The taxman cometh: Does tax uncertainty affect corporate cash holdings?

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The taxman cometh: does tax uncertainty affect corporate cash holdings?

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Abstract

We examine whether firms hold more cash in the face of tax uncertainty. Because of gray areas in the tax law and aggressive tax avoidance, the total amount of tax that a firm will pay is uncertain at the time it files its returns. The tax authorities can challenge and disallow the firm's tax positions, demanding additional cash tax payments. We hypothesize that firms facing greater tax uncertainty hold cash to satisfy these potential future demands. We find that both domestic firms and multinational firms hold larger cash balances when subject to greater tax uncertainty. In terms of economic significance, we find that the effect of tax uncertainty on cash holdings is comparable to that of repatriation taxes. Our evidence adds to knowledge about the real effects of tax avoidance and provides a tax-based precautionary explanation for why there is such wide variation in cash holdings across firms.

JEL classification: G30; G32; H25

Keywords: Cash holdings; Tax avoidance; Tax uncertainty; FIN 48; Disclosures; Long-run repatriation tax costs

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1 Introduction

One of the most fundamental decisions a firm can make is what to do with its cash. We examine whether tax uncertainty causes firms to retain more cash than they otherwise would. Dyreng et al. (2008) show that tax avoidance is pervasive, and researchers have made progress understanding determinants of tax avoidance (e.g., Badertscher et al. 2013; Bradshaw et al. 2016; Chen et al. 2010). However, whether tax avoidance will be sustained is often uncertain at the time it is initiated, and we know little about how this uncertainty affects firm behavior. Due to the complexities and ambiguities present in the tax laws, the tax authorities may have a different opinion of the firm's true taxes, particularly if the firm has aggressively avoided taxes. Faced with the potential of additional cash demands from tax authorities, we hypothesize that firms have a precautionary motive to hold cash balances that are increasing in their degree of tax uncertainty.

There is considerable variation across firms in the amount of cash they hold on their balance sheets. In our sample of publicly traded U.S. firms, for example, there is a sevenfold difference in the ratio of cash to total assets between the 25^{th} and 75^{th} percentiles of multinational firms, and even larger differences in cash holdings exist among purely domestic firms. Holding cash on the balance sheet is costly because of agency problems associated with large cash holdings and because retained cash is less valuable to the firm. It is also associated with declines in return on investment and is subject to mispricing by the market (Dechow et al. 2008). There can be benefits of large cash holdings as well, such as available cash to fulfill capital needs, leading to a precautionary motive to hold cash. Understanding why firms hold cash has been the subject of research for decades, dating back to at least Baumol (1952) and Tobin (1956). While advances have been made in understanding the economic determinants of cash holdings, most of

the cross-sectional variation in cash holdings remains unexplained. Our evidence provides a partial explanation for this variation caused by uncertainty about the ultimate success of tax avoidance.[1]

To test our predictions, we exploit the recent requirement that SEC registrants disclose estimates of their uncertain tax benefits (UTBs, described below), which became effective in 2007 with the enactment of a rule known as FIN 48.[2] These data and recent research examining FIN 48 disclosures show that tax uncertainty is an important economic phenomenon (e.g., Robinson et al. 2015; Blouin and Robinson 2014).[3] Our research design consists of regressions of cash balances (cash and short-term investments scaled by total assets) on previously identified determinants of cash balances and our empirical measure of tax uncertainty. We control for repatriation tax costs using a long-run measure to account for the tax cost of repatriation examined by Foley et al. (2007).[4] In addition, we rerun the tests on domestic-only firms, where there is no possibility of repatriation taxes driving the result. All of the regressions include controls, including one for cash flow from operations as well as a measure of cash taxes paid to control for any direct impact (mechanical relation) of tax avoidance (and any other cash-saving or generating activities) on cash balances. Our results are consistent with tax uncertainty relating positively to cash balances for the full sample and for both domestic firms and multinational firms separately. Overall, we interpret the evidence as showing that tax uncertainty is associated

[1] We follow prior literature and assume that tax aggressiveness is a subset of tax avoidance in that the latter includes benign, perfectly legal tax planning or tax advantaged investments (e.g., investing in municipal bonds, the income on which is tax exempt).
[2] FIN (FASB Interpretation Number) 48 was enacted by the Financial Accounting Standards Board and has since been codified as part of ASC 740. We discuss this in more detail below.
[3] We also considered using a measure of effective tax rate volatility (Guenther et al. 2016). However, given that tax volatility is only partially explained by tax settlements (Saavedra 2017), we prefer to use UTBs, which conceptually are more directly linked to future audits and tax settlements.
[4] To enable a better comparison of the economic magnitudes of a stock measure (UTB) with those of a flow measure (repatriation tax costs as measured by Foley et al. (2007)), we develop a measure of long-run (five-year) repatriation tax costs. Our results are robust to using the one-year repatriation tax cost measure used by Foley et al. (2007).

with larger cash balances due to a precautionary motive to hold cash for potential future tax assessments.[5]

Our results show that uncertainty related to tax avoidance has important real effects. Using our regression coefficient estimates, the results indicate that, in our sample of firm-years with UTB data, a one standard deviation increase in our measure of tax uncertainty, UTB scaled by total assets, is associated with firms holding an extra 1.2% of their total assets in cash. As a comparison, we find that a one standard deviation increase in our measure of repatriation tax cost is associated with firms holding an extra 1% of their total assets in cash. Overall, given that firms in our sample on average hold 19.8% of their total assets in cash, the effects of tax uncertainty on cash holdings are economically significant.

We conduct a number of additional tests. First, we examine changes in cash as the dependent variable. We find that changes in cash balances relate significantly to changes in lagged tax uncertainty, consistent with our predictions. Second, we examine our results when employing alternative definitions of cash holdings and find consistent results across the measures. Third, we examine cross-sectional variation in the degree to which firms are financially constrained. We find some evidence consistent with financially constrained firms having a greater association of tax uncertainty and cash holdings. Finally, we address the concern that conservative firms might not only book higher UTB reserves but also hold more cash, regardless of whether UTBs result in future cash tax outflows. In a first test, we show empirically that greater UTBs do result in greater future cash tax outflows, consistent with our measure of tax uncertainty reflecting expectations about future tax payments and not merely a reserve accrual unrelated to future cash outflows. In a second test, we find that our results hold when we

[5] We acknowledge that there are other precautionary reasons why firms might hold more cash. An advantage of our research setting is that, with the adoption of FIN 48, firms are required to provide detailed tax disclosures and thus this is a measurable precautionary reason.

control for accounting conservatism. Finally, we acknowledge that because conservatism is likely measured with error, we cannot fully rule it out.

Our paper makes three contributions to the literature. First, we provide a coherent, tax-based explanation about how uncertainty from tax avoidance affects corporate cash holdings. Whether taxes affect cash holdings is controversial in the literature. While Foley et al. (2007) provide evidence that tax repatriation costs affect cash holdings, Bates et al. (2009) and Pinkowitz et al. (2013) question this interpretation. As a result of this debate, it is unclear whether a tax explanation is an important determinant of cash holdings. Our findings provide new evidence that corporate taxation has an important effect on the cash held by corporations. Our tax hypothesis is distinct from that of Foley et al. (2007) in that we test tax uncertainty, while they test repatriation tax costs. The uncertainty in our setting can be from tax positions both in domestic-only and multinational corporations. Second, our paper examines a real effect of tax avoidance, answering the call for research by Hanlon and Heitzman (2010). The real effect of having to increase cash holdings is costly to firms, and evidence of such costs helps explain why firms sometimes forgo available tax avoidance opportunities. Third, the evidence shows that the newly mandated accounting disclosures of FIN 48, which we use in the paper to measure tax uncertainty, are economically meaningful and are informative about tax uncertainty. As a result, we address the Blouin and Robinson (2014) call for more research about whether and to what extent FIN 48 provides decision-useful information.

The remainder of the paper is organized as follows. Section 2 discusses the prior literature and develops testable predictions. Section 3 presents the research design and sample. Section 4 discusses the empirical results. Section 5 provides additional robustness tests and Section 6 concludes.

2 Prior research and hypothesis development

There are three streams of research that are highly related to our paper. The first examines the determinants of firms' cash holdings. The second investigates corporate tax avoidance. The third relates to the adoption of FIN 48, the accounting standard that mandated disclosure of uncertain tax benefits.

2.1 Prior research—cash holdings

Literature in the cash holdings area has generally examined four nonmutually exclusive theories of why firms hold cash. The first is the transaction cost motive—firms hold cash to avoid the cost of being short liquid assets (converting noncash assets to cash is costly) (e.g., Baumol 1952; Tobin 1956; Miller and Orr 1966; Mulligan 1997). The second is the precautionary motive—firms hold cash to protect against adverse shocks when access to capital markets is costly. Consistent with this motive, Opler et al. (1999) find that firms with better investment opportunities, firms with riskier cash flows, and firms with poor access to capital hold more cash because adverse shocks and distress are more costly for them. In a recent paper, Bates et al. (2009) associate the increase in cash holdings with riskier cash flows, fewer inventories and receivables, and increasing research and development expenditures, consistent with precautionary motives for holding cash.

The third theory of cash holdings is the agency motive—managers would rather hold the cash to use for their own purposes (e.g., empire building) than pay it out to shareholders (Jensen 1986). Consistent with this theory, prior literature has found that firms hold more cash in countries with greater agency problems (Dittmar et al. 2003), cash is worth less when agency problems are more severe (Faulkender and Wang 2006; Dittmar and Mahrt-Smith 2007; Pinkowitz et al. 2006), and firms with excess cash invest in more acquisitions and those

acquisitions are value-decreasing (Harford 1999). Consistent with these findings, Dechow et al. (2008) find that retained cash is less valuable because it tends to be associated with declines in return on investment and is not priced efficiently by the market.

