of the book value of equity to the market value of equity (market capitalization). Values have been winsorized at the 1st and 99th percentile.

4.1.4 The present value of growth opportunities (PVGO)

The value of a company can be seen as consisting of two components: the value of assets in place (AiP) and the present value of growth opportunities (PVGO).

My starting point in calculating the PVGO is that the value of equity is equal to the value of assets in place and the present value of growth opportunities:

$$V = AiP + PVGO$$

With respect to equity, V can be easily observed as the market capitalization (V=P). The value of assets in place is considered as the perpetual non-growing annuity of net income, discounted at the cost of equity (R_e). PVGO can thus be deduced as follows:

$$PVGO = P - \frac{Income}{R_e}$$

I calculate the required rate of return on equity using the capital asset pricing model (CAPM) formula:

$$R_e = r_f + \beta \times MRP$$

For the risk-free rate (r_f), I use the 10-year Treasury bond yield for the given year. Equity betas (β) are obtained from Datastream. Where unavailable, a beta of 1 is assumed. A large number of estimates of the market risk premium (MRP) based on divergent methodologies exist, with most arriving at values between five and seven percent. I choose to apply a fixed rate of 6%, representing the middle of the consensus range.

For comparability, the ratio of PVGO to equity value (PVGO/V) is used. Due to both negative earnings and incidentally high earnings, PVGO ratios below 0% and far above 100% are obtained this way. For use in the analysis, ratios are cut off at a minimum of 0% and a maximum of 100%.

4.1.5 Standard deviation of income

Consistent with Foley et al. (2006), I calculate the standard deviation of earnings before interest, taxes, depreciation and amortization (EBITDA). For this calculation, I use all EBITDA values reported for the given firm between 2000 and 2015. The standard deviation is divided by the average EBITDA.

4.1.6 E-Index and the poor governance dummy

The E-Index, as developed in Bebcuck et al. (2009) and discussed in the previous chapter, is used as a measure of formal corporate governance. The E-Index counts the number of key anti-takeover provisions in place (up to 6). Data on these provisions is obtained from the RiskMetrics database. Where the E-Index is unavailable for a given firm year, the respective value for the nearest previous year is used, if available.

The poor governance dummy is set to 1 for firms with an E-Index above 4 and set to 0 for firms with a lower E-Index.

4.1.7 Institutional ownership

An alternative corporate governance indicator is the percentage of shares held by institutional shareholders. Institutional managers with \$100 million or more in assets under management are required to report qualifying shareholdings quarterly to the Securities and Exchange Commission (SEC) using Form 13-F. For each year and each firm, I have calculated the total percentage of outstanding shares held at year-end by

institutional investors according to the Thomson Reuters 13-F Database. The calculated values are cut off at a minimum of 0% and a maximum of 100%.

4.2 Selection and availability

A total number of 46,176 U.S. firm years is available in Compustat for the period from 2010 to 2015. Only firm years with total assets over 100 million dollars are included in the sample. Furthermore, financial firms are excluded because they have very different motives to hold cash. Firm years for which essential data is missing are also removed. An initial sample of 16,232 firm years remains.

Not all firms report domestic and foreign income separately. This split is required in order to calculate the repatriation tax burden proxy. Only firms with significant foreign activity are required to report foreign income separately. In some of the analyses, we assume that firms that do not report foreign income separately, have zero foreign income, while other analyses are limited to firms reporting foreign income. For the latter, a sample of 6,716 firm years is available.

Because not all firm years in Compustat could be matched to data on firm years available in other databases, some variables are only available for a limited subset of firm years, resulting in a lower basis of observations. The number of observations is further reduced in advanced specifications that include more variables.

5. Results

Descriptive statistics of all variables used are provided in appendix 10.1. The average logarithm of the ratio of cash to net assets is -2.409, implying that on average 8.24% of total assets are cash. Note that the proxy for the repatriation tax burden is low in absolute numbers (0.002). This is unsurprising given that the proxy is calculated from the foreign pre-tax income in a single year only and is then scaled by total assets. In reality, the tax burden is a stock variable and should be a multiple of the calculated proxy.

In the sample for which the figure could be calculated, an average of 48.0% of equity value is derived from the present value of growth opportunities. The average book-to-market ratio of 0.657 also implies that growth opportunities are an important part of equity value.

Across firm years for which the data is available, an average of 3.5 out of a maximum of 6 key anti-takeover provisions were in place. Furthermore, across firm years, 59.7% of outstanding shares were in the hands of institutional investors.

Appendix 10.2 provides an overview of the correlation between variables used. The largest correlation (0.73) is found between the E-Index and the Poor Governance Dummy. This is unsurprising as the latter is based directly on the former. The strong negative correlation between cash holdings and market leverage (-0.43) and the positive relation between cash and the R&D ratio (0.49) are first hints at a perhaps causal relationship. The strong negative correlation between the PVGO ratio and Domestic Pretax Income (-0.45) can also be explained well: if earnings are relatively high in a given year, assets in place (AiP) are assigned a high value and PVGO thus a low value. The observed correlations do not give reason to worry about multicollinearity.

