

**The Relation between Tax Risk and Firm Value:
Evidence from the Luxembourg Tax Leaks**

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January 2017

Acknowledgements: We gratefully acknowledge support from the Eli Broad College of Business at Michigan State University. We thank Rita Gunn (discussant), Michele Nessa, Tom Neubig (discussant), Dan Wangerin, Den Patten, participants at the 6th (2016) Annual North American CSEAR Conference, 2016 American Accounting Association Annual Meeting, and the 107th (2016) National Tax Association Annual Conference, as well as workshop participants at Michigan State University for their helpful comments. All errors remain our own.

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Abstract

We investigate the relation between tax risk and valuation of a firm's tax avoidance through an analysis of the stock price reaction towards the firms that were exposed through the Luxembourg tax leaks. This event provides a unique opportunity to examine investors' reaction to revelation of a firm's specific tax avoidance strategies and the firm's efforts to reduce the associated tax risks. Prior research investigating the relation of tax risk and firm value has depended on measures that could be compromised by firm reporting choices (e.g., uncertain tax benefit disclosures). The exogenous nature of the Luxembourg tax leaks provides an opportunity to better disentangle a firm's actual tax risk from its "self-reported" tax risk. We find, on average, investors reacted positively to news of firms' inclusion in the tax leaks. This is in contrast to the documented negative reaction to news of other tax shelter participation and the negative media and political reaction to the Luxembourg tax leaks. We attribute the difference in market reaction to information on firms' preemptive steps to reduce the risk associated with their tax strategies by securing advance tax rulings. In cross-sectional analysis, we observe that among U.S. multinational firms, the market reaction is more positive for those firms perceived to be less tax aggressive, as proxied by the firm's cash effective tax rate. In addition, we find limited evidence of corporate governance explaining the variation in market reaction. However, we fail to find empirical evidence of political or reputational costs explaining the variation in market reaction.

Keywords: Luxembourg Tax Leaks, Tax risk, Tax avoidance, Event study.

JEL Classification: H25, G30

Data Availability: Data are publicly available from sources identified in the paper.

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1. Introduction

With the recent leaks of previously classified documents on corporate tax avoidance arrangements between Luxembourg and various multinational firms, an opportunity emerges for researchers to revisit the literature on investors' valuation of corporate tax avoidance. Prior research investigating the relation of firm value with a firm's level of tax avoidance (tax aggressiveness) has depended on measures that could be compromised by firm reporting choices (e.g., uncertain tax benefit disclosures). Robinson, Stomberg, and Towery (2016) and Ciconte, Donohoe, Lisowsky, and Mayberry (2016) find mixed evidence that self-reported unrecognized tax benefit (UTB) balances reflect a firm's level of tax aggressiveness, as measured by future tax settlements. The exogenous "shock" of the Luxembourg tax leaks provides a unique opportunity to better disentangle a firm's actual tax aggressiveness (risk) from its "self-reported" tax aggressiveness.

To date, few studies have investigated the market reaction to news about a firm's tax avoidance activities (e.g., Desai and Hines, 2002; Frischmann, Shevlin, and Wilson, 2008; Hanlon and Slemrod, 2009). The costs and benefits associated with tax avoidance create a tension around the question of how the market perceives the news about firms' involvement in such activities (Hanlon and Slemrod, 2009). On one hand, one could expect a positive market reaction if investors reward firms' effort to maximize shareholder value through reduction of cash tax payments. Alternatively, the market might react negatively if investors anticipate additional costs arising from future disallowances and penalties by the tax authorities, concerns about shareholder's wealth diversion, as well as other reputational and political costs. Depending

on investors' assessment of the costs and benefits, news about tax avoidance could boost or depress a firm's stock price.

Recent literature on tax avoidance increasingly has focused on another factor associated with such activities: tax risk. Whereas the definition of risk varies in different contexts, various authors adopt the notion of risk from finance as the dispersion or variation of possible outcomes from an investment (e.g., Drake, Lusch, and Steckelberg, 2017; Guenther, Matsunaga, and Williams, 2016). This dispersion in possible outcomes reflects a degree of uncertainty about the future. Similarly, in this study, we refer to the notion of *tax risk* as it relates to the uncertainty in the outcomes of a firm's tax avoidance activities. Different tax avoidance strategies impose different levels of risk to the firm, depending on how supportable (with regards to the law) the tax authority finds the arrangements. Therefore, the costs and benefits associated with a tax strategy vary not only on the degree of tax avoidance but also on the level of uncertainty associated with that strategy.

Recent research in the area of tax risk focuses primarily on the relation between tax risk and tax outcomes or the relation between tax risk and firm risk. The studies on tax outcomes document a positive association between tax risk and tax avoidance, i.e., firms associated with higher tax risk pay less corporate tax. Dyreng, Hanlon, and Maydew (2016) use firms' unrecognized tax benefits (UTBs) as a proxy for tax risk and find that tax avoiders (firms with relatively low cash effective tax rates) report higher UTBs. The second stream of research finds evidence consistent with higher tax risk contributing to greater operational uncertainty and overall firm risk (e.g., Guenther *et al.*, 2016; Hutchens and Rego, 2015).. These studies use a variety of proxies for tax risk (year-end unrecognized tax benefits (UTBs), current year additions to UTBs, discretionary book-tax differences, and the volatility of cash effective tax rates) and

find a positive association between tax risk and different measures of firm risk. A concern with these recent studies is that the proxies for tax risk are all ex-post and may not capture the full distribution of possible outcome. Neuman, Omer, and Schmidt (2016) develop an ex-ante measure of tax risk using practitioner-based risk assessment procedures. They document a positive association between their proxy for tax risk and a firm's operational uncertainty (proxied by volatility of reported taxes, sales and earnings), consistent with our concurrent research.

Relatively little prior research investigates the impact of tax risk on investors' valuation of tax avoidance. If a tax avoidance strategy imposes some level of risk on the firm, one would expect investors to discount the share price once they become aware of the risk. Alternatively, investors should reward the firm's action to reduce tax risk while achieving the same level of tax avoidance. Hanlon and Slemrod (2009) discuss tax risk in their analysis of the costs and benefits of tax aggressiveness; however they do not empirically explore whether investors incorporate tax risk into their valuations.

The challenge for academic researchers, investors, and other users of financial information is that it is often difficult to observe the specific types of tax strategies a firm employs and to evaluate how much risk these different strategies impose on the firm. Information contained in the financial statements is limited to aggregated data on the ex-post realized outcomes of the implemented tax strategies. This is a primary reason why observing the market reaction to exogenous events regarding specific tax strategies (e.g., leaks, news, and press releases) can be particularly informative (Hanlon and Slemrod, 2009).

Our study uses the recent event of the Luxembourg tax leaks (hereafter LuxLeaks) to investigate how the market values firms' cross-border tax avoidance strategies through an advanced tax ruling (ATR). The Luxembourg tax leaks reveal a series of confidential documents

detailing firms' complex tax structures and advanced tax rulings signed by the Luxembourg tax authority assuring firms about the legitimacy of their tax avoidance arrangements. An analysis of the documents reveals the frequent use of hybrid financial instruments and repatriation structures with little real economic substance. The primary purpose of the structures appears to be tax avoidance (Hardeck and Wittenstein, 2016; ICIJ, 2014). What is distinctive about these tax rulings is their legal and binding nature provides firms with a great deal of certainty about their tax arrangements. Firms can achieve the same level of tax avoidance with or without the ATR; however, the tax ruling reduces the risk of future disallowance and litigation from the issuing tax authority (or so it was thought at the time the ruling was issued). This feature makes news related to firms' use of these advance tax rulings unique from other tax news examined in prior literature pertaining to more uncertain tax strategies (e.g., tax shelter participation).

We construct our event study sample by cross-matching the 353 firms exposed through the leaks as having signed advanced tax ruling(s) with Luxembourg to those firms listed on a U.S. stock exchange.¹ The cross-matching exercise results in a sample of 82 U.S. listed firms. Within this sample, we further identify 49 U.S. headquartered firms for our cross-sectional analysis. We find, on average, a firm's stock price increased on the release dates of the tax ruling documents. The significant positive market reaction on the event dates holds for both the full sample and the subsample of U.S. headquartered firms. The direction of the market reaction to the LuxLeaks is opposite to that observed by Hanlon and Slemrod (2009), where investors responded negatively to news of tax shelter participation.² The contrast in market reaction

¹ On November 5, 2014, the International Consortium of Investigative Journalists (ICIJ) released more than 500 documents detailing private tax rulings between individuals, companies and the Luxembourg tax authority. ICIJ released a second batch of documents on December 9, 2014. For details on the leaked documents, see <https://www.icij.org/project/luxembourg-leaks>

² There is no universally accepted definition of a tax shelter. We rely on the Joint Committee on Taxation (1999) definition of a corporate tax shelter as "a plan or arrangement designed principally to avoid or evade ... income tax without exposure to economic risk or loss" (Wilson, 2009). Hanlon and Slemrod (2009) rely on the press use of the

provides empirical evidence consistent with investors differentiating between the levels of risk associated with tax avoidance strategies, and rewarding firms that take steps to reduce the risk associated with these tax strategies.

In further analyses, we investigate potential firm characteristics that could be associated with observed cross-sectional variation in the market's reaction. Specifically, we examine firms' perceived tax aggressiveness, reputational cost, corporate governance, and political cost. Hanlon and Slemrod (2009) examine the first two factors, while discussing but not exploring the latter two factors. Due to the data limitations for non-U.S. firms, we restrict our additional analyses to U.S. headquartered firms. We observe that within the group of U.S. headquartered firms, those firms with relatively higher cash effective tax rates experience a more positive market reaction. This finding provides additional support of Hanlon and Slemrod's (2009) inference that the market reacts more positively (less negatively) to news of tax shelter participation for firms that previously were perceived to be less tax aggressive.