The final explanation stems from the repatriation tax cost of bringing foreign earnings back to the U.S. The U.S. corporate tax system is one of worldwide taxation with deferral. This means that U.S. multinationals are taxed by the U.S. on their global earnings but the U.S. tax on foreign earnings is often deferred until the earnings are repatriated. While foreign earnings do not need to be held in the form of cash, there is some evidence that the U.S. tax upon repatriation leads to cash buildup in foreign subsidiaries (Foley et al. 2007). However, some later papers question the importance of the repatriation tax as a determinant of cash holdings (Bates et al. 2009; Pinkowitz et al. 2013). None of the studies in this literature examine how tax uncertainty affects cash holdings.[6]

2.2 Prior research—tax avoidance

A growing literature studies tax avoidance, its determinants, and its consequences. To date, the literature has focused more on uncovering determinants rather than the consequences. For example, recent studies have examined a variety of determinants of tax avoidance, such as 1) ownership (Chen et al. 2010; Badertscher et al. 2013; Bradshaw et al. 2016), 2) manager influence (Dyreng et al. 2010; Chyz 2013), 3) economies of scale (Rego 2003; Zimmerman 1983), 4) compensation (Armstrong et al. 2012), 5) financial constraints (Edwards et al. 2016, Law and Mills 2015), and 6) other determinants. (See Hanlon and Heitzman (2010) for a

[6] There are also other papers somewhat related to our study. Dhaliwal et al. (2011) posit that the greater the tax avoidance, the greater likelihood that managers are diverting rents from shareholders and thus greater tax avoidance leads to lower cash balances because cash is easily diverted. Campbell et al. (2014) find the market values foreign cash holdings less, consistent with its eventual effect on tax expense when repatriated. Thomas and Zhang (2014), however, find, in a more general setting, that valuation effects of tax expense are complicated and depend upon controlling for future profitability.

discussion.) While the literature can explain only a small fraction of the variation in tax avoidance, we know even less about its consequences. For example, Hanlon and Slemrod (2009), Graham et al. (2014), Lisowsky et al. (2013), and Gallemore et al. (2014) examine whether firms are concerned about reputational effects of tax avoidance and whether firms bear reputational costs (measured in a variety of ways) upon revelation of tax aggressive activities. These studies report mixed evidence. In addition, Kim et al. (2011) find that tax avoidance relates positively to stock price crash risk, based on the idea that tax avoidance creates an opaque environment, leading to rent diversion and hording of bad news. Aboody and Kasznik (2008) find that executive tax avoidance has real effects on their firms' compensation plans and payout policies. Finally, Saavedra (2017) provides evidence that firms less successful at avoiding taxes face higher financing costs when raising funds in the syndicated loan market.

2.3 Prior research—tax uncertainty and uncertain tax benefits (FIN 48)

FIN 48 is arguably the most important piece of regulation with respect to accounting for income taxes since SFAS 109 (Blouin and Robinson 2014) and has led to the development of a series of papers that examine the determinants and implications of the FIN 48 disclosure.

An early study is by Gleason and Mills (2002), who use tax return data to show that, before FIN 48, most firms did not voluntarily disclose UTBs even when they existed. More recent studies conclude that firms manage their tax expense to help meet earnings targets (Gleason and Mills 2008) and that UTB disclosures are influenced by management judgment (De Simone et al. 2014) or disclosure requirements (Blouin and Robinson 2014; Gleason and Mills 2011; Towery 2016). Lisowsky et al. (2013) show that UTBs relate to tax shelter involvement, documenting that UTBs reflect some measure of tax aggressiveness. Ciconte et al. (2016) finds that there is a positive relation between the UTB and future cash tax outflows and show that

UTBs are positively correlated with future IRS audit settlements. Robinson et al. (2015) examine the relevance of UTB disclosures and conclude that UTBs are associated with cash outflows but that the UTB is often over-reserved. Specifically, they estimate that, over a three-year period, 24 cents of every dollar of reserves unwinds via settlements. Overall, the UTB is a measure of uncertain tax benefits. The literature documenting the strength between this accrual and future realized cash tax outflows is mixed.

2.4 Hypothesis development

We predict that firms pursuing uncertain tax strategies hold cash for a specific precautionary reason—tax strategies that help firms lower their taxes can be challenged by tax authorities. The disputed amounts can be large. For example, the Internal Revenue Service (IRS) claimed that one firm alone, GlaxoSmithKline PLC, owed $5.2 billion in back taxes and penalties related to a transfer pricing strategy (*Philadelphia Inquirer* 2004). In addition, Merck & Co. in 2007 settled a case with the IRS by paying a settlement amount of $2.3 billion (taxes, penalties, and interest). Of course, most tax assessments are much smaller, but they happen frequently and can be significant. For example, Finish Line commented in its 2010 annual report: "The Company expects to make cash outlays in the future related to our unrecognized tax benefits. However, due to the uncertainty of the timing of future cash flows associated with our unrecognized tax benefits, we are unable to make reasonably reliable estimates of the period of cash settlement…"[7] Faced with uncertain future tax assessments, firms have a precautionary motive to ensure they have sufficient cash on hand to pay the additional taxes. Consistent with this motive, Sysco Corp., in its discussion of its income taxes in its 2010 annual report, disclosed that "An

[7] When discussing different firm disclosures, we acknowledge that firms might intentionally provide vague statements because they do not want to indicate to tax authorities how much tax they expect (or are willing) to pay to settle disputes with tax authorities.

unfavorable tax settlement generally would require use of our cash..."[8] Foreign and state jurisdictions also frequently challenge firms' tax avoidance activities and assess additional taxes. A recent *Wall Street Journal* article highlights that many foreign jurisdictions are attempting to collect back taxes from U.S. multinational corporations. For example, France has challenged Google's tax positions, demanding €1.7 billion in back taxes and penalties. Apple has been challenged by tax authorities in Australia, and Amazon.com has been challenged by France and various U.S. states (Pfanner 2012).

Even if the firm prevails in the tax dispute, it is expensive to defend such challenges, and the outcome is often uncertain. When negotiating with the tax authority, firms are in a better bargaining position if they are prepared to take the dispute to the courts. For the threat of litigation to be credible, however, the firm must have the financial wherewithal to mount a vigorous defense. Moreover, in some cases the firm must prepay the full amount of disputed tax and then sue the IRS for a refund.[9] Thus having sufficient cash on hand to be able to pay the entire disputed amount gives a firm the flexibility to litigate in the most favorable court and additional bargaining power with the IRS during the administrative process. If the firm has not

[8] Some additional anecdotal evidence is provided by the following company disclosures. (1) Epiq Systems disclosed in the liquidity section of its 2010 annual report the following: "…we have approximately $2.8 million of unrecognized tax benefits that have been recorded as liabilities, and we are uncertain as to whether, or when, such amounts may be settled. Settlement of such amounts could require the use of working capital." (2) Oshkosh disclosed in its liquidity section (2010 10K): "Due to the uncertainty of the timing of settlement with taxing authorities, the Company is unable to make reasonably reliable estimates of the period of cash settlement of unrecognized tax benefits for the remaining uncertain tax liabilities. Therefore, $52.1 million of unrecognized tax benefits as of September 30, 2010 have been excluded from the Contractual Obligations table. …" (3) Wausau Paper indicated in the liquidity section of its 2007 annual report: "At December 31, 2007, we had a liability for unrecognized tax benefits, including related interest and penalties, totaling $6.7 million, of which approximately $3.8 million is expected to be paid within one year. For the remaining liability, due to the uncertainties related to these tax matters, we are unable to make a reasonably reliable estimate when cash settlement with a taxing authority will occur." (4) Whole Foods Market disclosed in its 2010 annual report: "At September 26, 2010, the Company had gross unrecognized tax benefits totaling approximately $14.9 million including interest and penalties. Although timing of the resolution… is highly uncertain … [it is] reasonably possible to result in payment of cash within 12 months, including interest and penalties, of approximately $5.4 million."

[9] Specifically, firms can generally choose to litigate federal tax disputes in U.S. District Court, the U.S. Court of Federal Claims, or U.S. Tax Court. The first two courts require firms to pay the disputed tax upfront, while the Tax Court does not.

saved enough cash, then paying the tax, including penalties and interest, could force it to take costly actions such as forgoing capital spending or raising external funds. For all these reasons, we predict that firms will engage in precautionary saving of cash in the face of tax uncertainty. Our hypothesis, stated in alternate form, is:

H1: *Tax uncertainty is positively associated with cash balances, ceteris paribus.*

3 Research design

3.1 Variable measurement

While measures of cash holdings have a long history, tax uncertainty is a relatively new concept to the literature. We measure tax uncertainty by the amount of uncertain tax benefits disclosed by firms as a result of FIN 48, which was enacted in June 2006. In general, FIN 48 requires firms to estimate and disclose the amount of previous tax savings that management expects could be assessed by a tax authority.

To provide a more specific explanation of the variables, we first discuss the concept of an uncertain tax benefit (UTB), which is an accounting reserve for contingent tax liabilities. Assume a company engages in tax avoidance strategies that enable it to reduce its current tax payments. As a result, the firm generates "tax benefits" in the form of lower taxes today. Suppose that the tax benefits fall into a gray area such that there is some chance that the tax authority could disallow the tax benefits, either fully or in part. The firm records a UTB (liability) to account for the additional tax payments the firm will have to make if the tax benefits are ultimately disallowed. Firms are required to disclose the beginning and ending balance of the UTB as well as descriptions of changes in the balance during the current year.[10]

[10] Before FIN 48, companies were required to record a tax reserve under the general standard for contingent liabilities, SFAS 5 "Accounting for Contingencies." Thus the concept of a tax reserve is not new. However, before FIN 48, the amount of tax reserve was almost never separately disclosed (Gleason and Mills 2002), making it

We recognize that UTBs are not likely perfect measures of tax uncertainty. UTBs are potentially upwardly biased because Generally Accepted Accounting Principles (GAAP) require firms to assume the tax authorities know about each uncertain tax position the firm has taken; that is, firms are not allowed to take into account the "audit lottery" when calculating their UTB. Another important point is that financial accounting incentives may affect the reported amount (Hanlon and Heitzman 2010), which recent studies have started to investigate (e.g., De Simone et al. 2014). The financial accounting incentives may add noise to the UTB measure for purposes of our tests. If the financial accounting issues with UTB are severe enough to render UTBs uninformative of a firm's true tax uncertainty, then we might not find a relation between UTB and cash holdings even if firms do hold cash as a precaution against tax uncertainty. However, recent research suggests that UTBs are associated with future cash tax outflows, although the evidence to date suggests variation in the strength of this relation (Ciconte et al. 2016; Robinson et al. 2015). Later in the paper, we provide evidence that the positive relation between the UTB and future tax cash outflows also holds in our sample.

UTB data are not available until 2007, when the FIN 48 disclosure requirements took effect, thus limiting our sample period. We note that a benefit of the UTB as a measure is that it is a valid measure for loss firms as well as profit firms. In contrast, various measures of effective tax rates are generally limited to profitable firms because income is the most-used denominator of an effective tax rate.