5.1 Cash holdings and repatriation tax burdens

The first model specifications (Table 3) aim to replicate the results found in Foley et al. (2006). The dependent variable in each model is the natural logarithm of Cash/Net Assets. Specifications (1) and (2) are based on the broad sample which includes firms that did not separately report foreign and domestic income. Their foreign income and repatriation tax burden is presumed to be 0. For all other specifications, only the sample with a foreign-domestic income split is used. Because R&D and capital expenditures are only available for a subset of companies, specifications (1) and (3) do not include them.

The standard errors are calculated in a White consistent manner to ensure robustness to heteroscedasticity. It should be noted all residuals are not perfectly normally distributed for these as well as following specifications (see appendix 10.3). No further adjustments were made for the non-normality of residuals.

The results are largely consistent with earlier findings. A large significant positive result is replicated for the repatriation tax burden. However, the effect of foreign pre-tax income appears not to independently determine cash holdings. Larger companies keep less cash as a percentage of assets than smaller ones. Dividend payments and leverage also unsurprisingly keep cash reserves down. These results provide further support for the idea that R&D intensive companies hoard cash while capital intensive companies retain less cash. Overall, these factors are able to explain between forty and fifty percent of variation in cash holdings across firm years.

Table 3 Cash holdings and repatriation tax burdens

	(1)	(2)	(3)	(4)
Dependent variable	ln(Cash/Net Assets)	ln(Cash/Net Assets)	ln(Cash/Net Assets)	ln(Cash/Net Assets)
Constant	-2.287 (0.399) **	-1.479 (0.307) **	-0.839 (0.172) **	-1.290 (0.182) **
Repatriation tax burden	19.492 (2.452) **	13.066 (2.433) **	16.874 (2.198) **	14.317 (2.376) **
Domestic pre-tax income	-1.260 (0.178) **	-0.667 (0.185) **	-1.820 (0.232) **	-0.789 (0.222) **
Foreign pre-tax income	0.385 (0.260)	0.810 (0.317) *	0.121 (0.186)	0.365 (0.348)
ln(Total Assets)	-0.066 (0.008) **	-0.070 (0.011) **	-0.042 (0.011) **	-0.029 (0.012) *
Dividend dummy	-0.403 (0.026) **	-0.277 (0.033) **	-0.363 (0.033) **	-0.246 (0.037) **
Book-To-Market Ratio	-0.056 (0.012) **	-0.114 (0.021) **	-0.197 (0.027) **	-0.163 (0.039) **
Standard Deviation of Income	0.004 (0.001) **	0.003 (0.001) **	0.007 (0.001) **	0.004 (0.001) **
Leverage	-2.218 (0.058) **	-2.692 (0.104) **	-3.104 (0.100) **	-2.835 (0.132) **
R&D Expenditures		5.407 (0.321) **		5.036 (0.382) **
Capital Expenditures		-3.265 (0.477) **		-3.017 (0.515) **
Industry effects	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Year effects	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Number of Obs.	16,197	7,095	6,716	4,563
R²	0.410	0.510	0.394	0.478

Legend: This table displays regression coefficients with heteroscedasticity robust standard errors in parentheses. * and ** denote statistical significance at the 5 and 1 percent level, respectively. **ln(Cash/Net Assets)** is the natural logarithm of Cash and Short-Term Investments divided by Total Assets minus Cash and Short-Term Investments, **Repatriation tax burden** is the proxy for the cost of repatriating foreign earnings [Max(0, (marginal tax rate × foreign pretax income) – foreign taxes paid)] divided by Total Assets, or, for specification (1) and (2), set 0 if unavailable, **Domestic pre-tax income** and **Foreign pre-tax income** are scaled by total assets and, for specification (1) and (2), set to 0 if unavailable, **ln(Total Assets)** is the logarithm of total balance sheet assets, **Dividend Dimmy** is a dummy that is 1 if the firm paid a dividend in the given year, **Book-to-Market-Ratio** is the the book value of equity divided by the market value of equity, **Standard Deviation of Income** is the standard deviation of earnings before interest, taxes, depreciation and amortization (EBITDA), divided by the average EBITDA, **Leverage** is the ratio of debt to the market value of equity and debt, **R&D Expenditures** and **Capital Expenditures** are scaled by total balance sheet assets. Dummies are included for each but one **Industry** (based on the first two digits of the SIC code) and for each but one **Year**.

Following Foley et al. (2006) (in their Table 3, specifications (1) and (2)), I also evaluate a number of models with a *changes* specification. Specifications (5) to (8) take the change (first difference) of the logarithm of the ratio of cash to assets less cash as dependent variable and also use the first difference for a number of independent variables. These results are reported in Table 4.

For specification (5) and (6), the full sample of available firm years is used and foreign pre-tax income and the repatriation tax burden is assumed to be 0 if no split between domestic and foreign income is available. Specifications (6) and (7) use only firm years for which foreign income is reported separately. Specifications (5) and (7) do not take into account R&D and capital expenditures to arrive at a somewhat higher number of observations.