There is mixed evidence on the role of corporate governance as an explanatory variable for the cross-sectional variation in market reaction; results are sensitive to the proxy used to measure corporate governance. If stronger corporate governance reduces the risk of rent extraction, then we expect a more positive reaction for well-governed firms (Desai and Dharmapala, 2009). Consistent with our expectation, we find a more positive market reaction for U.S. firms with relatively higher institutional ownership and firms where stock options represent a larger percentage of management's total compensation. However, the results are contradictory when we include the value of restricted stock holdings in our calculation of total equity-based

term "tax shelter" to identify their sample firms. Their intention is to capture "off-the-shelf" tax shelter strategies promoted by law, investment banking, and accounting firms. Although the tax strategies revealed in the Luxembourg tax leaks have not been labelled tax shelters by the press, they are tax strategies (promoted by an accounting firm) with little or no economic benefit other than tax avoidance (Hardeck and Wittenstein, 2016).

compensation as a percentage of managers' total compensation. The market reacts less positively for firms with a higher fraction of total equity-based compensation to managers' total compensation.³ We offer a potential ex-post rationale for the mixed results; a higher fraction of restricted stock holdings compensation represents shareholders' focus on long-term rather than near-term performance. We interpret the results as indicating that dedicated shareholders react less positively to the leaks than transient investors (Bushee, 2001).

The last two cross-sectional analyses examine how political and reputational costs impact market reaction. Using corporate social responsibility scores as a measure of a firm's reputational cost, we find no evidence the market reacts less positively towards firms facing high reputational costs. There is also insufficient evidence to support the proposition that the market's reaction to the LuxLeaks is affected by political costs.

A concurrent study by Huesecken, Overesch, and Tassius (2016) also examines the market reaction to the Luxembourg tax leaks. Their study investigates whether the LuxLeak is associated with any reputational loss for the firms revealed in the leaks. Consistent with our findings, they observe a positive market reaction to the Luxembourg tax leaks, which they interpret as casting doubts on the posited reputational loss on the reveal of tax avoidance behavior that could be interpreted as socially inappropriate. The authors attribute the positive market reaction to increased tax certainty about the firms' tax avoidance activities from the disclosure of the advance tax rulings. Although both studies find similar market reactions to the LuxLeaks, we further exam the relation between tax risk and firm value and theorize the channel through which tax risk impacts firm value. Using the model developed in Hanlon and Slemrod

³ Hanlon and Slemrod (2009) also find mixed results using two measures of corporate governance based on shareholders' rights from Gompers, Ishii, and Metrick (2003) index. They find a more positive reaction for firms with entrenched boards (poorly-governed firms), but a more negative reaction for poorly-governed firms using the non-entrenched proxy.

(2009), we posit and document that the public disclosure of the advanced tax rulings results in a downward revision of investors' perceptions of the risk associated with these firms' aggressive tax strategies. In addition, we focus on a homogenous group of firms (i.e., U.S. headquartered firms) to identify the relation between tax risk and firm value, controlling for confounding variables.

Our paper proceeds as follows. Section 2 summarizes prior literature on the relation between tax avoidance and firm value. In addition, we provide details about the use of advanced tax rulings in tax avoidance strategies as well as background information about the Luxembourg tax leaks. Section 3 develops our hypothesis for the market's response to tax avoidance news and develops expectations about the firm-specific characteristics that might explain the cross-sectional variation in the stock price reaction. Section 4 describes the research design and data, and the empirical results are presented in Section 5. Section 6 outlines some caveats and limitations of our study, and Section 7 concludes.

2. Literature Review

2.1 The relation between tax avoidance and firm value

Few prior studies investigate the impact of disclosure of firms' tax avoidance activities or tax law changes on firm value. Dhaliwal and Erickson (1998) provide evidence the market impounds into share price the expected decline in future cash flows from a court ruling that disallowed a firm's amortization deduction for certain intangible assets. They find a similar negative market reaction for peer firms—those with similar intangible assets as the firm named in the case. The study also finds a positive market reaction towards the subsequent reversal of the disallowance by the U.S. Supreme Court.

Desai and Dharmapala (2009) find that, whereas shareholders positively value managerial actions to minimize corporate tax liability, the firm's corporate governance moderates this relation. By regressing Tobin's Q on a proxy of corporate tax avoidance, their study provides empirical evidence that tax avoidance is positively associated with firm value for well-governed firms but not for weakly governed firms. This finding is consistent with the idea of shareholders benefiting from corporate tax avoidance activities when firms are able to mitigate agency costs (i.e., minimizing managerial wealth diversion or rent extraction). Although the paper is not an event study, the results empirically demonstrate the importance of corporate governance in the relation between corporate tax avoidance and firm value.

There have been several event studies of market reaction toward firms' inversion activities through the relocation of their headquarters to a foreign jurisdiction with a lower tax rate than the United States (e.g., Cloyd, Mills, and Weaver, 2003; Desai and Hines, 2002; Seida and Wempe, 2004; Chorvat, 2016). These studies are concerned primarily with a firm's own decision as opposed to exogenous events. As such, the inference from the market reaction found in these studies is limited to the difference between the market's and firm's assessment of the associated costs and benefits.

Hanlon and Slemrod (2009) were the first to examine stock price reactions to news related to firms' involvement in tax shelters. Their study focuses on 108 news articles related to 97 firms, covering mainly eight types of tax shelters. They find, on average, the market reacts negatively to the initial news about the firm's use of tax shelters. Their additional cross-sectional tests provide evidence consistent with investors' concern about the negative impact of consumer backlash. They observe a more negative market reaction for firms in the retail sector. The authors also find a smaller negative market reaction toward firms viewed to be less tax

aggressive. Their results provide initial evidence that the market adjusts for the net benefit of tax savings, which were previously unobserved in the financial statements, on receiving new information about the firm's tax avoidance behavior.

The costs and benefits associated with tax avoidance create a tension around the question of how the market perceives news about firms' actively avoiding tax (e.g., Desai and Dharmapala, 2009; Desai and Hines, 2002; Hanlon and Slemrod, 2009). On one hand, one might expect a positive market reaction if investors recognize and reward firms' effort to maximize shareholders' value through reduction of cash tax payments. Alternatively, the market might react negatively if investors anticipate additional costs arising from future disallowances and penalties by the tax authorities, concerns about shareholder's wealth diversion as well as reputational and political costs.

Hanlon and Slemrod (2009) examine news regarding a firm's use of "off-the-shelf" tax shelter strategies promoted by investment banks, accounting and law firms and exploit the "loop-holes" of the tax code. Because of the exploitative nature of these tax strategies, the firms that take advantage of these shelters prefer to keep their plans undisclosed to tax authorities and in so doing play the "audit lottery." There is a non-zero probability of these tax shelters being detected and, once discovered by the tax authority, a high probability that the tax benefits will be disallowed and significant penalties imposed. The tax shelters mentioned in their study are those that faced intense controversy at some point in the past. Many of the firms involved ultimately owed the IRS a large amount of taxes (Wilson, 2009). In addition, almost all of the tax shelters mentioned in their study are now included in the IRS's list of recognized abusive ("listed") transactions.⁴

⁴ For the full list, see <https://www.irs.gov/Businesses/Corporations/Listed-Transactions>

Hanlon and Slemrod's (2009) findings—the negative market reaction to tax avoidance news—can perhaps only be generalized to “stealth” tax avoidance strategies such as tax shelters. Stealth, in this context, means the firms carrying out the arrangement do so without actively seeking consent from the tax authority. The undisclosed nature of these tax shelters brings some level of heightened risk to firms regarding the ultimate success of the arrangement and the size of the tax benefit to be disputed. Once a tax shelter is detected, the firm in question likely would experience increased costs from tax audit and litigation along with potential additional tax penalties and charges. It is therefore not surprising that markets reacted negatively to news about these firms' involvement in tax shelter activities.

By providing a unique setting of new information about how firms use “stealth” advance tax rulings to reduce tax risk associated with tax avoidance strategies, the LuxLeaks phenomenon offers an opportunity to revisit Hanlon and Slemrod (2009). The leaked documents include more than 500 documents detailing confidential tax rulings between wealthy individuals, multinational corporations and the Luxembourg tax authority. In these rulings, firms sought assurance from the Luxembourg tax authority, in advance, about the future tax liability associated with their tax arrangements. The legal and binding nature of the tax rulings along with Luxembourg's favorable tax law environment significantly reduced the amount of risk associated with tax avoidance activities carried out by these firms.

Recently, empirical research has begun to investigate the role of tax risk as described above (e.g., Dyreng *et al.*, 2016a; Guenther *et al.*, 2016; Neuman *et al.*, 2016). There are two concurrent streams of research. The first stream examines the association between tax risk or tax uncertainty and tax avoidance. The second stream investigates the conceptual link that tax risk contributes to both operational uncertainty and overall firm risk. Regarding the first stream, there

are a few studies that document a positive association between tax avoidance based on tax outcomes (measured using cash effective tax rate, CETR) and tax risk (measured using either a firm's assessment of risk (i.e., unrecognized tax benefits) or practitioner-based risk assessment procedures) (e.g., Dyreng *et al.*, 2016a; Neuman *et al.*, 2016). Dyreng *et al.* (2016a) find that, on average, firms with higher tax risk pay less corporate taxes, suggesting a positive return in terms of cash tax savings for engagement in risky tax strategies. However, Dyreng *et al.* (2016a) find that the tax risk is driven mainly by firms' use of tax havens and intangible-related transfer pricing strategies, but they do not find that general tax avoidance leads to increased tax uncertainty (risk).

The second stream of literature finds evidence that supports the notion that tax risk contributes to firm operational uncertainty and overall firm risk (e.g., Guenther *et al.*, 2016; Hutchens and Rego, 2015). These studies use a variety of proxies for tax risk (total UTBs, UTB additions, discretionary book-tax differences and CETR volatility) and find a positive association between tax risk and several market-based measures of firm risks (e.g., Guenther *et al.*, 2016; Hutchens and Rego, 2015). Neuman *et al.* (2016) also document a positive association between their practitioner-based measure of tax risk and a firm's operational uncertainty (proxied by volatility of reported taxes, sales, and earnings).