We obtain UTB data from Compustat. Although Lisowsky et al. (2013) finds UTBs to be informative of firms' tax shelters, they also find the data are at times incorrect. For example, Compustat sometimes reports an amount as missing when the amount is actually nonzero and

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difficult to study empirically. In addition to requiring disclosure, FIN 48 provided additional guidance designed to standardize the computation of the tax reserve.

sometimes reports the amount in Compustat as billions rather than millions (Lisowsky et al. 2013). As a result, we eliminate observations with missing UTB amounts. We scale UTB (Computstat mnemonic: TXTUBEND) by total assets (AT) to form our measure of tax uncertainty, *Tax uncertainty*. To deal with potentially misreported values, we eliminate observations with a negative UTB amount and observations in the top 1% of *Tax uncertainty*.[11]

3.2 Empirical model

In this section, we describe our research design. We start with regressions from the prior literature that relate the cash ratio to firm characteristics and investigate the incremental effect of tax uncertainty. Specifically, we estimate variations of the following general model:

$$Cash\ Ratio_{it} = \alpha_0 + \beta_1 Tax\ uncertainty_{it} + \Sigma\beta_c Control_{it} + \varepsilon_{it}. \quad (1)$$

Previous studies use several alternative definitions of the cash ratio. These include (1) cash-to-assets (CHE/AT), (2) log of cash-to-net assets (CHE/(AT-CHE)), (3) log of one plus cash-to-net assets (1+(CHE/(AT-CHE))), and (4) log of cash-to-sales (CHE/SALE). We follow Bates et al. (2009) and use the *Cash-to-assets* ratio in our main tests, with robustness tests using other measures described in Section 5.

The coefficient of interest is β_1, which captures the incremental effect of tax uncertainty on cash holdings. We predict $\beta_1>0$ (i.e., the more tax uncertainty the firm has, the greater the cash balance it holds to pay or defend potential future tax claims). We control for variables found by the prior literature to affect cash holdings as well as additional variables. The control variables that we use follow.

[11] Including these observations leads to qualitatively similar results.

1. *Five-year repatriation tax cost.* Foley et al. (2007) show that firms facing higher repatriation taxes hold higher levels of cash.[12] We estimate a long-run measure of the repatriation tax liability of the firm (closer to an estimate of the cumulative stock of repatriation tax cost of the firm).[13] We calculate a long-run measure of repatriation tax cost as the difference between the tax payments that would have been due if foreign earnings were taxed at the U.S. rate (i.e., foreign pretax income (PIFO) times 35%) and foreign income taxes paid (TXFO) over the previous five years. We then scale the difference by total assets:

$$5-year\ Repatriation\ tax\ cost_{it} = \frac{\sum_{k=t-4}^{t}[(PIFO\ x\ 35\%) - TXFO]_{ik}}{AT}.$$

   To avoid losing observations, we do not impose restrictions on the number of previous foreign tax payments that need to be available for the calculation. The measure is winsorized at zero (similar to the annual measure in Foley et al.) when it is negative.

2. *Five-year cash ETR.* We include five-year cash ETR as a control for any direct cash savings from tax avoidance. Five-year Cash ETR is defined as cash taxes paid (TXPD) over the previous five years divided by the sum of pretax income adjusted for special items

[12] As discussed by Foley et al. (2007) and Hanlon et al. (2015), the tax repatriation tax cost measure as computed in Foley et al. involves assumptions. First, the calculation assumes that foreign reported earnings are an approximation of foreign taxable income. Second, the calculation of the repatriation tax cost uses annual foreign income to calculate the incremental U.S. taxes due upon repatriation, even though the measure is intended to capture the taxes on repatriating the unremitted foreign earnings of the company. Thus the measure assumes that the annual income is proportional to the total stock of foreign earnings that has not yet been repatriated. Finally, Foley et al. (2007) assume that the foreign tax rates applicable at the time that foreign taxes are paid resemble rates at the time of repatriation. This assumption reflects that the measure includes an estimate of the available foreign tax credit upon an eventual repatriation. Foley et al. (2007) validate these assumptions by showing that their measure of repatriation tax cost is associated with the stock of foreign cash holdings using confidential data from the BEA.

[13] To enable a better comparison of the economic magnitudes of a stock measure (UTB) with those of a flow measure (repatriation tax costs), we develop this measure of long-run repatriation tax costs. Our results are robust to using the one-year repatriation tax cost measure suggested by Foley et al. (2007).

(PI-SPI) over the previous five years. To retain loss firms in our sample, we do not require that the denominator is positive.[14] We winsorize this variable at 0 and 1.

3. *Financially constrained.* Firms that are financially constrained are more likely to hold cash because they have a higher chance of not being able to acquire necessary financing to fund their investment opportunities. We use the Whited-Wu (2006) Index of financial constraints based on the methodology described in that paper. Higher values of the Whited-Wu Index indicate that firms are more financially constrained. In our tests, *Financially constrained* is an indicator variable equal to one if the firm is above the sample median of firms ranked by the index and zero if below it.
4. *NOL.* Firms with more tax loss carryforwards might hold less cash because they can save cash by offsetting future taxable income. We measure *NOL* as the balance of tax loss carryforwards scaled by total assets (TLCF/AT), where *NOL* is set equal to zero when tax loss carryforwards is missing.
5. *Loss firm.* We expect firms with losses to hold more cash to manage their operations. In our tests, *Loss firm* is an indicator variable equal to one if the firm has negative pretax income (PI) in the year t and zero otherwise.
6. *Net working capital.* We expect firms with more net working capital to hold less cash because of their access to other liquid assets. We measure *Net working capital* as the difference between working capital and cash holdings scaled by total assets ((WCAP-CHE)/AT).

[14] We retain firms with a negative denominator to maximize the sample size—the number of years with UTB data is small and the UTB (our test variable) is available and useful for loss firms. The Cash ETR is a control variable and re-coded to be constrained between 0 and 1. To make sure the inclusion of these firms does not drive our results, we also estimate our tests over the subsample of firms with a positive denominator. The results are very similar, and we discuss them in more detail below.

7. *Leverage*. Research has posited reasons for both a positive and negative relation between leverage and cash holdings. We measure leverage as long-term debt plus debt in current liabilities, divided by total assets ((DLTT+DLC)/AT).
8. *Volatility of cash flows*. Prior literature finds that firms with more volatile cash flows tend to hold more cash. Following Sufi (2009), we measure the volatility of cash flows by calculating the standard deviation of annual changes of EBITDA (OIBDP) over a four-year lagged period, scaled by average noncash assets (AT-CHE) in the same period.[15]
9. *Market-to-book ratio*. Firms with strong growth opportunities likely hold more cash because it is costly for them to not be able to fund their growth. The numerator of the ratio is the market value of equity plus the book value of liabilities (measured as book value of assets less the book value of equity) scaled by total assets ((CSHO*PRCC_F+(AT-CEQ))/AT).
10. *Firm size*. Research suggests that larger firms likely have greater access to capital and thus need to hold less cash (Mulligan 1997). We measure firm size as the natural logarithm of total assets (AT).
11. *Dividend payout*. Dividend paying firms are likely to be more stable, and, as a result, we expect them to hold less cash. The dividend payout dummy equals one in years in which a firm pays a common dividend (DVC) and zero otherwise.
12. *Capital expenditures*. Investments are expected to relate negatively to cash holdings if productivity shocks cause firms to invest more cash (Riddick and Whited 2009) or if assets created from capital expenditures serve as collateral, increasing debt capacity and reducing

[15] Alternatively, instead of EBITDA, we employ cash flow from operations, which is an after-tax measure of cash flows. Our overall inferences are unchanged when using this alternative measure of cash flows.

the need for cash. We measure capital expenditures as the ratio of capital expenditures to total assets (CAPX/AT).

13. *Acquisitions*. This variable follows the same logic as the variable for capital expenditures. We measure acquisitions as acquisition expenses during the current year scaled by total assets (AQC/AT).
14. *After-tax cash flows*. Firms with higher cash flow may accumulate more cash, all else equal. We follow Bates et al. (2009) and measure cash flow as earnings after interest, dividends, and taxes but before depreciation, divided by total assets ((OIBDP-XINT-TXT-DVC)/AT).[16] Note that, by measuring cash flow after taxes, it reflects any direct effect of tax avoidance on cash flow. Specifically, in our research setting, including after-tax cash flows controls for any potential effect of saving cash taxes on cash holdings.
15. *R&D*. Research and development expense is another proxy for a firm's growth opportunities. Firms with high growth opportunities likely hold more cash for precautionary reasons. We measure this as research and development expenses scaled by total assets (XRD/AT), and it is set equal to zero when missing.

We estimate equation (1) for the entire sample and for subsamples based on whether a firm has foreign operations or operates purely in the U.S. We classify firm-years as purely domestic if they report foreign income as either zero or missing and have no *five-year repatriation tax cost*. All other firm-years are classified as multinational. We winsorize all continuous variables at the 1% and 99% levels to limit the influence of outliers. In addition, we include industry and year fixed effects, and, following Petersen (2009), we cluster standard errors at the firm and year levels.

[16] We also employ an alternative measure of cash flows using the cash flow statement (cash flows from operations minus dividends) and obtain similar results.

3.3 Sample selection

Table 1 Panel A describes the sample selection. We require firms to be incorporated in the U.S., have positive total assets, positive sales, and nonmissing UTB information. The sample begins in 2007, the first year for which data on the UTB are available. After imposing these requirements, we obtain a sample of 23,479 firm-year observations. We exclude 2,910 observations corresponding to financial firms (SIC 6000–6999) and regulated utilities (4900–4999) because firms in those industries have differing cash and tax avoidance incentives and because we aim to be consistent with prior research. We require firms to have nonmissing cash holdings and data to calculate other determinants of cash holdings. Finally, as discussed above, we eliminate firms with negative UTB values or that are in the top 1% of UTB-to-assets (150 observations). This leaves a final sample of 14,920 firm-year observations.

Table 1 Panel B presents the distribution of the sample across years and by their status as a domestic or multinational firm. The observations are fairly well spread across years, with the sample ranging from 1,318 observations in 2007 to 2,047 observations in 2014.[17] Both multinationals and purely domestic firms are well-represented, allowing enough observations to test the relation between tax uncertainty and cash holdings separately on the two types of firms.