Compared to the levels specifications, these specifications have a very limited explanatory power (R^2 ranging from 0.019 to 0.042). No significant relation is apparent between the proxy for the repatriation tax burden and the change in the cash ratio.

For the significant relations that are found, the sign is generally consistent with results found in the levels specifications. The exception is R&D expenditures, which in the changes specification has a negative effect on the change in cash, while in the levels specification, a positive relation is found between R&D expenditures and cash holdings. This is consistent with the idea that while R&D expenditures are generally indicative of long-term growth opportunities and firms with good growth opportunities retain more cash, a firm that increases R&D expenditures in a given year will spend more cash, resulting in a short-term decrease in cash holdings.

Given the low explanatory power of these models, their derivative nature and the fact that they do not demonstrate a relationship between the repatriation tax burden and (changes) in cash holdings, only levels specifications are used to further investigate the relation between repatriation taxes and cash holdings.

Table 4 Changes in cash holdings and repatriation tax burdens

	(5)	(6)	(7)	(8)
Dependent variable	Change in ln(Cash/Net Assets)	Change in ln(Cash/Net Assets)	Change in ln(Cash/Net Assets)	Change in ln(Cash/Net Assets)
Constant	-0.069 (0.119)	0.213 (0.203)	-0.053 (0.167)	0.048 (0.193)
Repatriation tax burden	0.704 (1.427)	-1.619 (1.299)	0.250 (1.426)	-1.806 (1.321)
Domestic pre-tax income	0.097 (0.086)	0.085 (0.077)	0.133 (0.105)	0.117 (0.123)
Foreign pre-tax income	0.258 (0.244)	0.971 (0.181) **	0.441 (0.268)	1.105 (0.195) **
Change in ln(Total Assets)	-0.151 (0.057) **	-0.197 (0.071) **	-0.139 (0.086)	-0.177 (0.097)
Change in Dividend dummy	0.029 (0.031)	-0.016 (0.039)	0.019 (0.042)	-0.026 (0.042)
Change in Book-To-Market Ratio	-0.041 (0.013) **	-0.050 (0.020) *	-0.041 (0.018) *	-0.049 (0.013) **
Standard Deviation of Income	0.000 (0.000)	0.000 (0.001)	0.000 (0.001)	-0.001 (0.001)
Change in Leverage	-0.981 (0.111) **	-0.874 (0.161) **	-0.591 (0.179) **	-0.611 (0.178) **
Change in R&D Expenditures		-1.470 (0.300) **		-1.123 (0.556) *
Capital Expenditures		-2.045 (0.344) **		-1.974 (0.290) **
Industry effects	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Year effects	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Number of Obs.	14,180	6,587	6,362	4,339
R²	0.024	0.046	0.019	0.042

Legend: This table displays regression coefficients with heteroscedasticity robust standard errors in parentheses. * and ** denote statistical significance at the 5 and 1 percent level, respectively. **ln(Cash/Net Assets)** is the natural logarithm of Cash and Short-Term Investments divided by Total Assets minus Cash and Short-Term Investments, **Repatriation tax burden** is the proxy for the cost of repatriating foreign earnings [Max(0, (marginal tax rate × foreign pretax income) – foreign taxes paid)] divided by Total Assets or, for specification (5) and (6), set 0 if unavailable, **Domestic pre-tax income** and **Foreign pre-tax income** are scaled by total assets and, for specification (5) and (6), set to 0 if unavailable, **ln(Total Assets)** is the logarithm of total balance sheet assets, **Dividend Dimmy** is a dummy that is 1 if the firm paid a dividend in the given year, **Book-to-Market-Ratio** is the the book value of equity divided by the market value of equity, **Standard Deviation of Income** is the standard deviation of earnings before interest, taxes, depreciation and amortization (EBITDA), divided by the average EBITDA, **Leverage** is the ratio of debt to the market value of equity and debt, **R&D Expenditures** and **Capital Expenditures** are scaled by total balance sheet assets. Dummies are included for each but one **Industry** (based on the first digit of the SIC code) and for each but one **Year**.

5.2 Cash holdings, repatriation tax burdens and growth opportunities

The other specifications build upon specification (4) to investigate the possibility that corporate governance and the growth opportunities may be further helpful in explaining variation in cash holdings (hypotheses 2 and 3). The sample for these models includes only firms that reported income split in a foreign and domestic part.

With regard to growth opportunities, the results are provided in Table 5. The results are provided below. In specification (9), a term for the interaction between the book-to-market ratio and the proxy for the repatriation tax burden is added. Specification (10) adds the present value of growth opportunities (PVGO) as well as an interaction term for the PVGO and the repatriation tax burden proxy.