There is, however, relatively little prior research investigating the impact of tax risk on investors' valuation of tax avoidance. If tax avoidance imposes some level of risk on the firm, one would expect investors to discount for strategies that increase tax risk and reward for steps taken by the firm to reduce tax risk. Hanlon and Slemrod (2009) discuss tax risk in their analysis of the costs and benefit of tax aggressiveness; however they do not address whether the market incorporates tax risk into firm's valuation.

To the best of our knowledge, Drake *et al.* (2017) and Bauer and Klassen (2016) are the first to empirically explore the association between tax risk and firm value. Drake *et al.* (2017) examine the relation between the tax risk and firm value along the full continuum of tax avoidance (proxied by cash ETRs), while the later study examines extreme negative-tail of the tax risk distribution – tax loss events. Using Tobin’s Q as a measure of firm value, Drake *et al.* (2017) observe that investors positively value tax avoidance but negatively value tax risk, as proxied by the cash ETRs volatility. The authors conclude that tax risk moderates the positive valuation of tax avoidance. Bauer and Klassen (2016) examine tax loss events in which a firm incurs an unfavorable tax settlement with a tax authority. They document a negative market response to the tax loss event as well as the period leading up to the event. Their study provides further evidence that the market requires higher returns to compensate for the higher predicted downside tax risk.

We use the LuxLeaks event to investigate how the market values firms’ cross-border tax avoidance through advanced tax rulings, following the approach used in Hanlon and Slemrod (2009). The legal and binding nature of these tax rulings provides firms with the utmost certainty about the arrangement, making the news related to firms’ use of tax rulings different from other tax-risk related news examined in prior literature (e.g., tax shelter participation or the event of unfavorable tax settlement with tax authorities).

In the next subsection, we discuss in further detail how an advanced tax ruling (ATR) differs from traditional tax shelters in providing firms with more assurance over their tax affairs as well as the unique features of Luxembourg’s ATRs that make it a unique setting to investigate our research question.

2.2 Tax avoidance and advanced tax rulings

Different tax avoidance strategies impose different levels of tax risk to the firm, depending on how supportable the tax authority finds the arrangements. Before carrying out a tax strategy, firms can obtain, in advance, a determination or assessment from the relevant tax authority involved to offer more certainty. Advanced tax rulings provide firms with a level of assurance of the legitimacy of their tax arrangements. These rulings, in turn, lessen the probability of potential disallowances, penalties, and lawsuits by the tax authorities.

Government-provided advanced tax rulings is a common practice in countries with mature income tax systems, such as those of the U.S., U.K., Canada, Australia, and other European countries. The complexities of these countries' income tax systems, as well as the potential for high litigation costs, create a demand from firms for more certainty regarding their tax obligation. However, each country has considerable independence in establishing the terms and the procedures to obtain and use an ATR.⁵ Discretion in tax ruling policies has led countries to compete in attracting firms to their respective jurisdictions to maximize their own tax revenue (Givati, 2009).

Alarie, Datt, Sawyer, and Weeks (2014) provide a high-level comparison of the main differences in ATR practices between the U.S., U.K., Australia, Canada, and New Zealand. Romano (2002) and Brooks, Evans, Freedman, and Krever (2011) provide a similar comparison among several European countries. From these three papers, there are four primary differences between ATR regimes: (1) the availability of public and/or private rulings; (2) whether the ATR is legal and binding; (3) whether the granted ATRs are made publicly available; and (4) the costs and length of the review and approval process. These four factors also affect firms' initial

⁵ The Base Erosion and Profit Shifting (BEPS) initiative includes a goal to create a common approach to tax rulings among the G20 countries.

decision whether to pursue an ATR. Obtaining an ATR helps reduce firms' tax uncertainty, but the degree to which ATRs reduce tax risk depends on the policies of the particular country involved.

Currently, among tax jurisdictions, Luxembourg (along with Ireland and the Netherlands) appears to have one of the most generous and flexible policies, attracting trillions of dollars of investment flows from multinationals worldwide. Luxembourg's financial accounts at the end of the second quarter 2015, show the country's investment funds and financial firms hold about €7.7 trillion in assets.⁶ According to the ICIJ, hundreds, possibly thousands, of firms have used similar arrangements as described in the leaked documents to reduce their tax burden from the country's statutory rate to almost nothing. KPMG LLP describes the tax environment in one of the brochures to their clients as follows:

“Luxembourg's favourable tax legislations as well as its extensive tax treaty network made the country one of the preferred locations for holding and financing activities. Luxembourg provides for a large choice of vehicles and instruments to suit the profiles of the investors, PE Houses, management and targets: (i) semi-regulated vehicles for fund raising and (ii) unregulated holding companies generally used for structuring the investments (KPMG, 2011, p. 1).”

The tax ruling practice in Luxembourg fits in well with this description. Luxembourg tax authorities are willing to issue private rulings to confirm all tax matters with the filing firm (Romano, 2002). The ruling can cover both questions of fact and law. The rulings cover five years and are binding for the Luxembourg tax authority but not for the firm. Luxembourg also has no application fees for ATRs and all tax rulings are confidential (i.e., not made publicly available). The details of the leaked documents show the head of the Luxembourg tax office met with firms to discuss the facts of the arrangements prior to signing the rulings, which usually

⁶ http://www.bcl.lu/en/statistics/series/05_real_economy/index.html

takes place the same day as the submission of the proposal. The format of the confirmation letter by the Luxembourg tax authority is as follow:

“Dear Sir,

Further to your letter dated XXX relating to the transactions that the group XXX would like to conduct, I find that contents of said letter to be in compliance with current tax legislation and administrative practice.

It is understood that my above confirmation may only be used within the framework of the transactions contemplated by the abovementioned letter and that the principles described in your letter shall not apply ipso facto to other situations.

Le préposé du bureau d'imposition Sociétés 6
Marius Kohl”

These attributes have become top selling points among tax advisors to attract multinationals to Luxembourg and structure their tax avoidance strategies around Luxembourg tax law (e.g., Deloitte, 2013; KPMG, 2011; Van Campen Liem, 2013). With these features, Luxembourg’s tax rulings aim to provide firms with the highest level of certainty (relative to tax rulings available in other countries) regarding the tax treatment of income recognized in Luxembourg’s subsidiaries of the group. Despite the very favorable terms offered by Luxembourg, this practice has prevailed for years and has not been viewed as being in conflict with European law.⁷ The Luxembourg government argues that its ATRs are in compliance with national and international law as well as with the applicable tax treaties. The legality of these rulings has largely gone unchallenged, but recently Luxembourg (and other EU countries viewed as tax havens, e.g., The Netherlands and Ireland) faces increased international pressures to revise its tax practices.

⁷ In general, favorable tax rulings do not conflict with European law, provided all taxpayers in a similar situation are treated equally.

As an example of recent increased scrutiny on tax ruling practices, since March 2014, the European Commission has opened inquiries into the ATRs given to several multinational corporations operating within the European Union (EU). These include Amazon, Fiat Chrysler, Apple, and Starbucks. The first two firms obtained favorable rulings from Luxembourg, while the latter two obtained favorable rulings from Ireland and the Netherlands. Because these countries have the autonomy to provide tax rulings and set their own tax rates, firms' tax strategies were structured to be in line with the specific tax law of each country. However, in an effort to crack down on selective "sweetheart deals" given by some member states to specific companies, the European Commission is pursuing the inquiries from the perspective that these rulings violate the EU's state aid rules.⁸ The state aid rules prohibit a member state from providing a competitive advantage to a select entity or sub-group.

The final outcome of the state aid investigations is yet to be determined. The Commission released the first report on these inquiries on 21 October 2015 and held that ATRs given to Fiat Chrysler and Starbucks violate state aid rules. Luxembourg and the Netherlands were ordered to recover €20 - €30 million from these firms (European Commission, 2015a). Immediately after the release of the report, both firms and the governments of Luxembourg and the Netherlands expressed their disagreement with the findings and the firms stated they would appeal against the decision (Fairless, 2015). More recently, on August 30, 2016, the Commission issued the final report on the 2014 inquiry into Apple. It concluded that Ireland granted undue tax benefits of up to €13 billion to Apple, and must immediately recover this illegal state aid. Ireland and Apple also are planning to appeal this decision. Meanwhile, the Commission's findings, as well as the magnitude of the estimated illegal state aids, especially in the case of Apple, has set off alarm

⁸ For more information about State Aid Control, see http://ec.europa.eu/competition/state_aid/overview/index_en.html

bells around the world. The U.S. Department of Treasury published a white paper on August 24, 2016, detailing its concerns regarding the Commission's approach and findings to these state aid investigations and their severe implications for the U.S.

Although the Commission's ongoing state aid investigation on member countries' tax ruling practices is relevant to our study, it is worth noting that the Commission has acknowledged that tax rulings are not *per se* problematic under EU state aid rules. They are focused on tax rulings that provide selective advantages to specific firms or groups of firms (Commission, 2014). At a recent news conference at the EU's office in Washington D.C., the European Commissioner for Competition, Margrethe Vestager, divulged that the Commission has reviewed the tax rulings obtained through the LuxLeaks disclosure and concluded that the majority of them were consistent with state aid rules and require no further action (Parker, 2016).

2.3 The Luxembourg Tax Leaks

The documents from the Luxembourg leaks represent an unprecedented source of insight into tax avoidance schemes among multinational corporations. On November 5, 2014, the International Consortium of Investigative Journalists (ICIJ) released more than 500 documents detailing private tax rulings between individuals, multinational firms and the Luxembourg tax authority. ICIJ released a second batch of documents on December 9, 2014. There are 353 firms named in the two batches of documents. Most of the tax rulings involve arrangements where the firm established subsidiaries in Luxembourg, reportedly to act as the treasury or finance function for the group. However, the ICIJ claims the subsidiaries tend to have little real economic substance and the purpose of the structure is to shift profits from other tax jurisdictions into Luxembourg.