4 Results

4.1 Descriptive statistics

Table 2 presents descriptive statistics for the variables in our sample. The first six columns present the data for the full sample. The mean *Cash-to-assets* ratio is 19.8%. This is consistent with recent literature over a similar period. The mean value of *Tax uncertainty* is 1% of total assets, which is consistent with the statistics reported in Lisowsky et al. (2013). *Five-year*

[17] The increasing time trend of UTB observations is consistent with Lisowsky et al. (2013). Their analysis reveals that the incidence of missing data is declining over time, for example, 35% and 22% missing in 2007 and 2009, respectively.

repatriation tax cost for this sample is 0.8% of assets, which is significantly larger than the single-year repatriation tax cost reported by Foley et al. (2007). This difference is due to the long-run nature of our measure and is also likely due to the more recent period, as unremitted foreign earnings has grown over time (Credit Suisse 2015). *Five-year cash ETR* is equal to 20.2%. This measure is lower than in prior research because we include observations with negative denominators in our main analyses as discussed above. The remaining variables are also of reasonable magnitudes.

The final column of Table 2 presents the mean values for multinational firm-years. The data show that multinational corporations are larger in size, have less volatile cash flows, and are more likely to pay dividends. However, they do not have larger cash-to-asset ratios.

Table 3 presents correlations among the main variables in the sample. The table shows that *Tax uncertainty* is positively associated with cash holdings, consistent with our hypothesis that firms with higher tax uncertainty hold more cash. *Five-year repatriation tax cost* is also positively correlated with cash holdings, consistent with Foley et al. (2007). *Volatility of cash flows* and *Research and development* are positively correlated with cash holdings, consistent with the precautionary motive for holding cash and consistent with the work of Bates et al. (2009). Also consistent with prior literature, *Firm size*, *Dividend payout dummy*, *Capital expenditures*, *Acquisitions*, and *After-tax cash flow* relate negatively to cash holdings.

4.2 Tests of tax uncertainty and cash holdings

Figure 1 graphically presents the univariate relationship between tax uncertainty and cash holdings. For purposes of Figure 1A, we classify firm-years as having high or low tax uncertainty based on whether they are above or below the sample median of *Tax uncertainty*. We then present the level of cash holdings (both the mean and median *Cash-to-assets*) for firms with

high tax uncertainty compared to firms with low tax uncertainty. Figure 1A shows that tax uncertainty is associated with higher cash holdings. Both the mean and median of the *Cash-to-assets* ratio are higher for firms with high *Tax uncertainty* than firms with low *Tax uncertainty*. In Figure 1B, we present the data by quintile and show zero UTB firms as a separate group. Zero UTB firms are generally small and financially constrained, which are factors associated with larger cash holdings (e.g., Almeida et al. 2004) but not controlled in the univariate analysis. The remaining quintiles are consistent with higher UTB balances being associated with higher cash balances. In sum, the descriptive statistics in Table 2 and univariate graphs in Figure 1 are generally consistent with firms holding more cash when tax uncertainty is higher.[18]

Table 4 reports regression results for equation (1). Column (1) presents results for the full sample, while Columns (2) and (3) show results separately for multinational firm-years and domestic firm-years, respectively. In all specifications, higher tax uncertainty is significantly associated with higher cash holdings, consistent with our hypothesis. The coefficient on *Tax uncertainty* is positive and significant in the full sample (0.741, t-stat 4.61), as predicted. Columns (2) and (3) reveal a similar positive relation between *Tax uncertainty* and cash holdings in the subsamples of multinational and domestic-only firms (0.507, t-stat 2.93 and 0.983, t-stat 3.35, respectively).[19]

In terms of control variables, we find that *Five-year repatriation tax cost* are positively associated with cash holdings, consistent with Foley et al. (2007). Importantly, both factors are significant in explaining cash holdings; controlling for *Five-year repatriation tax cost* does not

[18] While we remove missing UTB observations from our sample, based on prior literature (discussed above), we retain zero-UTB firms under the assumption they are correct. However, the zero-UTB firms do seem different and if they are not true zero UTB firms, including them may be biasing our results downward.

[19] In untabulated results, we find that the difference in the magnitudes of the coefficients on *Tax uncertainty* between the multinational and domestic samples is partially due to the inclusion of *Five-year repatriation tax costs*. When we exclude *Five-year repatriation tax costs* from the specification, we find that the coefficient on *Tax uncertainty* in the multinational sample increases to 0.67.

eliminate the significance of *Tax uncertainty* in explaining cash holdings, nor does including *Tax uncertainty* eliminate the importance of *Five-year repatriation tax cost*. Moreover, Column (3) shows that the positive association between tax uncertainty and cash holdings obtains even in purely domestic firms, for which tax repatriation costs are by definition zero. The finding that tax uncertainty is a significant factor in explaining cash holdings of domestic companies provides strong evidence that the influence of tax uncertainty on a firm's cash holdings differs from the influence of repatriation tax costs documented by Foley et al. (2007). The remaining control variables are consistent with prior research (e.g., Bates et al. 2009) and also fairly consistent across the multinational and domestic subsamples.[20]

The regression results show that tax uncertainty is a significant predictor of cash holdings. This result also implies that additional cash holdings are an important economic consequence, or "real effect," of tax avoidance. For example, using our regression coefficient estimates for the full sample (0.741), a one standard deviation increase in *Tax uncertainty* is associated with firms holding an extra 1.2% of their total assets in cash.[21] By comparison, a one standard deviation increase in *Five-year repatriation tax cost* is associated with firms holding an extra 1% of their total assets in cash.[22] Thus tax avoiding firms reduce their current tax payments, but to the extent the tax avoidance is uncertain, they hold on to a substantial portion of the cash and do not deploy it until the tax uncertainty is resolved.[23]

[20] In untabulated tests, we estimate the regression over the subsample of observations with a positive denominator in the control variable *Five-year cash ETR*. The results are qualitatively unchanged (i.e., the coefficient on *Tax uncertainty* is statistically significant at the 1% level). We also estimate the regression including deferred tax liabilities as an additional control and find that our results and inferences are qualitatively unchanged.

[21] =0.741*0.016

[22] =0.563*0.019

[23] We conduct an untabulated test where we first partition UTB into the portion explained by temporary differences (regressing UTB on deferred tax liabilities and deferred tax assets) and the remainder. We then examine the effect of each UTB partition on cash holdings. The results indicate that both temporary differences and permanent differences are significant in explaining cash holdings.

To illustrate the economic significance of the results in another way, we rank firms into deciles based on *Tax uncertainty* (untabulated). We find that the average firm in the top decile of tax uncertainty (i.e., those with the largest *Tax uncertainty*) holds an extra 3.3% of its total assets in cash as compared to the average firm in the bottom decile (i.e., those that have the smallest *Tax uncertainty*).[24] By comparison, the average firm in the sample holds 19.8% of its assets in cash (Table 2). Thus the magnitude of the effect of tax uncertainty on cash holdings is economically significant and larger than some previously documented factors.

Overall, the results provide evidence that tax uncertainty is a significant determinant of firms' cash holdings. The analysis of domestic companies shows that the effect of tax uncertainty differs from the effect of the tax cost of repatriating foreign earnings, which affects only multinational firms. Finally, the results demonstrate that the additional cash holdings are an important economic consequence of tax avoidance.

5 Additional tests

5.1 Changes regressions

Our research question is whether tax uncertainty can explain, at least in part, the large variation in cash holdings across firms. Thus our main empirical specification is a regression of cash balances on *Tax uncertainty*. An econometric concern with such a levels regression, however, is that our results could be affected by an omitted correlated variable. To mitigate this concern, we follow Foley et al. (2007) and Bates et al. (2009) in conducting sensitivity analyses using a changes model. In additional analyses, Foley et al. (2007) estimates a regression of changes in cash holdings on levels of the independent variables. Similarly, in robustness tests, Bates et al. (2009) estimate a regression of changes in cash holdings on changes of the independent

[24] Note that the average *UTB* scaled by total assets of firms in the top decile is 0.053 and in the lowest decile the average is zero.

variables. These studies find that some variables have a relation with changes in cash holdings, yielding inferences consistent with the levels analysis, but that some relations are quite different from those in their levels analysis.

We employ a research design that consists of regressions of changes of cash balances on changes in *Tax uncertainty* (*Tax uncertainty*$_t$ – *Tax uncertainty*$_{t-1}$) and lagged changes in *Tax uncertainty* (*Tax uncertainty*$_{t-1}$ – *Tax uncertainty*$_{t-2}$). We employ lagged changes in *Tax uncertainty* because of timing differences between when firms are required to record settlements with tax authorities (i.e., a reduction of the UTB is accounted for) and payments to tax authorities are made (i.e., cash holdings are affected).[25] An example illustrates the intuition. In the first quarter of fiscal 2010, Sysco reached a settlement with the IRS (Sysco 2010 annual report) that required a payment of $212 million in 2011. As a result, uncertain tax positions declined in 2010, while taxes paid and cash holdings were only affected by this settlement in 2011 and later. In addition, when firms take an uncertain tax position, they are required to estimate the future tax liability and record the estimate of this cost in the current year. However, the cash savings might not be retained until the following year after the tax return is filed or perhaps the company starts to retain cash over time to have the excess ready when the audit is expected (at a later date). Thus we include both the current and prior year changes in the UTB to capture potential timing differences in the change in the accrual and change in the cash.

Changes are difficult to estimate in this setting because data to compute *Tax uncertainty* are only available over a short period. Despite these limitations, we estimate the changes models. We include the lagged change in cash and the lagged level of cash as independent variables to allow for partial adjustment of the cash ratio to the equilibrium level, consistent with Bates et al.

[25] The timing issue is not as important in the levels regression because the levels regression includes accumulated balances of the UTB and cash holdings.

(2009).[26] Furthermore, we winsorize all changes variables at the 1% level. Finally, we cluster standard errors at the firm and year levels.

Table 5 presents our results for the full sample as well as for the subsamples of multinational and domestic firms. For the full sample and for both the subsamples of multinational companies and domestic companies, the lagged changes in *Tax uncertainty* are significantly related to changes in cash balances. The coefficient on the lagged change in tax uncertainty is significant in the predicted direction in every specification—as *Tax uncertainty* increases, cash holdings rise.[27] However, we note that current changes in *Tax uncertainty* have no relation with the current changes in cash holdings in our sample. Plausible explanations, as discussed above, are timing differences in 1) knowing a prior tax liability must be paid (reducing the UTB) and actually paying that liability (reducing cash), 2) taking an uncertain tax position (increasing the UTB) and holding cash (increasing cash) to pay the future liability, or 3) both. As a result, we interpret the evidence in Table 5 to be consistent with our hypothesis.[28]

5.2 Alternative cash definitions

While it might seem that measuring the amount of cash a firm holds is straightforward, the literature has developed several different measures of cash holdings. To test the robustness of the results and to reduce concerns that they are driven by the choice of dependent variable, we conduct additional tests with different measures of cash holdings. In particular, we estimate

[26] We include lagged cash-to-assets and change in cash-to-assets following Bates et al. (2009) although we did not include lagged cash-to-assets in the levels regressions (nor did Bates et al. (2009)). In robustness tests, we estimate our levels regression including the lagged cash-to-assets ratio and find similar results. We note that lagged cash-to-assets ratio is highly collinear with the cash-to-assets ratio. This explains why this additional variable is only included in changes specifications. Furthermore, we also estimate the changes specification excluding lagged cash-to-assets and change in cash-to-assets and find qualitatively similar results.