Including an interaction term with the book-to-market ratio and the repatriation tax burden (specification (9)) does not yield new significant results. In specification (10), the PVGO ratio and interaction term for the PVGO ratio and repatriation tax burden are also not of significant value in explaining cash holdings. The apparent lack of usefulness of the PVGO ratio may be caused by the fact that the way it is construed can create a lot of noise, making it an interesting idea in theory but problematic in practice.

Table 5 Cash holdings, repatriation tax burdens and growth opportunities

	(9)	(10)
Dependent variable	ln(Cash/Net Assets)	ln(Cash/Net Assets)
Constant	-1.290 (0.182) **	-1.320 (0.193) **
Repatriation tax burden	13.935 (4.006) **	17.193 (4.048) **
Rep. tax burden * Book-To-Market Ratio	1.350 (10.546)	
Rep. tax burden * PVGO ratio		-8.425 (9.285)
Domestic pre-tax income	-0.788 (0.223) **	-0.753 (0.252) **
Foreign pre-tax income	0.367 (0.347)	0.407 (0.365)
ln(Total Assets)	-0.029 (0.012) *	-0.029 (0.012) *
Dividend dummy	-0.246 (0.037) **	-0.242 (0.037) **
Book-To-Market Ratio	-0.164 (0.039) **	-0.162 (0.039) **
Standard Deviation of Income	0.004 (0.001) **	0.004 (0.001) **
Leverage	-2.835 (0.132) **	-2.834 (0.132) **
R&D Expenditures	5.038 (0.381) **	5.043 (0.381) **
Capital Expenditures	-3.016 (0.514) **	-3.014 (0.514) **
PVGO Ratio		0.032 (0.063)
Industry effects	Yes	Yes
Year effects	Yes	Yes
Number of Obs.	4,563	4,563
R²	0.478	0.479

Legend: This table displays regression coefficients with heteroscedasticity robust standard errors in parentheses. * and ** denote statistical significance at the 5 and 1 percent level, respectively. **ln(Cash/Net Assets)** is the natural logarithm of Cash and Short-Term Investments divided by Total Assets minus Cash and Short-Term Investments, **Repatriation tax burden** is the proxy for the cost of repatriating foreign earnings [Max(0, (marginal tax rate × foreign pretax income) – foreign taxes paid)] divided by Total Assets, **Domestic pre-tax income** and **Foreign pre-tax income** are scaled by total assets, **ln(Total Assets)** is the logarithm of total balance sheet assets, **Dividend Dummy** is a dummy that is 1 if the firm paid a dividend in the given year, **Book-to-Market-Ratio** is the the book value of equity divided by the market value of equity, **Standard Deviation of Income** is the standard deviation of earnings before interest, taxes, depreciation and amortization (EBITDA), divided by the average EBITDA, **Leverage** is the ratio of debt to the market value of equity and debt, **R&D Expenditures** and **Capital Expenditures** are scaled by total balance sheet assets, **PVGO Ratio** is the present value of growth opportunities as a percentage of equity value. Dummies are included for each but one **Industry** (based on the first two digits of the SIC code) and for each but one **Year**.

5.3 Cash holdings, repatriation tax burdens and corporate governance

The final three specifications ((11), (12) and (13)) build upon specification (4) to consider the (interaction) effect of three corporate measures. Specification (11) focuses on the E-Index, the number of key anti-takeover provisions in place (out of a maximum of 6) for the given firm year. Specification (12) uses a dummy (Poor Governance Dummy) that is 1 for firm years with an E-Index greater than 4 and 0 otherwise. Specification (14) considers the percentage of outstanding shares held by institutional investors. In all specifications, the relevant governance indicator is included in addition to an interaction term for the governance indicator and the proxy for the repatriation tax burden. The results are provided in Table 6.

In specifications (11) and (12) I remarkably find a negative relation between anti-takeover provisions and cash holdings, albeit of rather limited statistical significance with respect to the raw E-Index. I had expected the sign to be positive. In specification (11), we see that the coefficient for the repatriation tax burden and for the interaction term is not significant. In both specifications, the coefficient for the interaction term suggests a higher sensitivity of cash holdings to the repatriation tax burden when firms have more anti-takeover provisions in place. However, this effect is statistically insignificant.

When considering institutional ownership (specification (13)), I find that firms where institutional shareholders own a greater proportion of outstanding shares hold significantly less cash. Firms with greater institutional ownership, where the agency problem between shareholders and board is presumably smaller, do not appear to have a statistically significant different sensitivity of cash holdings to repatriation tax burdens. In both specification (11) and (13), the repatriation tax burden in itself no longer shows a significant influence on cash holdings as part of the effect is attributed to the interaction with the respective governance measures.