The two leaks were widely covered in the press and media and public reaction were decidedly negative in both the U.S. and Europe. Major newspapers ran a series of editorials based on the content of these documents (e.g., The Wall Street Journal, Reuters, Financial Times, and The Guardian). Politicians from countries such as Germany, France, and the United Kingdom made critical remarks in public and proposed various measures to prevent the kind of arrangements now revealed. The U.K., for instance, passed new legislation on December 10, 2014 aimed at taxing multinational firms on profits that have been deemed “artificially diverted” to tax havens (HMRC, 2014). The former Prime Minister of Luxembourg, who was integral in the issuance of the advance tax rulings, faced a no-confidence vote as the President of the European Commission. In response to criticisms, the current Prime Minister of Luxembourg acknowledged that the leak is a “game changer” in the way Europe will regulate tax rulings. On March 18, 2015, the European Commission proposed a directive for greater transparency on tax rulings among member countries (European Commission, 2015b).

3. Tax Aggressiveness, Tax Risk, and Firm Value

The unique features of the Luxembourg advanced tax rulings distinguish them from tax shelters studied in Hanlon and Slemrod (2009). The binding and legal status of the ATR provides firms with a high level of certainty regarding their tax arrangements. By seeking an advanced tax ruling on the treatment of income generated from specific arrangements, the firms effectively reduce the risk of any unexpected tax charges and penalty imposed on the firms. On the other hand, the negative media publicity, the increase scrutiny, and backlash from EU Commission and other tax jurisdictions from the revelation of the ATRs could result in higher future tax costs. If the expected benefits of tax avoidance using an ATR more than offset the potential costs, then the market would react positively towards the firms exposed in the LuxLeaks; and vice versa.

Hanlon and Slemrod (2009) develop a straightforward model of the market reaction to news of tax aggressiveness. For brevity, we discuss the main inferences from their model and extend its implications to the LuxLeaks setting. In their model, market reaction to the news of tax shelter involvement (*tax aggressiveness*) is a function of five factors. The first factor is investors' concerns about any reduction in expected income due to consumer backlash from what may be perceived as un-civic behavior. The second factor is the decline in expected after-tax income from an increased perception of income diversion by management. The third factor is the change in expected income from a change in the perceived value of tax sheltering (S); this change will be positive (negative) if the market prior perception was that the previous level of tax sheltering was less (greater) than optimal (S^*). The fourth factor is investors' change in the perception of the effectiveness of the tax authority in detecting and penalizing future tax sheltering activity, the authors predict this change to be negative. The final factor is the difference between the *realized* losses from the detection of the tax shelter and investors' prior probability of detection. Within the context of the LuxLeaks setting, we focus our discussion on the last three factors. What is different about our setting in comparison to Hanlon and Slemrod (2009) is that with the LuxLeaks, the news about firms' involvement in aggressive tax avoidance is coupled with the revelation of firms' use of advance tax rulings to reduce tax risk. Theoretical models on firms' decision to seek a tax ruling predict that in many cases tax aggressive firms would be better off playing the "audit lottery" rather than attract the scrutiny of the tax authorities (Givati, 2009). Therefore, even though investors might have been able to infer the level of firms' tax aggressiveness from information disclosed in the financial statements, they might not have expected the firms to have obtained advanced tax rulings. The news about firms' use of advanced tax rulings may increase investors' perceived value of the tax arrangements (the third factor)

because ATRs reduce the tax risk associated with those arrangements. Furthermore, the fact that the Luxembourg tax authority was not only aware of the tax arrangements, but was also complicit in those arrangements may also lower investors' perceived tax risk of future penalties (the fourth factor).

At the time of the LuxLeaks, there was no report of any action by the Luxembourg government or any other tax authority to penalize the firms for their use of these tax arrangements. Investors may revise their prior probability of losses downward (upward) if they expect the ATRs to withstand scrutiny (not be upheld). This adjustment potentially affects the fifth factor in Hanlon and Slemrod's (2009) model. In summary, if investors perceive the reduction in tax risks outweighs the potential negative effects of consumer backlash and income diversion, then we may observe a net positive reaction to the LuxLeaks.

In our initial analysis, we perform market reaction tests on the full sample of 82 U.S. listed firms and on a subsample of 49 U.S. firms on their respective leaked dates. Next, we conduct four cross-sectional analyses on a sub-sample of 49 U.S. headquartered firms to investigate the partial relation between firm characteristics and the stock price reaction to the LuxLeaks. We limit the cross-sectional analysis to the group of U.S. based firms to obtain a more homogenous group and reduce the effect of omitted variables. For example, the market reaction to the LuxLeaks could potentially vary based on tax jurisdiction (and the enforcement practices of the tax authority) where the firm is headquartered (or has a substantial presence). In addition, some of the proxies used in the cross-sectional test are only available for U.S. firms.

Following Hanlon and Slemrod (2009), the first cross-sectional analysis examines the impact on the change in investors' perception of the firm's tax aggressiveness. We partition the subsample based on investor's prior belief about firm's tax aggressiveness, using two-year cash

effective tax rate (CETR3yr).⁹ We expect the higher the CETR3yr the less likely the market would perceive the firm ex-ante to be sufficiently tax aggressive, and the more likely the market is to take the LuxLeaks news as a positive signal the firm is trying to optimize after-tax income. As a result, we expect the market reaction to be more positive (less negative) for firms with CETR3yr above the median.

Second, we investigate the cross-sectional relation between firm's corporate governance and market reaction to the LuxLeaks. Prior research provides evidence the effect of tax avoidance on firm value is a function of firm governance, as characterized by the agency problem between shareholders and managers (Desai and Dharmapala, 2009). Whereas investors value tax savings, the potential benefit might be lower in poorly governed firms because of higher opportunities for managerial wealth diversion. Hanlon and Slemrod (2009) test cross-sectional variation using entrenchment scores, based on variations in shareholders' rights, developed in Bebchuk and Cohen (2005). However, these measures are not available for fiscal periods after 2006.

Instead, we use three alternative proxies for firm governance. First, we replace entrenchment scores with an alternative measure of governance used in Desai and Dharmapala (2009) - the fraction of firm's shares owned by institutional investors (IOFrac). The basic intuition behind the proxy is that institutional investors have greater incentives and capacity to monitor managerial performance. Therefore, agency problems in a firm can be better monitored/mitigated through higher levels of institutional ownership. If the LuxLeaks provide new information about a firm's tax aggressiveness and investors believe well-governed firms are better able to retain the benefits of tax aggressiveness, then firms with a higher fraction of

⁹ Appendix A provides the definition for all variables used in the paper.

institutional ownership will experience a more positive (less negative) market reaction.

Therefore, we expect a more positive (less negative) market reaction towards the group of firms with above median IOFrac.

For the second and third proxies, we follow Desai and Dharmapala (2006) and use the fraction of equity-based compensation in managers' total compensation to measure high-powered incentives. The intuition behind the use of these proxies is that managers have less incentive to extract rent when holding a large percentage of equity-based assets. The two proxies used in Desai and Dharmapala (2006) are STKMIXFGRANT and STKMIX. The earlier proxy only includes the fair value of stock options awarded in the nominator, whereas the latter proxy additionally includes the fair value of the restricted stock holdings. If the LuxLeaks provide new information about a firm's tax aggressiveness, and investors believe tax aggressiveness facilitates rent extraction by opportunistic managers, then firms with greater shareholder-manager alignment will experience a more positive (less negative) market reaction. Therefore, we expect a more positive (or less negative) market reaction for firms with above median STKMIXFGRANT and STKMIX.

Third, we investigate the cross-sectional relation between market reaction and firms' political costs. Following prior research, we partition our sample based on firm's total assets (SIZE), measured at the beginning of the fiscal year (e.g., Hanlon, Mills, and Slemrod, 2007; Karpoff, Lee, and Vondracik, 1999; Zimmerman, 1983). If investors believe that the LuxLeaks could lead to other governments taking retaliatory actions (e.g., the artificially diverted profits legislation in the U.K.), firms facing higher political costs would likely experience a less positive (more negative) market reactions. Therefore, we expect the market reaction to be more positive (less negative) for firms below the median in SIZE.

Fourth, we investigate the cross-sectional impact of reputational costs on market reaction. We proxy for reputation costs using the firm's aggregated ratings from the MSCI KLD database, which is available in WRDS. This proxy commonly is used in extant research to measure firms' corporate social responsibility reputation (e.g., Cho, Guidry, Hageman, and Patten, 2012; Hoi, Wu, and Zhang, 2013; Watson, 2015).¹⁰ The KLD rating is well-correlated with other measures of a firm's CSR and overall reputation, including the corporate reputation rating by Fortune magazine (Sharfman, 1996). In addition, the coverage by this database is large enough to avoid losing a significant amount of observations. If the LuxLeaks provide new information about a firm's tax aggressive profile to the public, firms with higher reputations are likely to experience more negative (or less positive) reaction than those with lower reputation. Therefore, we expect the market reaction toward the group with positive CSR scores to be more negative (or less positive) than for firms with neutral or negative CSR scores.

Finally, we perform a multivariate regression to ascertain which of the four firm characteristics has the most significant impact on the cross-sectional variation in stock price reactions. We regress firm-specific cumulative abnormal returns on the firm characteristics as described above. The model is a basic linear regression, as follows:

$$CAR_i = \beta_0 + \beta_1 CETR3yr_i + \beta_2 Governance_i + \beta_3 Size_i + \beta_4 netCSR_i + \varepsilon_i$$

Based on our expectations above, with regards to how the four factors may explain variation in abnormal returns, we expect β_1 and β_2 to be positive and β_3 and β_4 to be negative.

¹⁰ Hanlon and Slemrod (2009) partition their sample based on retail (vs. non-retail) firms for their cross-sectional test. However, the number of retail companies in our sample is too small (3 firms) to provide statistical power for the same approach.