[27] In untabulated tests, we estimate the regression over the subsample of observations with a positive denominator in the control variable *five-year cash ETR*. The results are qualitatively unchanged (i.e., the coefficient on *Lagged change tax uncertainty* is statistically significant at the 1% level).

[28] In untabulated tests, we examine whether the effect holds for increases and decreases in the UTB. We find that both explain changes in cash holdings.

equation (1) using the following alternative cash definitions: (a) log of the ratio of cash-to-sales, (b) log of cash-to-net assets, (c) log of one plus the ratio of cash-to-net assets, and (d) log of cash-to-assets.

Table 6 presents the results of estimating equation (1) using each of these alternative cash definitions as the dependent variable. The regression includes the same controls as in Table 4, but for parsimony, we present the coefficient and t-statistics for *Tax uncertainty* only. The table shows that across each of the specifications, *Tax uncertainty* is significantly and positively associated with cash holdings. While the coefficient magnitudes are not comparable across regressions due to the different dependent variables, the t-statistics range from 2.68 to 7.63. Thus, across alternative definitions of cash holdings, we continue to find that firms with tax uncertainty hold more cash.

5.3 Cross-sectional variation in financial constraints

In this section, we examine whether firms that are more financially constrained hold more cash per dollar of tax uncertainty. Financial constraints have played an important role in the literature on cash holdings. Almeida et al. (2004) and Han and Qiu (2007) show that financially constrained firms have cash holdings that increase with the volatility of their cash flows. Riddick and Whited (2009) examine cash holdings as a function of both financing constraints and income uncertainty. Campello et al. (2010) survey CFOs around the world and find that financial constraints have real effects during financial crises, such as forgone investment opportunities, relative to firms that are not financially constrained.[29] Drawing on the literature, we predict firms with more uncertainty about their tax positions will hold more cash, all else equal, if they are also financially constrained.

[29] Hirshleifer and Teoh (2009) discuss possible connections between tax incentives, favoring debt financing and systemic risk as firms become over-levered and financially constrained in a crisis.

However, the relation may also work the opposite way. Financially constrained firms may be so constrained that they need to deploy the very cash saved by the tax avoidance that gave rise to the tax uncertainty. Recent evidence by Edwards et al. (2016) suggests that firms that are financially constrained avoid more tax. Edwards et al. (2016) also find evidence consistent with financially constrained firms using the tax savings for investment and paying down current liabilities. Thus whether financially constrained firms hold more or less cash when they tax plan is an empirical question. With this tension in mind, we examine the effect of being financially constrained by interacting measures of financial constraints with our tax uncertainty measures via estimation of the following regression:

$$Cash\ ratio_{it} = \alpha_0 + \beta_1 Tax\ uncertainty_{it} + \beta_2 Financially\ constrained_{it} + \beta_3 Tax\ uncertainty_{it} * Financially\ constrained_{it} + \Sigma\beta_c Control_{it} + \varepsilon_{it}. \quad (2)$$

We proxy for firms being financially constrained using two variables from the literature, where both variables are defined such that larger values correspond to being more financially constrained. In particular, we use the following measures and classifications.[30]

a) *Whited-Wu* Index of financial constraints as described earlier: Higher values indicate that firms are more financially constrained. In our tests, *Whited-Wu* is an indicator variable equal to one if the firm is above the sample median of firms ranked by the index and zero if below.

b) *Hadlock-Pierce* Index of financial constraints: Hadlock and Pierce (2010) construct an index to measure financial constraints based on firm age and size. The index is calculated as (−0.737* *Size*) + (0.043* $Size^2$) − (0.040**Age*), where *Size* is the log of total assets, and *Age* is the number of years the firm has been on Compustat with a nonmissing stock

[30] In untabulated tests, we also use alternative proxies of financial constraints based on firm size, age, long-term S&P credit rating, and dividend payout and find results similar to those in Table 7.

price. In calculating this index, *Size* is winsorized at log($4.5 billion) and *Age* is winsorized at 37 years. Higher values of the Hadlock-Pierce Index indicate that firms are more financially constrained. In our tests, *Hadlock-Pierce* is an indicator variable equal to one if the firm is above the sample median of firms ranked by the index and zero if below.

Table 7 presents the results. The columns correspond to the two measures being used as the financial constraints partitioning variable. In the specifications, the main effect of tax uncertainty continues to be positive and is significant using two-tailed tests at conventional levels (5%) in the Hadlock-Pierce partition. The coefficient on financial constraints is positive and significant, as predicted, in both specifications. The coefficient on the interaction term of tax uncertainty and financial constraints is positive in both specifications, consistent with our prediction. However, we find that the coefficient on the interaction term, that is, the incremental effect of being financially constrained, is statistically significant at conventional levels using two-tailed tests only for the Whited-Wu partition (0.65; t-stat 2.34).

5.4 Addressing conservatism concerns

The previous tests assume that UTBs are informative about tax uncertainty. However, because cash holdings and UTBs could both be driven by conservatism in managerial choices (as manifest in both financing and financial accounting choices), a concern is that managerial conservatism could drive the association between cash holdings and tax uncertainty.[31] In some sense, because we are proposing a precautionary motive to hold cash, conservatism is likely part of what we are testing. However, to address this concern, we conduct the following tests. First, we provide evidence that UTBs, our proxy for tax uncertainty, predict future tax cash outflows.

[31] Gupta et al. (2015) and Cazier et al. (2015) examine how financial reporting incentives directly influence the amount of unrecognized tax benefits.

In other words, UTBs are not accounting reserves held purely to have accruals in reserve for a conservative manager. In particular, we estimate the following regression based on the work of Ciconte et al. (2016):

$$Log(Sum\ Future\ Tax\ Payments)_{it+1;t+5} = \alpha_0 + \beta_1 Tax\ uncertainty_{it} + \Sigma\beta_c Control_{it} + \varepsilon_{it}, \quad (3)$$

where *Sum Future Tax Payments* is equal to the sum of tax payments (TXPD) made by the firm over the following five years scaled by total assets in year t (AT).[32] Following Ciconte et al. (2016), we also control for net operating loss carryforwards (NOL) in year t scaled by total assets (TLCF/AT), cash taxes paid in year t scaled by total assets (TXPD/AT), change in cash taxes paid (i.e., taxes paid in year t minus taxes paid in year t-1, the quantity scaled by total assets ($(TXPD_t\text{-}TXPD_{t-1})/AT_t$)), change in pretax income (i.e., pretax income in year t minus pretax income in year t-1, the quantity scaled by total assets ($(PI_t\text{-}PI_{t-1})/AT_t$)), and net deferred taxes adjusted for UTBs that relate to temporary book-tax differences scaled by total assets ((TXNDB-(TXTUBEND-TXTUBTXTR)/AT). Table 8 presents our results. We find that *Tax uncertainty* is positively related to future tax payments.[33] Thus the UTB is informative of future tax payments and not recorded solely to be conservative.

Second, we include a measure of accounting conservatism as a control in both the levels and changes specifications from Tables 4 and 5. To measure conservatism, we follow Givoly and Hayn (2000) and use average non-operating accruals scaled by total assets.[34] While some of these accruals are dictated by GAAP, the timing or amount of many of them are subject to

[32] Depending on data availability, some firms might have five years of future tax payments while others just one.
[33] The sample size for this test differs from the one used in our main analysis because we require data about future tax payments and because of the more limited number of observations with available changes variables.
[34] Givoly and Hayn (2000) define non-operating accruals as accruals consisting primarily of such items as loss and bad debt provisions (or their reversal), restructuring charges, the effect of changes in estimates, gains or losses on the sale of assets, asset write-downs, the accrual and capitalization of expenses, and the deferral of revenues and their subsequent recognition.

managerial discretion. Thus firms with more negative accruals are considered to be more conservative because they are quicker in recognizing losses and slower in recognizing gains. In our tests *Conservatism* is an indicator variable equal to one if the firm is above the sample median of conservatism and zero if below.[35]

Table 9 presents the results when we control for conservatism. To conduct these tests, we restrict our sample to firms that have sufficient data to calculate *Conservatism*. After including the control for accounting conservatism, our results with respect to tax uncertainty continue to hold: greater tax uncertainty is positively associated with greater cash holdings.

6 Conclusions

We examine whether tax uncertainty is a partial explanation for variation in cash holdings across firms. Because of complexity and ambiguity present in the tax laws, tax avoidance often involves some degree of uncertainty. Upon audit of the firm's returns, the tax authorities may have a different opinion of the firm's taxes and demand repayment of the tax savings. We posit that firms engaging in tax avoidance will hold additional cash for precautionary purposes to pay the tax claims on their uncertain tax positions. We find that both domestic and multinational firms with tax uncertainty hold significantly larger cash balances than firms that have little tax uncertainty. Finding the effect in purely domestic firms is important because it rules out repatriation tax effects as an alternative explanation, since purely domestic firms, by definition, do not face repatriation taxes. In addition, in the tests using multinational firms we include a long-run repatriation tax measure and find both repatriation taxes and tax uncertainty help explain cash holdings.

The magnitude of the effect is economically significant. The average firm in our sample holds 19.8% of their total assets in cash. Controlling for other factors that affect cash holdings,

[35] Results are similar if we use the continuous measure of conservatism.

including any direct effects of tax avoidance on cash flow, the data show that moving from the first decile of tax uncertainty to the tenth decile of tax uncertainty is associated with an increase in the assets held in cash of 3.3%.

We focus on tax uncertainty in our paper for two reasons. First, testing tax uncertainty allows us to extend the literature on the effects of tax avoidance and, in particular, on the real effects of uncertain tax avoidance. Second, tax uncertainty is measurable in recent years due to the required disclosures in financial statements following FIN 48. We recognize that other contingent liabilities and uncertainties may operate similarly to lead managers to hold more cash. These have not been considered in the cash holdings literature; perhaps accountants have a comparative advantage in identifying such liabilities (Slemrod 2005; Hanlon and Heitzman 2010). We have started this identification process and hope that future research continues the quest to broaden finance models and better explain variation in cash holdings.