Table 6 Cash holdings, repatriation tax burdens and corporate governance

	(11)	(12)	(13)
<i>Dependent variable</i>	ln(Cash/Net Assets)	ln(Cash/Net Assets)	ln(Cash/Net Assets)
<i>Constant</i>	-1.412 (0.247) **	-1.574 (0.213) **	-1.152 (0.189) **
Repatriation tax burden	3.101 (9.639)	11.680 (3.272) **	9.203 (4.708)
Rep. tax burden * E-Index	2.872 (2.703)		
Rep. tax burden * Poor Governance Dummy		6.617 (6.671)	
Rep. tax burden * Inst. Ownership			7.490 (6.968)
Domestic pre-tax income	0.762 (0.286) **	0.748 (0.287) **	-0.764 (0.225) **
Foreign pre-tax income	1.379 (0.482) **	1.355 (0.482) **	0.421 (0.349)
ln(Total Assets)	-0.014 (0.016)	-0.016 (0.015)	-0.026 (0.012) *
Dividend dummy	-0.213 (0.047) **	-0.204 (0.048) **	-0.254 (0.037) **
Book-To-Market Ratio	-0.127 (0.074)	-0.128 (0.074)	-0.166 (0.039) **
Standard Deviation of Income	0.008 (0.003) **	0.008 (0.003) **	0.004 (0.001) **
Leverage	-2.284 (0.205) **	-2.290 (0.204) **	-2.854 (0.132) **
R&D Expenditures	5.262 (0.494) **	5.273 (0.496) **	5.018 (0.381) **
Capital Expenditures	-4.550 (0.684) **	-4.463 (0.684) **	-3.126 (0.511) **
E-Index	-0.044 (0.023) *		
Poor Gov. Dummy		-0.164 (0.056) **	
Inst. Ownership			-0.202 (0.069) **
Industry effects	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Year effects	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Number of Obs.	2,610	2,610	4,552
R²	0.464	0.465	0.480

Legend: This table displays regression coefficients with heteroscedasticity robust standard errors in parentheses. * and ** denote statistical significance at the 5 and 1 percent level, respectively. **ln(Cash/Net Assets)** is the natural logarithm of Cash and Short-Term Investments divided by Total Assets minus Cash and Short-Term Investments, **Repatriation tax burden** is the proxy for the cost of repatriating foreign earnings [Max(0, (marginal tax rate × foreign pretax income) – foreign taxes paid)] divided by Total Assets, **Domestic pre-tax income** and **Foreign pre-tax income** are scaled by total assets, **ln(Total Assets)** is the logarithm of total balance sheet assets, **Dividend Dummy** is a dummy that is 1 if the firm paid a dividend in the given year, **Book-to-Market-Ratio** is the the book value of equity divided by the market value of equity, **Standard Deviation of Income** is the standard deviation of earnings before interest, taxes, depreciation and amortization (EBITDA), divided by the average EBITDA, **Leverage** is the ratio of debt to the market value of equity and debt, **R&D Expenditures** and **Capital Expenditures** are scaled by total balance sheet assets, **E-Index** is the number of select anti-takeover defenses used (out of a maximum of 6), **Poor Governance Dummy** is a dummy that is 1 for an E-Index value above 4, **Institutional Ownership** is the percentage of outstanding shares held by institutional shareholders. Dummies are included for each but one **Industry** (based on the first two digits of the SIC code) and for each but one **Year**.

6. Discussion & analysis

The first hypothesis posed in this thesis was that firms facing higher repatriation tax burdens hold more cash in total. This relationship was rather evident from previous research, which considered earlier time periods.

The results in this research confirm the first hypothesis and show that the relationship holds also for the 2010-2015 period. When adjusting for relevant control variables, a clear and significant positive relationship is found between the construed proxy for the repatriation tax burden and the logarithm of the cash to net assets ratio. However, a similar result was not evident from the specifications based on the change (first difference) of cash holdings. This is somewhat puzzling and inconsistent with previous findings in Foley et al. (2006). However, I do not ascribe high relevance to these model specifications. The explanatory power of these models is very low, which is unsurprising given that changes for a certain year can be rather volatile and may be caused by a variety of factors that these models are unable to capture, including the difference between cash flows and income on the short-term. Provided that on average the proxy for repatriation tax burden (with respect to both marginal rates and foreign income), which is based on data for a single year, is proportionate to the actual repatriation tax burden (a stock variable), the levels specification should provide an unbiased view of the true relationship between cash holdings and repatriation taxes.

The second hypothesis posed was that companies with good growth opportunities exhibit less sensitivity of cash holdings to repatriation tax burdens. My empirical results direct me to reject this hypothesis. While in itself a high book-to-market ratio (implying relatively low growth opportunities) is found to be related to lower cash holdings when controlling for other variables, no significant relation is found between the interaction product of this ratio and the repatriation tax burden proxy. The PVGO ratio is not found to have a significant marginal effect on cash holdings. Given the difficult, somewhat arbitrary construction of the PVGO and its relatively noisy contents, due to the fact that it is based on many assumptions and the profit for only a single year, its irrelevance as an addition to the book-to-market ratio is also understandable. The interaction term based on these two variables is also not found to be of marginal significance in explaining variation cash holdings, providing an additional argument for the rejection of the second hypothesis.