4. Sample Selection and Research Methodology

4.1 Sample selection

The ICIJ released the leaked documents in two batches, the first on November 5, 2014 and the second on December 9, 2014. The documents detailed 577 private tax rulings covering 353 firms and individuals. To obtain the financial data on the firms, we crossmatch each firm's name to its ticker symbol, PERMNO and CUSIP number available on the CRSP and Compustat databases. Additionally, we cross-check the firm's ticker with the Bloomberg database to ensure the matched firms are listed on a U.S. stock. Where the firm was acquired or merged prior to the LuxLeaks, we use the data for the current parent instead.¹¹

We are able to identify 91 unique public firms with listings on a U.S. stock exchange. We exclude six observations from the sample due to the lack of stock price data in 2014, primarily due to delisting or bankruptcy. We further exclude firms where there is no evidence of an advanced tax ruling with the Luxembourg tax authority, e.g., documents related to Apple and Amazon only disclose tax returns. The final sample consists of 82 firms; 78 firms disclosed on November 5th and 5 firms on December 9th, with one overlapping firm.¹² Table 1 below presents a summary of the sample selection process. Table 2 provides additional information regarding the location of the headquarters of the firms. Most firms in the sample are headquartered in the United States (59.8%), followed by the United Kingdom (11.0%), and Ireland (7.3%). We create a sub-sample consisting only of 49 U.S. based firms for the purpose of our cross-sectional analyses.

[TABLE 1 about here]

¹¹ In our full sample, there are 12 firms which were either acquired or merged with another firm after signing an ATR with Luxembourg, 6 of the 12 firms are U.S. headquartered firms.

¹² In our analysis, we only include the overlapping firm in the first batch of leaked documents on November 5th.

[TABLE 2 about here]

4.2 Research methodology

We use an event-study methodology to examine the market reaction to the leaks of the documents. Following prior event studies, we examine the three-day window centered on the respective release dates. The day before the event is included to capture any effect of the information being available to the market before the leak, and the day after is included to allow enough time for the market to fully react. The length of the estimation period is 255 trading days, ending 47 trading days prior to the event date. For sensitivity analysis, we also report the abnormal returns on the event date

Consistent with Hanlon and Slemrod (2009), we use the market model based on a value-weighted index to estimate the abnormal returns for each day and firm. The market model is appropriate to control for the effects of market fluctuation. The index is a weighted-average index based on all stocks listed on the NYSE, AMEX and NASDAQ exchanges, the prices of which are available on the CRSP database. Daily abnormal return for each firm is the difference between the actual return (including dividends) and the expected return as derived from the market model.

$$AR_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt})$$

where:

R_{it} = return for firms i on day t

$\hat{\alpha}_i$ and $\hat{\beta}_i$ are ordinary least squares estimates of α_i and β_i from the following regression

$$R_{it} = \alpha_i + \beta_i R_{mt} + u_{it}$$

R_{mt} = CRSP value-weighted index on day t

Once daily abnormal returns are obtained, mean cumulative market reaction is defined as:

$$CAAR = \frac{1}{N} \sum_{i=1}^N CAR_i; \text{ with } CAR_i = \sum_{t=0}^T AR_{it}$$

We report four statistical tests of significance: Patell test, Generalized Sign test, Standardized Cross-sectional test, and Jackknife test for both the main and cross-sectional analysis. The p -values from the test for difference between the mean CAR values of the sub-groups in the cross-sectional analyses are also provided. In the Patell test, each security-event abnormal return is standardized before the test statistic is calculated. In addition, under cross-sectional independence assumption, the Z-statistics of the Patell test has a standard normal distribution (Patell, 1976). The generalized sign test examines the null hypothesis that the fraction of positive returns is the same proportion of positive CAR from the estimation period (Cowan, 1992).

The Standardized Cross-sectional test is an extension of the Patell test. It is designed to compensate for possible variance increase on an event date by incorporating a cross-sectional variance adjustment (Boehmer, Masumeci, and Poulsen, 1991). Under the Patell test, each firm's test statistics are adjusted for serial correlation in the returns following Mikkelsen and Partch (1988). The Jackknife test is a resampling method, designed to estimate bias in sample statistics (Giaccotto and Sfiridis, 1996; Quenouille, 1949). An estimate for the bias and variance of the statistic is calculated from the set of statistical estimates, which are systematically recomputed by leaving out one or more observations at a time from the sample set. Given our small sample size, we report all four statistical tests to provide robust evidence our results.

5. Results

5.1 Descriptive statistics

Table 3 presents simple descriptive statistics on the variables used in our paper. CETR3yr is measured as firm's average cash effective tax rate over the two fiscal years prior to the leaks (2012 and 2013). We obtain CETR3yr by summing cash taxes paid over the two-year period and dividing by pretax income (excluding special items) summed over the same period. CETR3yr are truncated at 0 and 1, following prior research (e.g., Hanlon and Slemrod, 2009). The average CETR3yr for the subsample of U.S. headquartered firms is 24.8%, which is below the average CETR for U.S. multinational firms of 27.2% for 2012 calculated in (Dyreng, Hanlon, Maydew, and Thornock, 2016; Markle and Shackelford, 2011). This suggests that the U.S. multinational firms listed in the LuxLeaks are relatively more tax aggressive (or have greater opportunity) than the average U.S. multinational firm.

[TABLE 3 about here]

For purposes of the second cross-sectional analysis, we first use the fraction of the firm's outstanding shares at the beginning of fiscal year 2014 that was held by institutional investors (IOFrac) as a proxy for corporate governance (Desai and Dharmapala, 2009). The relevant data to calculate IOFrac are obtained from Thomson Reuters Institutional (13f) Holdings database in WRDS. The database includes quarterly information from Schedule 13F filings with the SEC by large institutional investors. The fraction of a firm's share owned by institutional investors is the weighted average for the fiscal year 2013. The average institutional ownership fraction for U.S. based firms is 76.8%.

The two proxies for equity-based compensation (STKMIX and STKMIXFGRANT) relate to high-powered incentives (Desai and Dharmapala, 2006). They are the aggregated

equity-based compensation held by top executives in fiscal year 2013. STKMIXFGRANT only includes the fair value of stock options awarded in the nominator, whereas the STKMIX also includes the fair value of the restricted stock holdings. The relevant data to calculate these measures are obtained from the ExecuComp database. The mean STKMIXFGRANT (STKMIX) is 31.4% (52.05%).

The third cross-sectional analysis investigates market reaction varies by firm's political costs. We measure political costs using total assets (SIZE) as at the beginning of fiscal year 2014. The average total assets for the U.S. headquartered firms is \$200.3 billion.

Finally, we measure reputation costs using the aggregated MSCI KLD score. KLD scores are ratings developed by KLD Research and Analytics, Inc. and measure a firm's corporate social responsibility activities. The KLD metric is extensively used in accounting research literature (e.g., Hoi *et al.*, 2013; Kim, Park, and Wier, 2012; Watson, 2015). The database contains firm-year rating on 126 subcategories (*strengths* and *concerns*) for corporate activities in the seven main areas: corporate governance, employee relations, environment, community, diversity, human rights, and product. The KLD database also provides rating on additional industry-specific categories, including: alcohol, firearms, gambling, military, nuclear, and tobacco. We do not include these industry-specific categories in computing the overall CSR score for each firm.

For consistency, we use scores for the year 2013, and the KLD data are available for 44 U.S.-based firms. In the last cross-sectional analysis, we partition the sample into three sub-groups, (1) *Negative netCSR* where aggregated scores for *concerns* exceed *strengths*, (2) *Neutral netCSR* where the aggregated scores for *strengths* equals *concerns*, and (3) *Positive netCSR* where aggregated scores for *strengths* exceed *concerns*.

5.2 Market Reaction

Table 4 reports the mean 3-day cumulative abnormal return (CAR) for the group of U.S. listed firms and the subsample of U.S. headquartered firms. Panel A reports the results for all 82 firms on their perspective leaked dates (November 5, 2014 and December 9, 2014). Panel B reports the results for the U.S. based firms only (49 firms).

[TABLE 4 about here]

We observe a positive and statistically significant market reaction (mean 3-day CAR = 0.43%, p -value < 0.01) on event dates among the 82 U.S. listed firms that were exposed in the LuxLeaks (see Table 4 - Panel A). The market reaction for the subsample of 49 U.S. headquartered firms is larger, with mean 3-day CAR of 1.24%¹³ (see Table 4 - Panel B). The *positive* market reaction is consistent with our argument that investors value more positively (less negatively) tax arrangements where management takes actions to reduce the associated tax risk, evidenced by obtaining advanced tax rulings.

We extend the event windows to +/- 2 and +/- 3 days around the leaked dates and find that the positive stock price reactions remain statistically significant. In untabulated analysis, we also estimate the cumulative abnormal returns for both groups of firms using three common alternative models: market-adjusted returns model, Fama-French three factor model, and Fama-French momentum model. The magnitude of the market reactions as well as the significance of the tests are similar to the results reported using the market model.

¹³ As previously mentioned, the based comparison for the abnormal returns calculation is the market's weighted-average index of all stocks listed on the NYSE, AMEX and NASDAQ exchanges.

The direction of the market reaction to the LuxLeaks is opposite of that observed for news of tax shelter participation in Hanlon and Slemrod (2009); the mean 3-day CAR in their study was -0.53%. We interpret the contrasting results as evidence that the level of tax risk associated with a particular type of tax avoidance strategies is relevant to investors' valuation of the potential cost and benefits of the tax strategy.