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Figure 1
Cash-to-Asset Ratio for Firms Partitioned by Tax Uncertainty

Figure 1A: Above and Below Mean and Median

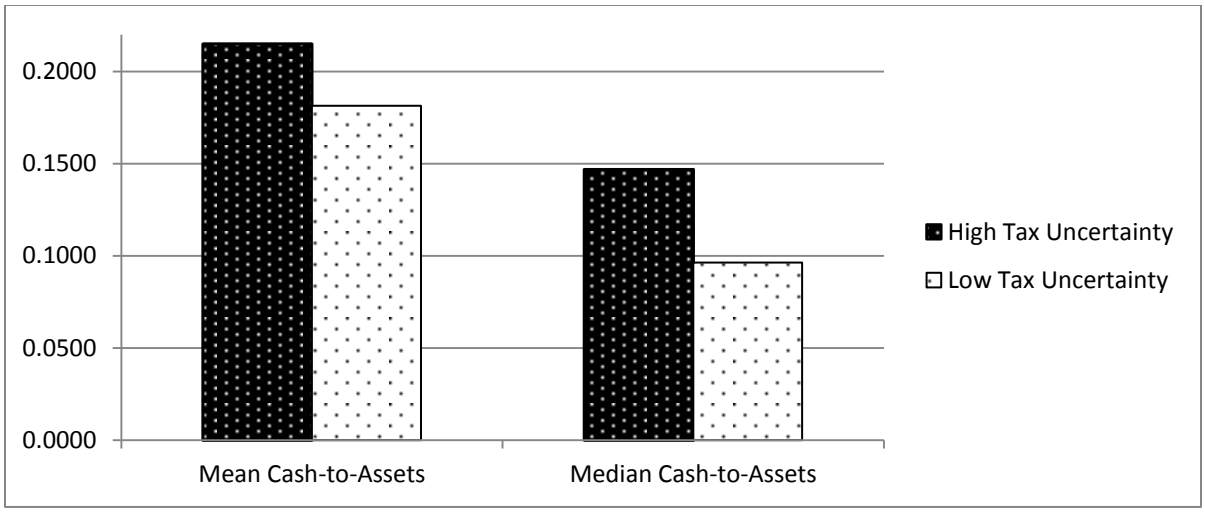

Figure 1B: Mean and Median Cash-to-Assets by Quintile

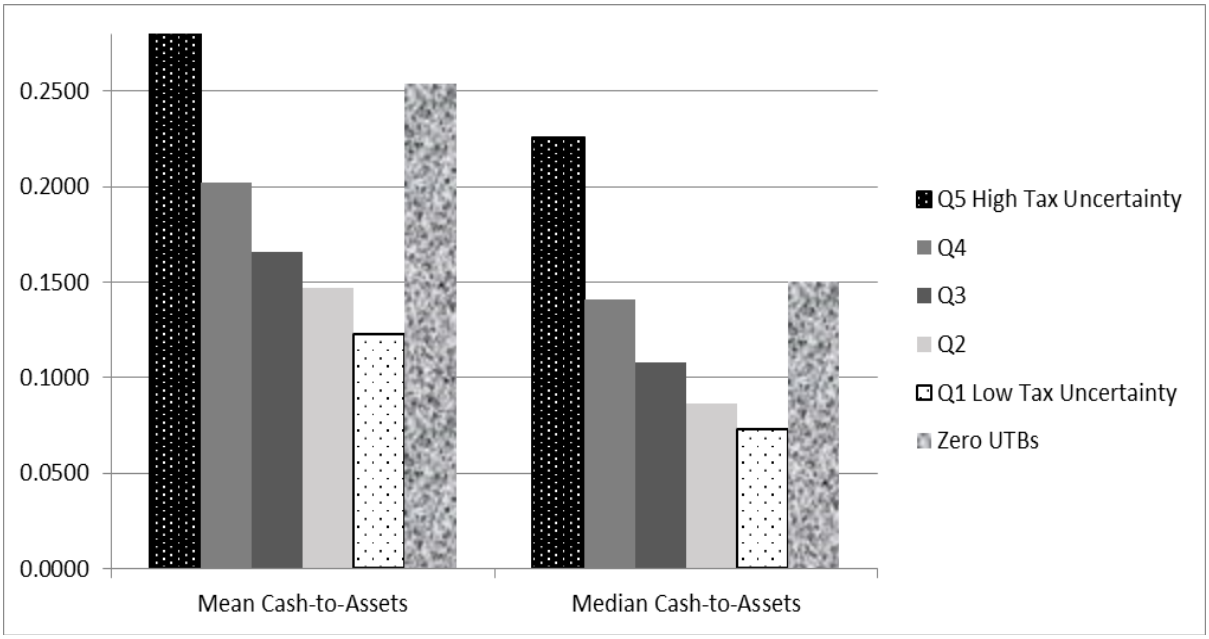

Figure 1. Tax uncertainty and cash holdings. This figure presents mean and median cash holdings of high *Tax uncertainty* firms versus low *Tax uncertainty* firms for firms with non-missing *UTB* data. *Tax uncertainty* is measured as the reserve for unrecognized tax benefits scaled by total assets. Firms are classified into either high *Tax uncertainty* or low *Tax uncertainty* based on whether they are above or below the sample median in Figure 1A. The data are presented by quintile in Figure 1B. Following previous research, we exclude financial firms (SIC code 6000–6999) and utilities (SIC code 4900–4999). We exclude firms with negative total assets or sales, missing cash holdings, and missing values for all control variables. The data used for this graph include the years 2007–2014.

Table 1
Sample Selection and Distribution

Panel A: Sample Selection

Firm years with nonmissing tax information	23,479
Excluding financial firms (SIC code 6000–6999) and utilities (SIC code 4900–4999)	-2,910
Excluding firm years with missing cash holdings or control variables	-5,499
Excluding firm years with UTB values <0 or above 99% of the distribution	-150
Final Sample	**14,920**

Panel B: Sample Distribution

	Firm year observations		
Fiscal Year	**Full Sample**	**Multinationals**	**Domestic**
2007	1,318	709	609
2008	1,460	792	668
2009	1,904	1,029	875
2010	2,087	1,169	918
2011	2,052	1,183	869
2012	2,026	1,189	837
2013	2,026	1,207	819
2014	2,047	1,225	822
Total	**14,920**	**8,503**	**6,417**

Notes: Firms are classified as domestic for firm years in which they report foreign income as either zero or missing and have no five-year repatriation tax cost. All other firm years are classified as multinational. Following previous research, we exclude financial firms (SIC code 6000–6999) and utilities (SIC code 4900–4999). We exclude firms with negative total assets or sales, missing cash holdings, and missing values for all control variables.

Table 2
Descriptive Statistics

Variable	N	Mean	Median	Std Dev	25th Pctl	75th Pctl	Mean Multinational
Cash-to-assets	14,920	0.198	0.122	0.209	0.044	0.276	0.188
Tax uncertainty	14,920	0.010	0.004	0.016	0.001	0.013	0.013
Five-year repatriation tax cost	14,920	0.008	0.000	0.019	0.000	0.002	0.013
Five-year cash ETR	14,920	0.202	0.191	0.204	0.000	0.308	0.225
Financially constrained	14,920	0.500	0.500	0.500	0.000	1.000	0.388
NOL	14,920	0.519	0.009	1.804	0.000	0.167	0.274
Loss firm	14,920	0.327	0.000	0.469	0.000	1.000	0.260
Net working capital	14,920	0.036	0.048	0.236	-0.044	0.158	0.067
Leverage	14,920	0.240	0.187	0.265	0.021	0.347	0.216
Volatility of cash flow	14,920	0.173	0.049	0.473	0.023	0.115	0.093
Market-to-book	14,920	2.008	1.496	1.634	1.126	2.205	1.877
Firm size	14,920	6.374	6.493	2.118	5.063	7.816	7.026
Dividend payout	14,920	0.348	0.000	0.476	0.000	1.000	0.405
Capital expenditures	14,920	0.046	0.030	0.053	0.015	0.056	0.041
Acquisitions	14,920	0.025	0.000	0.061	0.000	0.016	0.030
After-tax cash flow	14,920	0.005	0.070	0.262	0.018	0.108	0.053
R&D	14,920	0.055	0.005	0.111	0.000	0.061	0.048

Notes: Following previous research, we exclude financial firms (SIC code 6000–6999) and utilities (SIC code 4900–4999). We exclude firms with negative total assets or sales, missing cash holdings, and missing values for all control variables. Firms are classified as domestic in those firm years in which they report foreign income as either zero or missing and have no *Five-year repatriation tax cost*. All other firm years are classified as multinational and the statistics for those firm-years are shown separately from the full sample in the final column. *Cash-to-assets* corresponds to the ratio of cash and short-term investments to total assets (CHE/AT). *Tax uncertainty* is measured as the reserve for unrecognized tax benefits scaled by total assets (TXTUBEND/AT). *Five-year repatriation tax cost* is computed by subtracting foreign taxes paid (TXFO) from the product of a firm's foreign pretax income and the U.S. statutory tax rate (PIFO x 35%) over the previous five years divided by total assets (AT). *Five-year cash ETR* is the long-run cash effective tax rate, computed as the sum of cash taxes paid (TXPD) over the previous five years divided by the sum over the same five years of a firm's pre-tax income adjusted for special items (PI-SPI). We winsorize the values at zero and one. *Financially constrained* is an indicator variable equal to one if the firm is above the sample median of firms ranked by the Whited-Wu index and equal to zero if it is below the sample median. We calculate the Whited-Wu (2006) Index of financial constraints based on the methodology described in that paper. *NOL* is the balance of tax loss carryforwards scaled by total assets (TLCF/AT), where *NOL* is set equal to zero when tax loss carryforwards is missing. *Loss firm* is an indicator variable equal to one if the firm has a negative pretax income (PI) and zero otherwise. *Net working capital* is the difference between working capital and cash holdings scaled by total assets ((WCAP-CHE)/AT). *Leverage* is long-term debt plus debt in current liabilities divided by total assets ((DLTT+DLC)/AT). *Volatility of cash flow* is the standard deviation of annual changes of EBITDA (OIBDP) over a four-year lagged period, scaled by average noncash assets (AT-CHE) in the four-year lagged period. *Market-to-book* is the market value of equity plus the book value of liabilities (measured as book value of assets less the book value of equity), scaled by the book value of assets ((CSHO*PRCC_F+(AT-CEQ))/AT). *Firm size* is the natural logarithm of total assets (AT). *Dividend payout* is equal to one in years in which a firm pays a common dividend (DVC) and zero otherwise. *Capital expenditures* is the ratio of capital expenditures to total assets (CAPX/AT). *Acquisitions* is calculated as acquisition expenses during the current year over total assets (AQC/AT). *After-tax cash flows* is earnings after interest, dividends, and taxes but before depreciation divided by total assets ((OIBDP-XINT-TXT-DVC)/AT). *R&D* is research and development expenses scaled by total assets (XRD/AT), and research and development expense is set equal to zero when missing. All variables are winsorized at the 1% and 99% level.

