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Reputational Shockwaves from the Panama Papers

An Event Study on Industry Spillover Effects and Governance Quality Moderation Following a Global Tax Scandal

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Abstract:

Throughout the 2010s the perception of corporate tax planning underwent a notable transformation, moving beyond a pure profit-maximizing strategy to include ethical considerations. As ethical concerns for tax planning arose, major tax scandals gained attention, where the Panama Papers leak 2016 was one of them. In this study we use the Panama Papers as a natural experiment to examine if reputational capital operates as a firm-specific asset or an industry-level resource. In addition, we investigate if reputational capital is impaired following a tax scandal and if country governance quality shapes the cross-border contagion effects. Adopting an event study design, we proxy changes in stock prices to reputational capital impairment. Furthermore, to examine cross-border spillover mechanisms we employ a multivariate regression on governance quality. Our findings indicate reputational capital operates as an industry-wide resource that is negatively affected by a tax scandal. We also find that industry spillover effects are conditional to the governance quality of the country in which the firm is located, where high governance leads to amplified negative reactions. These results support that tax scandals have global industry-wide effects in countries with high governance.

Keywords: Panama Papers, Tax Scandal, Reputational Capital, Industry Spillover Effect, Governance Quality

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1. Introduction

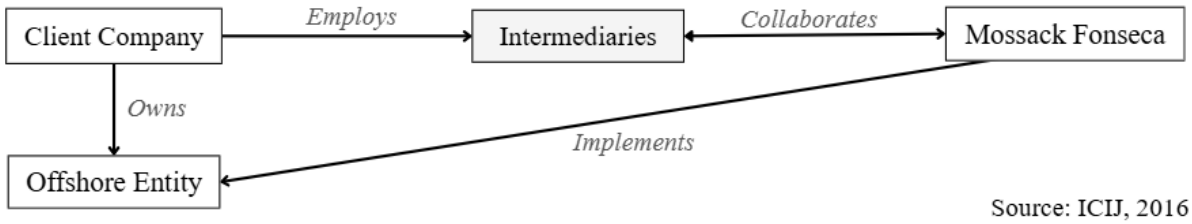
On the 3rd of April 2016, at 2 pm US Eastern Time, the world faced one of the largest data leaks in history. More than 11.5 million confidential records from the Panama-based law firm Mossack Fonseca had been published for anyone to browse, and for all journalists to dig into. The Panama Papers records did not solely reveal obscure offshore tax strategies, but further framed famous people of power, forced the resignation of Iceland's Prime Minister within days and dented public trust in corporations and governments worldwide (Henley, 2016). The scandal revealed 214,488 offshore entities, exposing how the global elite utilized tax havens, shell companies and legal grey zones to hide wealth and avoid taxation. The leak exposed both legal tax avoidance as well as tax evasion enabling crime and corruption (ICIJ, 2016).

Although the Panama Papers were officially published on the 3rd of April 2016, the release was the result of one of the largest journalistic collaborations in history. In 2015, an anonymous source obtained a database from Mossack Fonseca, the world's fourth largest offshore law firm. The source, *yet not identified*, provided the data to the German newspaper Süddeutsche Zeitung, which in turn shared it with International Consortium of Investigative Journalists (ICIJ), a network of journalists who collaborate worldwide to conduct in-depth investigation. Over the course of a year, the ICIJ coordinated hundreds of journalists and partners to take part of the data and analyze it, agreeing to release all their findings on the 3rd of April 2016. On the day of publication, big media outlets as The Guardian, BBC and The New York Times published articles on the data leak as front pages, gaining worldwide attention. One month later, the ICIJ released a publicly accessible database on all the records gathered, free for anyone to use (ICIJ, 2016).

At the center of these revelations stood the **intermediaries**, *law firms, accounting firms, banks and trust companies*, the middlemen who acted as architects and enablers of offshore arrangements. The intermediaries played a vital role in the Panama Papers, as without these intermediaries, the creation of complex offshore architectures would not be possible. The report "*Role of Advisors and Intermediaries in the Schemes Revealed in the Panama Papers*" from the European Parliament's Policy Department (2017) describes intermediaries as the main sellers of offshore structures who operated as the linkage between clients and Mossack Fonseca. Intermediaries, *with their relevant expertise in law, accounting and finance*, **enabled tax minimization** and financial secrecy for client companies, essentially selling tax

benefits as a service (Policy Department A: Economic and Scientific Policy, 2017). See Figure 1 below for a simplified portrayal of their vital role in the tax scandal.