This finding might seem counter-intuitive at first: why would the firms choose not to disclose this information if the investors view it as beneficial to the firm's value? Dye (1986)'s theory on disclosures of proprietary and nonproprietary information provides us with a sensible explanation to this question. One of the conclusions drawn from Dye's model (1986) is that when disclosure of nonproprietary information partially reveals proprietary information about the firm, disclosure of good news may increase firm's expected value while, at the same time, worsening this prospect by revelation of proprietary data. A few examples of such a drawback include the potential for audits by tax authorities in other jurisdictions where the firm also operates, increased public scrutiny, and the possibility of competitors adopting a similar strategy. Therefore, a value-maximizing manager may choose not to disclose even nonproprietary data, such as the existence of tax rulings between their firm and the Luxembourg government, unless the effect of the disclosure on the firm's value is sufficiently large.

5.3 Cross-Sectional Analysis

Table 5 reports the cross-sectional analyses of the market reaction. In Panel A, we divide the observations into those with CETR3yr above the median and those with observations below the median. Firms with a CETR3yr above the median have average 3-day CAR of 2.15%, which is significantly different from zero at conventional levels. The firms with a CETR3yr below the median value have average CAR of 0.87%, which is also significantly different from zero. The

difference in the mean CARs of the two groups is not statistically significant, potentially due to the small numbers of observations when the sample is split into two groups. We discuss these findings further in our multivariate test below.

[TABLE 5 about here]

Panel B of Table 5 reports results for the sample divided into well-governed and poorly-governed firms, based on three alternative metrics for governance. The sample is first partitioned at the median based on the fraction of the firm's shares held by institutional investors (IOFrac). We observe that the market reacts more positively to the group of well-governed firms (IOFrac above the median, 3-day CAR = 2.02%), compared with the group of poorly-governed firms, (IOFrac below the median, 3-day CAR = 0.49%). The mean CARs for both groups are significantly different from zero. The difference in market reactions between these two groups is 1.53%, and is marginally significant (p -value = 0.099). Using STKMIXFGRANT to partition the sample, we observe a similar pattern. The average CAR of the above-median group is 2.54%, whereas the average CAR for the below-median group is 0.24%. The difference in the mean CARs of the two groups is statistically significant at the conventional level (p -value = 0.039).

The above results are consistent with Desai and Dharmapala's (2009) findings that the effect of tax avoidance on firm's value is a function of firm governance. When using STKMIX to partition the sample, however, the results contradict our expectation. The average CAR of the above-median group (0.10%) is not significantly different from zero and is smaller than the below-median group (2.68%). The difference between the mean CARs of the two groups is statistically significant, p -value = 0.024. Hanlon and Slemrod (2009) also find similar mixed

results in their cross-sectional analysis for governance. Similar to other measures of corporate governance, the three proxies chosen capture different dimensions of governance (Larcker, Richardson, and Tuna, 2007). Ex-post, we offer one potential rationale for the mixed results. If a higher fraction of restricted stock holdings in managers' compensation represents shareholders' focus on long-term rather than near-term performance, then we interpret the results as dedicated shareholders reacting less positive to the leaks than transient investors (Bushee 2001).

Panel C of Table 5 shows the results for the sample divided into two groups according to firm size (total assets at the beginning of fiscal year 2014). We observe the average 3-day CAR for the group below the median in SIZE is 1.89%, while the average 3-day CAR observed for the group above the median is 0.57%. However, the mean 3-day CARs are not statistically different from each other (p -value = 0.135). We are unable to conclude whether a firm's political costs affect investor's valuation of tax avoidance in this setting. Apart from the small sample size, one potential factor for the lack of significant statistical difference is measurement error in using total assets as a proxy for political costs.

In untabulated results, we test the sensitivity of the market reaction to the type of business culture present in the country in which the firm is headquartered, i.e., stakeholder-orientated or shareholder-orientated. The business culture literature posits that a stakeholder-orientated culture tends to view a broad spectrum of stakeholders as having a vested interest in the corporate activities, while shareholder-orientated culture tends to view companies as instruments to create shareholder value (Dhaliwal, Radhakrishnan, Tsang, and Yang, 2012; Simnett, Vanstraelen, and Chua, 2009). This theory suggests that the market reaction to the leaks should be stronger for firms with headquarters located in a shareholder-orientated country. Our results support this argument. We observe a positive (3-day CAR= 0.69%) and significantly higher (p -value =

0.038) market reaction for the sub-group of firms with headquarters located in a shareholder-orientated culture (common law countries) than the negative market reaction (3-day CAR= -1.42%) for the sub-group of firms with headquarter located in a stakeholder-oriented culture (civil law countries).

Panel D of Table 5 shows the result for the sample divided into three groups according to whether the firm has positive, neutral, or negative net CSR scores. Positive netCSR score means the firm has a good reputation of being socially responsible, and vice versa. We find the average CAR for the group with positive netCSR is 1.39%, for the group with neutral netCSR the score is 0.23%, and for the group with negative netCSR the score is 2.32 %. The mean CARs for the three groups suggest some non-linearity in the market reaction. The magnitudes are consistent with our expectation that firms with positive reputation capital will have a less positive market reaction to news of being involved in tax aggressive activity. However, the difference between the mean CAR for the positive netCSR and negative netCSR group is not statistically significant. Hanlon and Slemrod (2009) find retail firms in their sample suffer a more negative market reaction to tax shelter news than non-retail firms, suggesting that consumer/taxpayer backlash is a factor which partially explains the variation in market reaction. Due to a small number of retail firms in our sample, only 3 firms, we choose CSR ratings as an alternative measure.

Table 6 presents the results for the multivariate regressions for the cross-sectional analyses. Again, we focus our analysis on the subsample of U.S. firms. The number of observations varies among the columns based on data availability of the explanatory variables. Across all specifications, the explanatory variables CETR3yr and STKMIXFGRANT appear to be the main factors explaining the variation in market reaction among firms. The coefficients on CETR3yr vary from 4.152 to 5.463 across the regressions, and are all statistically significant at

the 5% level or lower. This finding is consistent with our expectation, as well as with Hanlon and Slemrod's (2009) finding, that the market reacts more positively towards firms perceived to be less tax aggressive based on the relevant information disclosed in the financial statement. We infer that investors perceive the LuxLeaks news as a positive signal about firms' effort to reduce tax risk as well as be tax savvy. The coefficients on STKMIXFGRANT vary between 1.270 and 1.726, and are all statistically significant at the 5% levels. This result provides additional evidence that the market reacts more positively to well-governed firms.

6. Caveats and limitations

There are several caveats and limitations to our study. First, we cannot reliably identify whether prior to the LuxLeaks, investors knew about the firms' existing tax rulings with the Luxembourg tax authority, either through disclosures in the firms' financial statements or other sources. We examine the 10-Ks for the firms in our sample and find no evidence of disclosure of the advance tax rulings with Luxembourg, neither in the year the tax ruling was granted or in the subsequent year. We do observe that the majority (43 out of 49) of the firms in our U.S. based sub-sample disclose having at least one subsidiary in Luxembourg in their 2013 financial statements. However, if the market learned about the tax rulings in advance of the news, then one should not observe a market reaction to the LuxLeaks.

In untabulated analyses, we perform supplementary tests to identify if there are any spillover effects of the market reaction to other multinational firms that investors would reasonably expect to have an advanced tax ruling with Luxembourg. We start with a sample of all U.S. multinational firms that disclose in their Exhibit 21 listing at least one Luxembourg subsidiary during the period 2010-2013 (excluding the firms in our original sample). In preliminary results, we do not observe a significant market reaction for these firms, suggesting

no spillover effect for this group of firms. We further match firms in this group to the 49 U.S. headquartered firms exposed in the LuxLeaks based on size (2013 market capitalization) and industry (Fama-French 12-industry classification). We document a positive and significant spillover effect for the matched firms (3day-CAR = 0.74%). The results suggest that LuxLeaks provide additional information regarding the riskiness of firm tax avoidance not only for the firms that were exposed but also for those which investors reasonably expect to employ similar tax strategies.

Second, our documentation of market reaction to the firms exposed for using advanced tax rulings to avoid taxes only provides limited evidence to the question regarding the impact of tax risk on investor's valuation of tax avoidance. That is because the counterfactual scenario in which the firms using a similar tax strategy without obtaining an ATR is not observable. We infer from the opposite market reaction to the LuxLeaks compared to tax shelter news in Hanlon and Slemrod's (2009) study, that the market values firms' actions to reduce tax risks; e.g., by securing a binding advance tax ruling.

Finally, the use of event- study methodology has its limitations. We cannot rule out the probability that the CARs capture other potential news that was announced during the 3-day window. To partially mitigate this problem, we cross-check with the Bloomberg database for other news announcements during the 3-day window. We identify four U.S. firms with earnings announcements during the 3-day event window. We rerun our analyses, excluding these four firms, our results remain positive (0.75%) and statistically significant (Patell-Z = 3.283; Generalized-sign-Z = 2.823; StdCsect-Z = 2.840; Jackknife-Z = 3.122). Additionally, to exclude the possibility of that increased trading volume drove the observed positive market reaction, we test for abnormal trading volume during the 3-day window around the LuxLeaks. Our results for

both the full sample of 82 LuxLeaks firms and the sub-sample of 49 U.S. based firms do not indicate abnormally high trading volume around the event dates. On the contrary, the results show that the trading volumes are abnormally low, suggesting that investors do not differ substantially in their interpretation of the information contained in the LuxLeaks.

7. Conclusion

Shareholders value cash savings arising from tax avoidance activities when the net benefits exceed the net costs. Prior research, however, discusses little about the impact of tax risk on the costs and benefits of tax aggressiveness. Using the event of the Luxembourg tax leaks, we revisit Hanlon and Slemrod's (2009) study, with an attempt to investigate how the market values a firm's actions to reduce risk related with tax avoidance. We find, on average, a firm's stock price increases on release of the tax leaks, which suggests investors revised downward their perceived risk of the firms' tax aggressiveness upon revelation that these firms had secured advanced tax rulings from the Luxembourg tax authority.