Table 3
Pearson Correlation Coefficients for the Variables used in the Analysis

		A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*	*M*	*N*	*O*	*P*	*Q*
Cash-to-assets	*A*	**1.000**	**0.190**	**0.077**	**-0.186**	**0.342**	**0.241**	**0.221**	**-0.204**	**-0.278**	**0.463**	**0.328**	**-0.340**	**-0.235**	**-0.212**	**-0.136**	**-0.299**	**0.542**
Tax uncertainty	*B*		**1.000**	**0.229**	**-0.038**	-0.013	**0.071**	**0.061**	**-0.032**	**-0.072**	**0.019**	**0.038**	**0.064**	**-0.035**	**-0.118**	**-0.016**	-0.010	**0.230**
5-year repatriation tax cost	*C*			**1.000**	**-0.027**	**-0.196**	**-0.058**	**-0.165**	**0.047**	**-0.081**	**-0.073**	**0.034**	**0.222**	**0.105**	**-0.047**	0.011	**0.117**	**0.016**
5-year cash ETR	*D*				**1.000**	**-0.201**	**-0.230**	**-0.249**	**0.224**	**-0.092**	**-0.202**	**-0.173**	**0.204**	**0.199**	**-0.023**	**0.020**	**0.261**	**-0.268**
Financially constrained	*E*					**1.000**	**0.245**	**0.354**	**-0.107**	**-0.106**	**0.266**	**0.162**	**-0.729**	**-0.537**	**-0.072**	**-0.050**	**-0.300**	**0.327**
NOL	*F*						**1.000**	**0.306**	**-0.397**	**0.158**	**0.399**	**0.385**	**-0.393**	**-0.186**	**-0.091**	**-0.078**	**-0.593**	**0.455**
Loss firm	*G*							**1.000**	**-0.253**	**0.131**	**0.278**	**0.096**	**-0.390**	**-0.341**	**-0.050**	**-0.081**	**-0.463**	**0.349**
Net working capital	*H*								**1.000**	**-0.400**	**-0.335**	**-0.431**	**0.174**	**0.137**	**-0.043**	**0.025**	**0.506**	**-0.289**
Leverage	*I*									**1.000**	**0.058**	**0.152**	**0.090**	**-0.019**	**0.083**	**0.049**	**-0.238**	**-0.061**
Volatility of cash flow	*J*										**1.000**	**0.397**	**-0.374**	**-0.181**	**-0.090**	**-0.084**	**-0.548**	**0.497**
Market-to-book	*K*											**1.000**	**-0.256**	**-0.076**	**-0.040**	**-0.043**	**-0.452**	**0.402**
Firm size	*L*												**1.000**	**0.397**	**0.125**	**0.116**	**0.484**	**-0.384**
Dividend payout	*M*													**1.000**	**0.028**	0.007	**0.183**	**-0.248**
Capital expenditures	*N*														**1.000**	**-0.088**	**0.121**	**-0.152**
Acquisitions	*O*															**1.000**	**0.098**	**-0.075**
After-tax cash flow	*P*																**1.000**	**-0.557**
R&D	*Q*																	**1.000**

Notes: Correlations that are significant at the 10% level or lower are marked in bold. Firms are classified as domestic in those firm years in which they report foreign income as either zero or missing and have no five-year repatriation tax cost. All other firm years are classified multinational. Following previous research, we exclude financial firms (SIC code 6000–6999) and utilities (SIC code 4900–4999). We exclude firms with negative total assets or sales, missing cash holdings, and missing values for all control variables. Variables are defined in Table 2.

Table 4
The Effect of Tax Uncertainty on Cash Holdings

The Effect of Tax Uncertainty on Cash Holdings

	Dependent Variable = Cash-to-Assets		
	Full Sample	*Multinationals*	*Domestic*
Tax uncertainty	0.741***	0.507***	0.983***
	(4.61)	(2.93)	(3.35)
Five-year repatriation tax cost	0.563***	0.669***	
	(4.12)	(5.28)	
Five-year cash ETR	-0.023**	-0.012	-0.028*
	(-2.27)	(-1.34)	(-1.65)
Financially constrained	0.036***	0.025***	0.051***
	(6.85)	(4.53)	(5.48)
NOL	-0.006**	-0.005	-0.004
	(-2.06)	(-0.69)	(-1.51)
Loss firm	0.014**	0.001	0.017**
	(2.11)	(0.13)	(2.40)
Net working capital	-0.117***	-0.155***	-0.099***
	(-5.96)	(-6.28)	(-3.76)
Leverage	-0.222***	-0.220***	-0.215***
	(-16.84)	(-12.15)	(-13.76)
Volatility of cash flow	0.102***	0.124***	0.097***
	(9.79)	(6.94)	(8.28)
Market-to-book	0.013***	0.022***	0.008***
	(5.80)	(8.02)	(3.06)
Firm size	-0.002	-0.005**	0.004
	(-0.81)	(-2.14)	(1.03)
Dividend payout	-0.015***	-0.022***	-0.000
	(-3.64)	(-4.54)	(-0.04)
Capital expenditures	-0.395***	-0.452***	-0.368***
	(-10.04)	(-9.02)	(-6.35)
Acquisitions	-0.306***	-0.287***	-0.334***
	(-18.33)	(-12.83)	(-10.02)
After-tax cash flow	0.067***	0.021	0.059***
	(5.09)	(0.63)	(3.64)
R&D	0.374***	0.379***	0.310***
	(9.00)	(5.05)	(7.02)
Firms	3,076	1,700	1,622
N	14,920	8,503	6,417
Fixed effects	Industry and Year	Industry and Year	Industry and Year
Clustering	By firm and year	By firm and year	By firm and year
R-Squared	0.526	0.502	0.569

Table 4 (continued)
The Effect of Tax Uncertainty on Cash Holdings

Notes: The table presents regression results of a model predicting cash holdings. Firms are classified as domestic in those firm years in which they report foreign income as either zero or missing and have no five-year repatriation tax cost. All other firm years are classified as multinational. Following previous research, we exclude financial firms (SIC code 6000–6999) and utilities (SIC code 4900–4999). We exclude firms with negative total assets or sales, missing cash holdings, and missing values for all control variables. Variables are defined in Table 2. t-statistics are presented in parentheses below the coefficients and are clustered by firm and year. ***, **, and * denote significance at the 1%, 5%, and 10% levels, two-tailed, respectively.

Table 5
Changes in Cash Holdings Explained by Changes in Tax Uncertainty
Dependent Variable = Change (Cash-to-Total Assets)

	Full Sample	*Multinationals*	*Domestic*
Change tax uncertainty	-0.062	-0.208	0.053
	(-0.43)	(-0.97)	(0.19)
Lagged change tax uncertainty	**0.558*** **	**0.572*** **	**0.589*** **
	(3.41)	(3.86)	(1.82)
Lagged cash-to-assets ratio	-0.094***	-0.104***	-0.093***
	(-11.38)	(-15.61)	(-7.81)
Lagged change cash-to-assets	-0.082***	-0.010	-0.144***
	(-4.82)	(-0.58)	(-7.92)
Change five-year repatriation tax cost	0.404***	0.471***	-4.143***
	(2.81)	(3.07)	(-2.94)
Change five-year cash ETR	0.002	0.001	-0.002
	(0.36)	(0.19)	(-0.14)
Change financially constrained	0.002	0.003	0.001
	(1.08)	(0.98)	(0.37)
Change NOL	-0.006***	-0.007**	-0.006**
	(-2.73)	(-2.28)	(-2.08)
Change loss firm	-0.008***	-0.012***	-0.006
	(-3.64)	(-3.51)	(-1.49)
Change net working capital	-0.140***	-0.212***	-0.100***
	(-9.68)	(-11.90)	(-5.31)
Change leverage	-0.051***	-0.009	-0.078***
	(-2.93)	(-0.46)	(-2.86)
Change volatility of cash flow	0.053***	0.033**	0.060***
	(5.09)	(2.09)	(5.22)
Change market-to-book	0.002	0.002	0.005*
	(1.33)	(0.84)	(1.90)
Change firm size	0.031***	0.029**	0.032***
	(4.14)	(2.42)	(4.69)
Change dividend payout	0.004	0.004	0.003
	(0.89)	(0.77)	(0.62)
Change capital expenditures	-0.302***	-0.435***	-0.202***
	(-7.35)	(-9.51)	(-4.21)
Change acquisitions	-0.242***	-0.284***	-0.211***
	(-11.43)	(-8.90)	(-6.32)
Change after-tax cash flow	0.016	-0.042*	0.038**
	(0.91)	(-1.96)	(2.10)
Change R&D	-0.192***	-0.179	-0.160***
	(-6.65)	(-1.64)	(-3.41)
Firms	2,527	1,499	1,172
N	9,476	5,704	3,772
Fixed effects	Industry and Year	Industry and Year	Industry and Year
Clustering	By firm and year	By firm and year	By firm and year
R-Squared	0.229	0.259	0.240

Table 5 (continued)
Changes in Cash Holdings Explained by Changes in Tax Uncertainty