My third and final hypothesis was that firms with poorly governed firms exhibit less sensitivity of corporate cash holdings to the repatriation tax burden. Based on the results

found, this hypothesis must also be rejected. No statistically significant coefficient is found for interaction terms of the repatriation tax burden proxy and corporate governance measures. Contrary to my expectations, I found that a greater number of anti-takeover provisions, as measured by the E-Index, or a simplified measure based on it, results in significantly *lower* cash holdings. This effect puzzles me. Perhaps anti-takeover defenses, thought to be a distortion in the market for corporate control, are of limited meaning in encouraging or allowing managers to hoard cash. However, I cannot explain why they would have an opposite effect then. Perhaps a confounding variable elusive to me is at play. Consistent with my expectations is the finding that higher institutional ownership yields lower cash holdings. Institutional shareholders may be better equipped in monitoring the board than other shareholders, partially mitigating the agency problem and controlling managers' urges to hoard cash.

With regard to my main question I can conclude that tax costs related to repatriating foreign income increase the amount of cash held by firms. This relationship does not significantly depend on growth opportunities or corporate governance.

6.1 Implications

This research strongly confirms that firms facing repatriation tax burdens retain more cash. While the research set-up does not allow me to ascribe this effect with certainty to a causal relationship, I think it is highly probable that such a relationship exists. The most likely explanation for this phenomenon is that companies facing high repatriation tax burdens choose to retain cash earned outside the United States abroad in order to defer paying the repatriation tax. This implies that the repatriation tax is avoided to a large extent. This also implies that the effect of the structure of the US tax code with respect to taxes on foreign income is distortionary: companies keep cash in their (foreign) pockets for years instead of (repatriating it and) using it for investments or returning it to shareholders. It is very likely that companies would act differently if the tax code did not tax foreign income or if deferring was not possible or was limited in time. This distortion very likely leads to underinvestment with regard to domestic investment opportunities and limitations to dividends or stock buybacks. Companies may respond to this distortionary effect by raising additional debt in order to return cash to shareholders while at the same time retaining large cash reserves in foreign accounts. This structure of course leads to inefficiencies. Needless to say, endlessly deferring taxes through the simple solution of retaining cash abroad also hurts the treasury's tax income.

Furthermore, this research shows that the relationship between repatriation tax burdens and cash holdings is independent of corporate governance and growth opportunities effects. These three factors all independently appear to influence the amount of cash held by firms, but there is no significant interaction between them. In other words, these motives influence the amount of cash held by firms in itself and independently from each other.

6.2 Limitations

A number of limitations to my research approach should be noted. First of all, this research is focused exclusively on the United States. The reason for this is that it evolves around an odd characteristic of the US tax code (its treatment of foreign income) that is rather unique to the United States. I do not expect that the key relationship found in this research would hold for firms incorporated in other countries.

The dependent variable in my analyses is based on the total amount of cash and short-term investments of a given firm. Data on cash held in (specific) foreign jurisdictions is not publicly available. This makes it impossible to evaluate the underlying idea that firms facing a repatriation tax burden keep this cash *abroad*. Foley et al. (2006) additionally used unique, not publicly available data from the Bureau of Economic Analysis to demonstrate that firms do in fact hold cash in foreign jurisdictions in response to repatriation tax burdens, but my research could not verify this relationship.

The proxy that I use as an indicator for the repatriation tax burden is a somewhat simple one. It is based on the foreign income earned and foreign taxes paid in a given year, while in reality the repatriation tax burden is a stock variable built up over a number of years. Furthermore, it is based on a somewhat simplified characterization of the US tax code, which in reality is likely to be more nuanced. The proxy is thus an imperfect and somewhat noisy indicator for the true burden, but I see no reason to assume that is biased in either direction.

A number of variables used in my statistical analysis are scaled to the book value of (net) assets, including the dependent variable. This makes characteristics more comparable across firm years. However, assets are a balance sheet measure that is backward looking and is influenced by multiple effects that may make it a noisy and imperfect indicator of the size of a firm. For example, a firm that has grown through acquisitions may have a large amount of goodwill capitalized which makes its asset value higher to an otherwise identical firm that has grown organically. Again, I do not think this leads to bias in a particular direction.

Construction of the present value of growth opportunities (PVGO) depends on a number of assumptions and calculation choices, including the choice to base it on a single year's profit only. The PVGO thus obtained may not be a great indicator of the true growth opportunities of a given firm. For this reason, I have also used the book-to-market ratio in my analysis.

6.3 Opportunities for future research

My results help to strengthen the case for the relationship between repatriation taxes and cash holdings. However, there is still room to further test this relationship and its sensitivity to other effects. Future studies could use other measures for corporate governance and growth opportunities, for example.

A different approach would be to survey or interview firm managers on their decisions to retain, return or invest cash, especially if it is earned abroad. However, such self-reported motives should be interpreted with caution. For example, corporate managers are likely to understate the agency problem as a driver for retaining cash.