In addition, we find some evidence of cross-sectional variation in the abnormal returns. The stock price increases more positively for firms perceived ex-ante to be less tax aggressive, as proxied by above-median three-year cash ETRs, which suggests the market interprets the news as a positive signal of tax aggressiveness. The reaction seems to be less positive for poorly-governed firms. Both findings are consistent with Hanlon and Slemrod's (2009) hypotheses. However, we do not find enough evidence to support the expectations that firms' political and reputational costs moderate the market reactions to the LuxLeaks news.

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APPENDIX

Appendix A: Variable Definitions

CAR Cumulative Abnormal Return (non-standardized) over a 3-day window centered on the date of the leaks, calculated using market model based on CRSP value-weighted index (with dividends).

$$CAR_i = \sum_{i=0}^T AR_{it}$$

CETR3yr CETR3yr is computed by taking the sum of cash taxes paid over three fiscal years prior to the news of the shelter (FY2011-2013), divided by the sum of worldwide pre-tax book income over the three years prior to the news of the shelter. If the denominator of the ratio is a loss we set the CETR3yr variable to zero.

$$\frac{\sum_{t=1}^N \text{Cash Tax Paid}_{it}}{\sum_{t=1}^N (\text{Pretax Income}_{it} - \text{Special Items}_{it})}$$

SIZE Natural logarithm of total asset at the beginning of FY2014, unless otherwise stated.

$$\log(at)$$

netCSR netCSR is the difference between the aggregated KLD scores in *strengths* and *concerns*. The higher the netCSR score, the better the firm's reputation in corporate social responsibility.

aggregated *strengths* scores in - aggregated *concerns* scores

IOFrac Fraction of total firm's outstanding shares that are owned by institutional investors in FY2013

$$IOFrac_{it} = \sum_{j=1}^M \text{Average fraction of stock held by Institution } j \text{ in year } t$$

STKMIXFGRANT Fair value of stock options granted to executives as a fraction of total compensation in FY2013

$$\frac{STKMIXFGRANT_i}{\sum_j \text{FV of Options Awarded}_{j,i}} = \frac{\sum_j \text{FV of Options Awarded}_{j,i}}{\sum_j \text{FV of Options Awarded}_{j,i} + \sum_j \text{Salary}_{j,i} + \sum_j \text{Bonus}_{j,i}}$$

STKMIX Fair value of stock options and restricted stock holdings to executives as a fraction of total compensation in FY2013

$$\frac{STKMIX_i}{\sum_j \text{FV of Options Awarded}_{j,i} + \sum_j \text{Restricted Stock Holdings}_{j,i}} = \frac{\sum_j \text{FV of Options Awarded}_{j,i} + \sum_j \text{Restricted Stock Holdings}_{j,i}}{\sum_j \text{FV of Options Awarded}_{j,i} + \sum_j \text{Salary}_{j,i} + \sum_j \text{Bonus}_{j,i}}$$

Table 1: Sample selection

	Number of Firms on 5 Nov 2014	Number of Firms on 9 Dec 2014	Overlapping firm(s)	Total Number of Firms
Total number of firms identified through the leaked documents	345	11	(3)	353
Less:				
Non-listed firms	(179)	(3)	-	(182)
Non U.S. listed firms	(80)	(3)	2	(81)
Without a ruling [†]	(2)	-	-	(2)
Firms without CRSP data for stock prices for November 5, 2014 and December 9, 2014	(6)	-		(6)
Number of U.S. listed firms	78	5	(1)	82
# of U.S. headquartered firms	46	4	(1)	49
# of non U.S. headquartered firms	32	1	-	33

*There is one U.S listed firm overlapping between the two batches.

[†] No advanced ruling was leaked for Amazon and Apple, only tax returns.

Table 2: Overview of the Sample

Country	Frequency	Industry	Frequency
Belgium	1	Aircraft, Ships, and Railroad Equipment	1
Bermuda	2	Apparel	2
Brazil	1	Automobiles and Trucks	1
Canada	5	Banking, Insurance, Real Estate, Trading	28
China	1	Beer & Liquor	2
Germany	1	Business Equipment	3
Ireland	6	Business Supplies and Shipping Containers	2
Israel	1	Chemicals	1
Italy	1	Communication	5
Luxembourg	1	Construction and Construction Materials	2
Switzerland	4	Consumer Goods	1
U.K.	9	Electrical Equipment	1
United States	49	Fabricated Products and Machinery	4
		Food Products	1
		Healthcare, Medical Equipment, Pharmaceutical Products	7
		Personal and Business Services	6
		Petroleum and Natural Gas	4
		Precious Metals, Non-Metallic, and Industrial Metal Mining	2
		Printing and Publishing	1
		Retail	3
		Tobacco Products	1
		Transportation	1
		Utilities	1
		Other	2
Total	82	Total	82

Notes: Table 2 provides an overview of the country and industry distribution of the firms in our sample. Country-classification is based on the country in which the firm's headquarter is located. The industry-classification is based on the Fama and French 30 industries.

Table 2A: List of All 82 U.S. Publicly Listed LuxLeak firms

Company Name	Country	Industry	Company Name	Country	Industry
ABBOTT LABORATORIES	USA	Healthcare, Medical Equipment, Pharmaceutical Prod.	INTELSAT SA	LUX	Communication
ACCENTURE PLC	IRL	Personal and Business Services	INTERPUBLIC GROUP OF COMPANIES INC	USA	Personal and Business Services
ACTAVIS PLC	IRL	Healthcare, Medical Equipment, Pharmaceutical Prod.	INTERNATIONAL FLAVORS & FRAGRANCES INC	USA	Chemicals
AMERICAN INTERNATIONAL GROUP	USA	Banking, Insurance, Real Estate, Trading	JAZZ PHARMACEUTICALS PLC	IRL	Healthcare, Medical Equipment, Pharmaceutical Prod.
AMERIPRISE FINANCIAL INC	USA	Banking, Insurance, Real Estate, Trading	JONES LANG LASALLE INC	USA	Banking, Insurance, Real Estate, Trading
ANHEUSER-BUSCH INBEV	BEL	Beer & Liquor	JPMORGAN CHASE & CO	USA	Banking, Insurance, Real Estate, Trading
APOLLO GLOBAL MANAGEMENT LLC	USA	Banking, Insurance, Real Estate, Trading	MATTHEWS INTERNATIONAL CORP	USA	Printing and Publishing
ARCH CAPITAL GROUP LTD	BMU	Banking, Insurance, Real Estate, Trading	MCGRAW HILL FINANCIAL INC (now S&P GLOBAL INC)	USA	Personal and Business Services
AVERY DENNISON CORP	USA	Business Supplies and Shipping Containers	METTLER-TOLEDO INTL INC	USA	Business Equipment
AVIVA PLC	GBR	Banking, Insurance, Real Estate, Trading	MICROSOFT CORP	USA	Personal and Business Services
BALL CORP	USA	Business Supplies and Shipping Containers	MYLAN NV	GBR	Healthcare, Medical Equipment, Pharmaceutical Prod.
BANK OF AMERICA CORP	USA	Banking, Insurance, Real Estate, Trading	NAVISTAR INTERNATIONAL CORP	USA	Automobiles and Trucks
BARCLAYS PLC	GBR	Banking, Insurance, Real Estate, Trading	NORDSON CORP	USA	Fabricated Products and Machinery
BAYTEX ENERGY CORP	CAN	Petroleum and Natural Gas	OAKTREE CAPITAL GROUP LLC	USA	Banking, Insurance, Real Estate, Trading
BERKSHIRE HATHAWAY INC	USA	Everything Else	OFFICE DEPOT INC	USA	Retail
BLACKSTONE GROUP LP	USA	Banking, Insurance, Real Estate, Trading	PEPSICO INC	USA	Beer & Liquor
BANCO BRADESCO SA	BRA	Banking, Insurance, Real Estate, Trading	PROCTER & GAMBLE CO	USA	Consumer Goods
BRITISH AMERICAN TOBACCO PLC	GBR	Tobacco Products	PROLOGIS INC	USA	Banking, Insurance, Real Estate, Trading
BROOKFIELD ASSET MANAGEMENT	CAN	Banking, Insurance, Real Estate, Trading	PRUDENTIAL PLC	GBR	Banking, Insurance, Real Estate, Trading
CARLYLE GROUP LP	USA	Banking, Insurance, Real Estate, Trading	ROWAN COMPANIES PLC	USA	Petroleum and Natural Gas
CATERPILLAR INC	USA	Fabricated Products and Machinery	ROYAL BANK OF CANADA	CAN	Banking, Insurance, Real Estate, Trading
CBRE GROUP INC	USA	Banking, Insurance, Real Estate, Trading	SHIRE PLC	IRL	Healthcare, Medical Equipment, Pharmaceutical Prod.
CHINA PETROLEUM & CHEM CORP	CHN	Retail	STANLEY BLACK & DECKER INC	USA	Fabricated Products and Machinery
CHUBB LTD (now ACE LTD NEW)	CHE	Banking, Insurance, Real Estate, Trading	STAPLES INC	USA	Retail
CIRCOR INTERNATIONAL INC	USA	Construction and Construction Materials	STATE STREET CORP	USA	Banking, Insurance, Real Estate, Trading
CITIGROUP INC	USA	Banking, Insurance, Real Estate, Trading	SYKES ENTERPRISES INC	USA	Personal and Business Services
CLIFFS NATURAL RESOURCES INC	USA	Precious Metals, Non-Metallic, and Industrial Metal Mining	TELECOM ITALIA SPA	ITA	Communication
COACH INC	USA	Apparel	TEVA PHARMACEUTICALS INDUSTRIES LTD	ISR	Healthcare, Medical Equipment, Pharmaceutical Prod.
CREDIT SUISSE GROUP	CHE	Banking, Insurance, Real Estate, Trading	TITAN INTERNATIONAL INC	USA	Fabricated Products and Machinery
DANAHER CORP	USA	Business Equipment	TYCO INTERNATIONAL PLC	IRL	Business Equipment
DDR CORP	USA	Banking, Insurance, Real Estate, Trading	UBS GROUP AG	CHE	Banking, Insurance, Real Estate, Trading
DEUTSCHE BANK AG	DEU	Banking, Insurance, Real Estate, Trading	UNITED TECHNOLOGIES CORP	USA	Aircraft, ships, and railroad equipment
DST SYSTEMS INC	USA	Personal and Business Services	VERIZON COMMUNICATIONS INC	USA	Communication
EQT CORP	USA	Utilities	VERMILION ENERGY INC	CAN	Petroleum and Natural Gas
FEDEX CORP	USA	Transportation	VF CORP	USA	Apparel
FOSTER WHEELER AG	GBR	Construction and Construction Materials	VODAFONE GROUP PLC	GBR	Communication
GENERAL ELECTRIC CO	USA	Everything Else	WALT DISNEY CO	USA	Communication
GLAXOSMITHKLINE PLC	GBR	Healthcare, Medical Equipment, Pharmaceutical Prod.	WEATHERFORD INTERNATIONAL PLC	CHE	Petroleum and Natural Gas
GLOBAL INDEMNITY PLC	IRL	Banking, Insurance, Real Estate, Trading	WHITE MOUNTAINS INSURANCE GROUP LTD	BMU	Banking, Insurance, Real Estate, Trading
HARBINGER GROUP INC (now HRG GROUP INC)	USA	Electrical Equipment	WHITEWAVE FOODS CO	USA	Food Products
HSBC HOLDINGS PLC	GBR	Banking, Insurance, Real Estate, Trading	YAMANA GOLD INC	CAN	Precious Metals, Non-Metallic, and Industrial Metal Mining