Figure 1. Simplified Description of Relationships to Intermediaries



Source: ICIJ, 2016

While the intermediary companies played a crucial role in the construction of the offshore structures that were revealed in the Panama Papers, they have gained little academic attention in previous studies on the Panama Papers. Rather, market reactions of the clients (*owners of the offshore entities*) have been of interest for studies (O'Donovan et al., 2018; Wagner and Zeume, 2018). Since previous Panama Papers studies have tracked valuation changes for the clients, changes in their valuation can be traced back to (1) *reputational effects* and (2) *the loss of tax avoidance benefits*, making it hard to examine the strict reputational effects from being associated with the Panama Papers leak.

In this study we are specifically interested in the **reputational effects** from the Panama Papers leak, and whether these effects extend beyond the explicitly mentioned firms onto their full industry, *an industry spillover effect*. In effort to isolate the (1) *reputational effects* we will focus on the **intermediaries** which were the enablers of offshore tax avoidance structures. As these intermediaries have not been recorded to reap tax benefits by their own offshore structures, we can assume any firm valuation change is solely stemmed from (1) *reputational effects* and **not** (2) *loss of tax avoidance*.

From an accounting perspective, reputation is not displayed on the balance sheet as a standardized asset, *however*, it is according to some scholars an intangible asset. Its asset value is based on trust, perceived legitimacy and ethical conduct. Having a strong reputation enables firms to gain loyal customers, premium pricing and trust from stakeholders (Fombrun, 2018). Such benefits support future revenue, improving firm value. Accounting for reputation as both an intangible asset and support mechanism for future cash flows implies a firm's reputation impacts the firm's valuation, and further the firm's stock value. As intermediaries' business model often depends on relationships, trust and legitimacy, their firm

value relies on reputation (Boot and Thakor, 2002). The Panama Papers leak, *a global tax scandal revealing ethically questionable practices*, could be suggested to have damaged the reputations of those implicated. Such damage can since be viewed as an impairment of the unrecognized intangible asset *reputation*. Although reputation is rarely recorded in financial statements, its loss carries financial consequences. By involuntarily disclosing firms' involvement in ethically questionable tax behavior, the leak made hidden reputational information public. Returning to Fombrun's (2018) theory of reputation as an intangible asset, any resulting decline in perceived integrity or trustworthiness following the leak should be reflected in firms' stock valuation.

As touched upon, our study of the reputational effects following the Panama Papers leak extends beyond the explicitly mentioned intermediaries. The main focus of this thesis lies in how an event associated with reputational erosion had effects extending beyond directly impacted firms, onto their full industry. Since, we will study the Panama Papers leak's effects on the intermediaries' **industry peers**. Industry peers are firms operating in the same industry as the intermediaries (*banking, financial services, accounting, law services*) while not being explicitly exposed to the event (*not being mentioned in the Panama Papers leak*). By examining **industry spillover effects** we investigate if reputational capital operates as a firm-specific asset or if it is an industry-level intangible resource. Eventual evidence of an industry spillover effect indicates that reputation exists as an industry-level resource. This implies firms are grouped on the basis of industry-belonging for assessment of their legitimacy and perceived trustworthiness, impacting firm valuation. Additionally, existing literature suggests country-level governance quality is a key factor for the shaping of investor reactions of new market information (*such as a tax scandal*). To properly analyze the reputational industry spillover effect we since investigate country-level governance quality's relationship to the reputational spillover.

The focus of this research can be summarized into the following broad **research question**: "*does reputation operate as a firm-specific intangible asset or as a shared industry-level resource, and under what circumstances is it impaired?"*. To pursue this study we adopt an event study framework where we track day close stock prices for:

1. intermediaries mentioned in the Panama Papers, and
2. intermediaries' industry peers,

over the course of the event window [trading day -1; trading day +1] where trading day 0 is the first exchange-open day following the leak of Panama Papers on 3rd of April 2016. We will record the (*cumulative*) abnormal returns over the event window to track if intermediaries' stock value was affected following the leak, and if the effect spread beyond the directly impacted firms onto their industry peers. As discussed, stock price changes can be attributed as reputational effects - the impairment of reputational capital. Through this we find evidence for reputation as a firm-specific asset or industry-level resource, and if it is impaired in the circumstance of a global tax scandal. Additionally, running a regression between country-level governance quality and the reputational spillover effects allows nuancing of how the reputational industry spillover effect spreads.