7. Conclusion

The study of the determinants of cash holdings is decades old. Numerous explanations have previously been provided to the question of what drives corporate cash holdings. Companies may hold cash in order to avoid transaction costs when faced with short-term mismatches between cash inflows and outflows. Cash holdings may also be used as a mitigant to the underinvestment problem. Agency theory has two distinct implications for cash holdings. In conflicted firms, managers' preference for hoarding cash may dominate. In order to mitigate agency costs, limiting cash holdings may serve as solution. Avoiding double taxation of investment income could be a different motive to limit cash holdings. More recent research suggests a role of cash holdings in deferring taxes due when repatriating foreign income.

My research focused on this last motive, asking how repatriation tax burdens affect corporate cash holdings for U.S.-based firms. The scope of my analysis was all U.S. firm years over the 2010 to 2015 period. I first tested the hypothesis that companies facing higher repatriation tax burdens hold more cash. Consistent with previous literature, I confidently confirm this hypothesis.

Contrary to my second hypothesis, companies with large growth opportunities do not exhibit lesser sensitivity of cash holdings to repatriation tax burdens. I do find that companies with good growth opportunities (as indicated by a low book-to-market ratio) hold more cash *ceteris paribus*, but no interaction between a growth opportunity measure and repatriation tax burden was found to have a significant role in explaining variation in cash holdings.

My third and final hypothesis was that firms with poor corporate governance would exhibit less sensitivity of cash holdings to repatriation tax burdens. This hypothesis is also rejected. The effect of the repatriation tax burden is not significantly dependent on either the number of anti-takeover provisions or institutional shareholder ownership. In itself, large shareholdings by institutional investors are found to limit cash holdings, consistent with the idea that institutional investors are relatively better equipped in monitoring board members, whose preference for greater cash reserves would otherwise dominate. Remarkably, firms with more anti-takeover provisions in place are found to hold less cash on average. No explanation is obvious for this result.

In conclusion, repatriation tax burdens appear to be an important driver for corporate cash holdings in U.S. firms and this effect is independent of corporate governance and growth opportunity effects. This implies that firms maintain cash holdings in order to

defer (possibly indefinitely) paying repatriation taxes on foreign income. The American treasury likely misses out on a large sum of revenue due to this behavior.

It should be noted that this research is subject to a number of limitations, especially with regard to the way some variables are constructed. The results of this research are limited to firms based in the United States and are not likely to hold for other countries. Previous research has found that cash held in response to repatriation tax burdens in response to repatriation tax burdens is actually hold in foreign jurisdictions. While I find this very likely, such a conclusion cannot be drawn from this research set-up due to the unavailability of public data on the location of firms' cash holdings.

8. Literature

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9. Appendices

9.1 Descriptive statistics

Table 7 Descriptive statistics of variables used

	Mean	Std. Dev.	Minimum	Maximum	Observations
ln(Cash/Net Assets)	-2.409	1.768	-13.239	8.513	16,197
Repatriation tax burden	0.002	0.006	0.000	0.126	6,723
Domestic pre-tax income	0.026	0.115	-1.790	1.177	7,510
Foreign pre-tax income	0.023	0.067	-2.440	0.604	7,435
ln(Total Assets)	7.190	1.625	4.606	14.994	16,232
Dividend dummy	0.544	0.498	0.000	1.000	16,232
Book-to-Market Ratio	0.657	1.033	-10.414	5.541	16,232
Standard Deviation of Income	1.614	14.879	0.010	574.874	16,232
Leverage	0.270	0.245	0.000	1.000	16,232
R&D Expenditures	0.062	0.092	0.000	0.973	7,100
Capital Expenditures	0.043	0.066	-0.004	2.013	16,232
PVGO ratio	0.480	0.390	0.000	1.000	16,232
E-Index	3.518	1.025	0.000	6.000	6,266
Poor Governance Dummy	0.169	0.375	0.000	1.000	6,266
Institutional Ownership	0.597	0.300	0.000	1.000	16,197

Legend: **ln(Cash/Net Assets)** is the natural logarithm of Cash and Short-Term Investments divided by Total Assets minus Cash and Short-Term Investments, **Repatriation tax burden** is the proxy for the cost of repatriating foreign earnings [$\text{Max}(0, (\text{marginal tax rate} \times \text{foreign pretax income}) - \text{foreign taxes paid})$] divided by Total Assets, **Domestic pre-tax income** and **Foreign pre-tax income** are scaled by total assets and set to 0 if unavailable, **ln(Total Assets)** is the logarithm of total balance sheet assets, **Dividend Dummy** is a dummy that is 1 if the firm paid a dividend in the given year, **Book-to-Market-Ratio** is the book value of equity divided by the market value of equity, **Standard Deviation of Income** is the standard deviation of earnings before interest, taxes, depreciation and amortization (EBITDA), divided by the average EBITDA, **Leverage** is the ratio of debt to the market value of equity and debt, **R&D Expenditures** and **Capital Expenditures** are scaled by total balance sheet assets, **PVGO Ratio** is the present value of growth opportunities as a percentage of equity value, **E-Index** is the number of select anti-takeover defenses used (out of a maximum of 6), **Poor Governance Dummy** is a dummy that is 1 for an E-Index value above 4, **Institutional Ownership** is the percentage of outstanding shares held by institutional shareholders.