Notes: Table 2A provides the full list of 82 U.S. listed firms exposed through the LuxLeaks. Country-classification is based on the country in which the firm's headquarter is located. The industry-classification is based on the Fama and French 30 industries.

Table 3: Descriptive Statistics

Variables	N	Mean	Standard Deviation	Q1	Median	Q3
All firms						
CAR(%)	82	0.433	3.808	-0.820	0.350	1.070
Std CAR(%)	82	0.300	1.297	-0.371	0.190	0.686
SIZE(millions)	82	273,265	602,422	7,820	23,525	142,431
CETR3YR	76	0.248	0.176	0.161	0.226	0.312
NETCSR	71	3.324	3.668	1	3	6
U.S. headquartered firms						
CAR(%)	49	1.241	4.147	-0.270	0.650	1.430
Std CAR(%)	49	0.613	1.374	-0.185	0.387	0.980
SIZE (millions)	49	200,281	520,803	6,061	16,535	84,896
CETR3YR	47	0.230	0.159	0.155	0.218	0.281
NETCSR	44	3.614	3.749	0.5	3.5	6.0
IOFrac	49	0.768	0.191	0.652	0.816	0.905
STKMIXFGRANT	44	0.314	0.295	0	0.376	0.600
STKMIX	44	0.684	0.217	0.579	0.721	0.861

Notes: Variables are defined in Appendix A.

Table 4: Mean Cumulative Abnormal Returns on the event dates.

Dependent Var. = CAR	Days	# obs	Mean CAR(%)	Pos/Neg	Patell Z	Generalized Sign Z	StdCsect Z	Jackknife Z
Panel A:								
All firms on their respective event dates	(0 , 0)	82	0.07%	43:39	1.803**	0.839	1.679**	1.173
	(-1,+1)	82	0.43%	51:31***	2.672***	2.608***	2.078**	2.712***
	(-2,+2)	82	0.43%	47:35**	1.781**	1.724**	1.621*	1.805**
	(-3,+3)	82	0.38%	48:34**	1.776**	1.945**	1.594*	2.022**
Panel B:								
U.S. domiciled firms on their respective event dates	(0 , 0)	49	0.18%	28:21*	1.509*	1.301*	1.711**	1.399*
	(-1,+1)	49	1.24%	35:14***	4.231***	3.303***	3.100***	3.520***
	(-2,+2)	49	1.53%	35:14***	3.861***	3.303***	3.529***	3.570***
	(-3,+3)	49	1.91%	36:13***	4.209***	3.589***	4.176***	4.019***
<p>One-day and three-day window of market reaction around the two release dates of the Luxembourg tax documents: November 5, 2014 and December 9, 2014 are reported above. The market model, based on a value-weighted index (including dividends) is used to estimate the abnormal returns. The symbols *, **, and *** denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively, using a generic one-tail test.</p>								

Table 5: Mean Cumulative Abnormal Returns for U.S. headquartered firms

	Subgroup Avg.	Days	# obs	Mean CAR (%)	Mean Std CAR (%)	Pos/Neg	Patell Z	Generalized Sign Z	StdCsect Z	Jackknife Z
Panel A:										
Cumulative abnormal returns for the U.S. headquartered firms – above and below the median in CETR3yr										
CETR3yr above median	33.26%	(-1,+1)	23	2.15%	0.71%	17:6***	4.206***	2.515**	2.306**	2.590***
CETR3yr below median	13.23%	(-1,+1)	24	0.87%	0.59%	18:6***	2.872***	2.668***	2.988***	3.229***
Difference in the mean CARs (<i>p</i> -value)				0.236	0.388					
Panel B:										
Cumulative abnormal returns for the U.S. headquartered firms – above and below the median in IOFrac										
IOFrac above median	91.26%	(-1,+1)	24	2.02%	0.85%	17:7**	4.134***	2.199**	2.278**	2.359***
IOFrac below median	62.87%	(-1,+1)	25	0.49%	0.38%	18:7***	1.873**	2.469***	2.770***	2.608***
Difference in the mean CARs (<i>p</i> -value)				0.099*	0.116					
Cumulative abnormal returns for the U.S. headquartered firms – above and below the median in STKMIXFGRANT										
STKMIXFGRANT above median	57.97%	(-1,+1)	22	2.54%	1.12%	18:4***	5.180***	3.151***	2.944***	3.858***
STKMIXFGRANT below median	4.84%	(-1,+1)	22	0.24%	0.25%	15:7**	1.140	1.947**	1.448*	1.528*
Difference in the mean CARs (<i>p</i> -value)				0.039**	0.020**					
Cumulative abnormal returns for the U.S. headquartered firms – above and below the median in STKMIX										
STKMIX above median	84.74%	(-1,+1)	22	0.10%	0.13%	13:09	0.571	1.039	0.786	0.813
STKMIX below median	52.05%	(-1,+1)	22	2.68%	1.24%	20:2>>>	5.748***	4.059***	3.353***	4.895***
Difference in the mean CARs (<i>p</i> -value)				0.024**	0.004***					

Table 5 (cont'd): Mean Cumulative Abnormal Returns for U.S. headquartered firms

	Subgroup Avg.	Days	# obs	Mean CAR (%)	Mean Std CAR(%)	Pos/Neg	Patell Z	Generalized Sign Z	StdCsect Z	Jackknife Z
Panel C:										
Cumulative abnormal returns for the U.S. headquartered firms – above and below the median in SIZE										
Total assets above median (millions)	402,302	(-1,+1)	24	0.57%	0.47%	17:7***	2.248**	2.274***	2.975***	2.638***
Total assets below median (millions)	6,342	(-1,+1)	25	1.89%	0.75%	18:7***	3.721***	2.396***	2.101**	2.332***
Difference in the mean CARs (<i>p</i> -value)				0.135	0.247					
Panel D:										
Cumulative abnormal returns for the U.S. headquartered firms – positive, neutral and positive netCSR										
Positive netCSR	5.12	(-1,+1)	33	1.39%	0.65%	25:8***	3.676***	3.214***	2.758***	3.382***
Neutral netCSR	0	(-1,+1)	5	0.23%	0.30%	3:2	0.603	0.605	0.742	0.604
Negative netCSR	-1.67	(-1,+1)	6	2.32%	1.23%	5:1**	2.996***	1.730**	1.378*	1.381*
Difference in the mean CARs of posCSR and negCSR sub-groups (<i>p</i> -value)				0.328	0.193					

CARs reported above are the cumulative abnormal returns calculated over three-day window centered on the date of the leaks (November 5, 2014 and December 9, 2014) and calculated using the market model and CRSP value-weighted index. The market model, based on a value-weighted index (including dividends) is used to estimate the abnormal returns. The symbols *, **, and *** denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively, using a generic one-tailed test. *p*-value reported is the result of a one-tailed T-test comparing the difference between the mean CARs of the two groups.

Table 6: Regression Analysis for U.S. headquartered firms

Dependent Var. = Std. CAR	1	2	3	4	5	6	7
Constant	-0.304 (0.415)	-1.182 (0.338)	-2.299* (0.082)	-2.157* (0.099)	-0.508 (0.846)	-0.761 (0.749)	-2.151 (0.385)
CETR3yr	4.152** (0.025)	4.567** (0.014)	5.302*** (0.003)	4.504** (0.011)	4.670** (0.050)	4.908** (0.017)	5.003*** (0.007)
SIZE		0.077 (0.419)	0.130 (0.187)	0.098 (0.302)	0.057 (0.688)	0.060 (0.643)	0.098 (0.453)
STKMIXFGRANT			1.270** (0.028)			1.683** (0.027)	1.726** (0.024)
IOFrac				1.021 (0.105)			1.182* (0.060)
STKMIX					-0.744 (0.556)	-1.475 (0.274)	-1.346 (0.317)
netCSR						0.045 (0.343)	0.039 (0.402)
Observations	47	47	42	47	42	41	41
R-squared	0.2271	0.2384	0.3055	0.2568	0.2534	0.3648	0.3878

Notes: *p*-values are in parentheses. The variables are as defined in Appendix A. The sample for each column includes all U.S. headquartered firms for which the required explanatory variables are available. The sample in column (3) to (5) excludes observations with missing equity-based compensation data in ExecuComp database. The sample in column (4) to (6) excludes observations with missing data in MSCI database (formerly KLD). Significance levels are as follows: *** indicates significance at .01, ** at .05, and * at .10, two-tailed.

Dependent variable: cumulative abnormal returns.