Notes: The table presents regression results of a model predicting changes in cash holdings. Firms are classified as domestic in those firm years in which they report foreign income as either zero or missing and have no five-year repatriation tax cost. All other firm years are classified as multinational. Following previous research, we exclude financial firms (SIC code 6000–6999) and utilities (SIC code 4900–4999). We exclude firms with negative total assets or sales, missing cash holdings, and missing values for all control variables. The dependent variable is the first difference in the ratio of cash and short-term investments to total assets. *Change tax uncertainty* is the first difference in *Tax uncertainty*. *Lagged change tax uncertainty* is the first difference in *Tax uncertainty* lagged by one period. *Lagged cash-to-assets ratio* is the ratio of cash to total assets at the beginning of the year. *Lagged change cash-to-assets* is the first difference in the ratio of cash to total assets lagged by one period. *Change five-year repatriation tax cost* is the first difference of *Five-year repatriation tax cost*, which is computed by subtracting foreign taxes paid from the product of a firm's foreign pretax income and the U.S. statutory tax rate over the previous five years scaled by total assets. *Change five-year cash ETR* is the first difference in the long-run cash effective tax rate, which is computed as the sum of cash taxes paid over the previous five years divided by the sum of a firm's pre-tax income adjusted for special items over the previous five years. *Change financially constrained* is the first difference of *Financially constrained*, which is an indicator variable equal to one if the firm is above the sample median of firms ranked by the Whited-Wu index and equal to zero if it is below the sample median. *Change NOL* is the first difference of *NOL*, which is the balance of tax loss carryforwards scaled by total assets, and *NOL* is set equal to zero when tax loss carryforwards is missing. *Change loss firm* is the first difference of *Loss firm*, which is an indicator variable equal to one if the firm has a negative pretax income and equal to zero otherwise. *Change net working capital* is the first difference of *Net working capital*, which is the difference between working capital and cash holdings scaled by total assets. *Change leverage* is the first difference of *Leverage*, which is long-term debt plus debt in current liabilities divided by total assets. *Change volatility of cash flows* is the first difference of *Volatility of cash flows*, which is the standard deviation of annual changes of EBITDA over a four-year lagged period, scaled by average non-cash assets in the four-year lagged period. *Change market-to-book* is the first difference of *Market-to-book*, which is the market value of equity plus the book value of liabilities (measured as book value of assets less the book value of equity), scaled by the book value of assets. *Change firm size* is the first difference of *Firm size*, which is the natural logarithm of total assets. *Change dividend payout* is the first difference of *Dividend payout*, which is equal to one in years in which a firm pays a common dividend and zero otherwise. *Change capital expenditures* is the first difference of *Capital expenditures*, which is the ratio of capital expenditures to total assets. *Change acquisitions* is the first difference of *Acquisitions*, which is calculated as acquisition expenses during the current year over total assets. *Change after-tax cash flows* is the first difference of *After-tax cash flows*, which is earnings after interest, dividends, and taxes but before depreciation divided by total assets. *Change R&D* is the first difference of *R&D*, which is research and development expenses scaled by total assets, and research and development expense is set equal to zero when missing. All variables are winsorized at the 1% and 99% levels. t-statistics are presented in parenthesis below the coefficients and are clustered by firm and year. ***, **, and * denote significance at the 1%, 5%, and 10% levels, two-tailed, respectively.

Table 6
Tests using Alternative Cash Definitions

The Effect of Tax Uncertainty on Cash Holdings

	Dependent Variable			
	log (Cash-to-Sales)	***log (Cash-to-Net Assets)***	***log (1+Cash-to-Net Assets)***	***log (Cash-to-Assets)***
Tax uncertainty	**4.304*** **	**7.644*** **	**0.914*** **	**6.731*** **
	(3.77)	(6.92)	(2.68)	(7.63)
Firms	3,076	3,076	3,076	3,076
N	14,920	14,920	14,920	14,920
Controls	Yes	Yes	Yes	Yes
Fixed Effects	Industry and Year	Industry and Year	Industry and Year	Industry and Year
Clustering	By firm and year	By firm and year	By firm and year	By firm and year
R-Squared	0.434	0.451	0.526	0.395

Notes: The table presents regression results of a model predicting cash holdings. Firms are classified as domestic in those firm years in which they report foreign income as either zero or missing and have no five-year repatriation tax cost. All other firm years are classified as multinational. Following previous research, we exclude financial firms (SIC code 6000–6999) and utilities (SIC code 4900–4999). We exclude firms with negative total assets or sales, missing cash holdings, and missing values for all control variables. *Log (cash-to-sales)* is defined as the natural logarithm of cash and short-term investments to sales (CHE/SALE). Log (*cash-to-net assets)* is defined as the natural logarithm of the ratio of cash and short-term investments to total assets minus cash and short-term investments (CHE/(AT-CHE)). *Log (1+ cash-to-net assets)* is defined as the natural logarithm of one plus the ratio cash and short-term investments to total assets minus cash and short-term investments (1+(CHE/(AT-CHE))). *Log (cash-to-assets)* is defined as the natural logarithm of the ratio cash and short-term investments to total assets (CHE/AT). *Tax uncertainty* is measured as the reserve for unrecognized tax benefits scaled by total assets (TXTUBEND/AT). We winsorize the values at zero and one. Control variables from Table 4 are included. t-statistics are presented in parentheses below the coefficients and are clustered by firm and year. ***, **, and * denote significance at the 1%, 5%, and 10% levels, two-tailed, respectively.

Table 7
Tax Uncertainty and Financial Constraints

Dependent Variable = Cash-to-Assets

	Financial Constraint	
	Whited-Wu	***Hadlock-Pierce***
Tax uncertainty	0.320	0.461*
	(1.60)	(1.84)
Tax uncertainty x Fin. Constraint	**0.650****	**0.477**
	(2.34)	(1.43)
Financial Constraint	0.029***	0.023***
	(5.15)	(4.26)
Firms	3,076	3,011
N	14,920	14,400
Controls	Yes	Yes
Fixed Effects	Industry and Year	Industry and Year
Clustering	By firm and year	By firm and year
R-Squared	0.526	0.531

Notes: The table presents regression results of a model predicting cash holdings. Firms are classified as domestic in those firm years in which they report foreign income as either zero or missing and have no five-year repatriation tax cost. All other firm years are classified as multinational. Following previous research, we exclude financial firms (SIC code 6000–6999) and utilities (SIC code 4900–4999). We exclude firms with negative total assets or sales, missing cash holdings, and missing values for all control variables. *Cash-to-assets* corresponds to the ratio of cash and short-term investments to total assets. *Tax uncertainty* is measured as the reserve for unrecognized tax benefits scaled by total assets. *Financially constrained* is measured in two ways as follows. First, the *Whited-Wu* Index of Financial Constraints as detailed by Whited and Wu (2006). The authors estimate the Euler equation and model the shadow price of relaxing the financing constraint as a function of firm-characteristics. (See Whited-Wu (2006) for a detailed description.) Higher values of the Whited-Wu Index indicate that firms are more financially constrained. In our tests, *Whited-Wu* is an indicator variable equal to one if the firm is above the sample median and zero otherwise. Second, the *Hadlock-Pierce* Index of financial constraints as detailed by Hadlock and Pierce (2010). The authors construct an index to measure financial constraints based on firm age and size. The index is calculated as $(-0.737 * Size) + (0.043 * Size^2) - (0.040 * Age)$, where *Size* is the log of total assets, and *Age* is the number of years the firm has been on Compustat with a nonmissing stock price. In calculating this index, *Size* is winsorized at log($4.5 billion) and age is winsorized at 37 years. Higher values of the Hadlock-Pierce Index indicate that firms are more financially constrained. In our tests, *Hadlock-Pierce* is an indicator variable equal to one if the firm is above the sample median and zero otherwise. Control variables from Table 4 are included. t-statistics are presented in parenthesis below the coefficients and are clustered by firm and year. ***, **, and * denote significance at the 1%, 5%, and 10% levels, two-tailed, respectively.

Table 8
Tax Uncertainty and Future Tax Payments

	Dependent Variable
	Log(Sum Future Tax Payments)
Tax uncertainty	**3.008****
	(2.12)
NOL	-0.286***
	(-6.60)
Cash Taxes Paid	39.934***
	(24.12)
Change Cash Taxes Paid	-13.164***
	(-9.17)
Change Pretax Income	0.726
	(1.56)
Deferred Taxes	-0.097
	(-0.25)
Firms	2,148
N	9,275
Fixed Effects	Industry and Year
Clustering	By firm and year
R-Squared	0.433

Notes: The table presents regression results of a model predicting future tax payments. Following previous research, we exclude financial firms (SIC code 6000–6999) and utilities (SIC code 4900–4999). We exclude firms with negative total assets or sales, missing cash holdings, and missing values for all control variables. *Sum future tax payments* corresponds to the sum of available tax payments (TXPD) over the next five years over total assets (AT). *Tax uncertainty* is measured as the reserve for unrecognized tax benefits scaled by total assets (TXTUBEND/AT). Following Ciconte et al. (2016), we also control for net operating loss carryforwards scaled by total assets both in year t (TLCF/AT), cash tax paid in year t scaled by total assets in year t (TXPD/AT), change in cash taxes paid (year t – (t-1)) scaled by total assets in year t ($(TXPD_t-TXPD_{t-1})$/AT), change in pretax income scaled by total assets in year t ((PI_t-PI_{t-1})/AT), and net deferred taxes adjusted for UTBs that relate to temporary book-tax differences scaled by total assets in year t ((TXNDB-(TXTUBEND-TXTUBTXTR)/AT). t-statistics are presented in parentheses below the coefficients and are clustered by firm and year. ***, **, and * denote significance at the 1%, 5%, and 10% levels, two-tailed, respectively.

Table 9
Including Accounting Conservatism as a Control

	Dependent Variable	
	Cash-to-Assets	***Change (Cash-to-Total Assets)***
Tax uncertainty	**0.471*** **	
	(2.69)	
Conservatism	0.015***	
	(4.75)	
Lagged Change Tax uncertainty		**0.449*** **
		(2.65)
Change Conservatism		0.061***
		(6.83)
Firms	2,532	2,190
N	13,121	8,513
Controls	Yes	Yes
Fixed Effects	Industry and Year	Industry and Year
Clustering	By firm and year	By firm and year
R-Squared	0.576	0.247

Notes: The table presents regression results of a model that includes *Conservatism* as a control. Following previous research, we exclude financial firms (SIC code 6000–6999) and utilities (SIC code 4900–4999). We exclude firms with negative total assets, sales or sum of a firm's pre-tax income over the last five years, missing cash holdings, and missing values for all control variables. To measure conservatism, we follow Givoly and Hayn (2000) and use the average non-operating accruals scaled by total assets. Firms with larger negative (i.e., income decreasing) accruals are assumed to be more conservative. In our tests, *Conservatism* is an indicator variable equal to one if the firm is above the sample median of conservatism and equal to zero if it is below the sample median. *Change conservatism* is the first difference in *Conservatism*. All other control variables are as defined previously. All variables are winsorized at the 1% and 99% levels. t-statistics are presented in parentheses below the coefficients and are clustered by firm and year. ***, **, and * denote significance at the 1%, 5%, and 10% levels, two-tailed, respectively.