9.2 Correlations

Table 8 Correlations of variables used

	CashHoldings	RepTaxBurden	DomPretaxInc	ForPretaxInc	LogAssets	DivDummy	BkToMkt	StdDevInc	MktLev	RDRatio	CapExRatio	PVGORatio	EIndex	PoorGov	InstOwned
CashHoldings	1.00	0.19	0.05	0.10	-0.24	-0.26	-0.05	0.13	-0.43	0.49	-0.12	0.12	-0.07	-0.11	0.03
RepTaxBurden	0.19	1.00	0.00	0.13	0.11	0.05	-0.10	0.00	-0.14	0.10	-0.05	-0.12	-0.09	-0.04	-0.02
DomPretaxInc	0.05	0.00	1.00	-0.14	-0.11	0.01	-0.08	-0.09	-0.18	-0.07	0.04	-0.21	0.05	0.01	0.08
ForPretaxInc	0.10	0.13	-0.14	1.00	-0.17	-0.04	-0.15	-0.05	-0.07	0.04	-0.02	-0.05	-0.02	-0.01	0.06
LogAssets	-0.24	0.11	-0.11	-0.17	1.00	0.39	-0.14	-0.14	0.36	-0.28	0.03	-0.31	-0.18	-0.10	-0.18
DivDummy	-0.26	0.05	0.01	-0.04	0.39	1.00	-0.10	-0.13	0.14	-0.34	0.02	-0.29	0.04	0.10	-0.18
BkToMkt	-0.05	-0.10	-0.08	-0.15	-0.14	-0.10	1.00	0.06	0.05	-0.07	-0.05	0.03	0.08	0.06	0.06
StdDevInc	0.13	0.00	-0.09	-0.05	-0.14	-0.13	0.06	1.00	-0.07	0.19	-0.03	0.09	-0.04	-0.03	0.01
MktLev	-0.43	-0.14	-0.18	-0.07	0.36	0.14	0.05	-0.07	1.00	-0.32	-0.03	-0.02	-0.01	0.00	-0.05
RDRatio	0.49	0.10	-0.07	0.04	-0.28	-0.34	-0.07	0.19	-0.32	1.00	-0.11	0.26	-0.05	-0.08	0.02
CapExRatio	-0.12	-0.05	0.04	-0.02	0.03	0.02	-0.05	-0.03	-0.03	-0.11	1.00	-0.06	-0.03	0.02	-0.05
PVGORatio	0.12	-0.12	-0.21	-0.05	-0.31	-0.29	0.03	0.09	-0.02	0.26	-0.06	1.00	-0.01	-0.05	0.06
EIndex	-0.07	-0.09	0.05	-0.02	-0.18	0.04	0.08	-0.04	-0.01	-0.05	-0.03	-0.01	1.00	0.73	0.09
PoorGov	-0.11	-0.04	0.01	-0.01	-0.10	0.10	0.06	-0.03	0.00	-0.08	0.02	-0.05	0.73	1.00	-0.02
InstOwned	0.03	-0.02	0.08	0.06	-0.18	-0.18	0.06	0.01	-0.05	0.02	-0.05	0.06	0.09	-0.02	1.00

Legend: **CashHoldings** is the natural logarithm of Cash and Short-Term Investments divided by Total Assets minus Cash and Short-Term Investments, **RepTaxBurden** is the proxy for the cost of repatriating foreign earnings [$\text{Max}(0, (\text{marginal tax rate} \times \text{foreign pretax income}) - \text{foreign taxes paid})$] divided by Total Assets, **DomPretaxInc** is the domestic pre-tax income, **ForPretaxInc** is the foreign pre-tax income, **LogAssets** is the logarithm of total balance sheet assets, **DivDummy** is a dummy that is 1 if the firm paid a dividend in the given year, **BkToMkt** is the the book value of equity divided by the market value of equity, **StdDevInc** is the standard deviation of earnings before interest, taxes, depreciation and amortization (EBITDA), divided by the average EBITDA, **MktLev** is the ratio of debt to the market value of equity and debt **RDRatio** is R&D Expenditures divided by total assets, **CapExRatio** is capital expenditures divided by total assets, **PVGORatio** is the present value of growth opportunities as a percentage of equity value, **EIndex** is the number of select anti-takeover defenses used (out of a maximum of 6), **PoorGov** is a dummy that is 1 for an E-Index value above 4, **InstOwned** is the percentage of outstanding shares held by institutional shareholders.

9.3 Residual normality tests

Table 9 Jarque-Bera tests for normality of residuals

	Jarque-Bera	p-value
Specification (1)	3352	0.000
(2)	11097	0.000
(3)	3123	0.000
(4)	589	0.000
(5)	95373	0.000
(6)	54060	0.000
(7)	30629	0.000
(8)	8287	0.000
(9)	590	0.000
(10)	588	0.000
(11)	274	0.000
(12)	271	0.000
(13)	593	0.000