1.1 Background

It is not a new phenomenon that multinational companies move large amounts of income to tax haven jurisdictions in order to lessen tax liabilities. Through practices such as transfer pricing, intragroup loans and royalty payments they can limit tax obligations. Although operations in tax havens are not necessarily unlawful, these jurisdictions enable firms to hide relevant information for the market. Some locations are recurring in opaque tax strategies as they typically offer limited transparency, weak information sharing mechanisms and low tax rates. This is particular in the case of small *dot havens* such as The British Virgin Islands, Cayman Islands, Cook Islands, Hong Kong, Mauritius, the Seychelles and Singapore. Such jurisdictions seldom function as genuine production hubs and are instead used mainly as vehicles for tax planning (Schmal et al., 2021).

Due to the extensive use of these jurisdictions for tax planning, the Panama Papers is only one of many tax haven leaks the previous years. Other similar events include the Offshore Leaks (2013), Luxembourg Leaks (2014), Bahamas Leak (2016) and the Paradise Papers (2017) (Schmal et al., 2021). While the leaks draw substantial public attention towards the

mentioned tax havens, it is often hard to determine whether the tax practices are illegal or legal. Creating offshore entities is not particularly illegal, but some uses for the vehicles include illegal activities, such as money laundering. In addition to this, tax avoidance is often ethically questionable as it actively avoids government funding. In leaks of offshore structures it is difficult to identify the individual client companies that obtain ownership over entities handled by law firms. As disclosed names of parent client companies are seldom mentioned, and other identifiable information is seldom given, there is a great risk of incorrect data mergers.

In the Panama Papers, *by example*, it remains true **no client companies have their names in the data leak**, rather it is the names of their entities that are displayed along with some officer names and addresses. Studies conducted on client companies trace the client companies through algorithmic matching with information provided. This is not only hard and time consuming, but further brings uncertainty to matching. In O'Donovan et al. (2018) Panama Paper study they identified less than 400 client companies even though the leak concluded 214,488 offshore entities. The lack of transparency on what client companies utilized offshore vehicles makes it hard to accurately study its true impact. Nevertheless, it is estimated that the global offshore assets vary somewhere between $7 to $32 trillion (O'Donovan et al., 2018). Withdrawing from specifics, the asset value is large and reflects lost corporate tax revenue for governments. This *lost* revenue is compensated through increased taxing of individuals. Since, corporations using tax havens directly results in private citizens paying more of the cost for a welfare society, while corporations benefit from public infrastructure, legal systems and markets (Christensen and Murphy, 2004). Through this lens, tax scandal leaks bring up the discussion of justice, fairness and social welfare.

1.2 Purpose and Contribution

This thesis investigates how the stock market reacted to intermediaries being exposed in the Panama Papers on 3rd of April 2016, and whether the leak triggered industry spillover effects. By focusing on intermediaries we isolate market reactions to reflect reputational effects rather than the loss of tax advantages. In doing so, we explore whether investors treat reputation as an intangible asset that can be impaired by a major tax scandal. A second contribution lies in investigating whether reputational effects are limited to individual firms involved or if they spill over to uninvolved industry peers. Such industry-level spillover effects would imply reputation operates as a shared resource within industries, rather than a firm-specific asset. Finally, by incorporating country-level governance and its relationship to industry-level reputational spillover effects, we investigate governance environments' shaping of reputational effects transmissions. Taken together, by addressing these topics, our thesis contributes to research on reputation as an intangible asset. We investigate if it exists on a firm- or industry-level, whether it is impaired following a global tax scandal and if the industry spillover effects are shaped by the governance environment.

1.3 Delimitations

Constrained by time and page count, we adopt appropriate delimitations to the scope of our thesis. First of all, in this event study we adopt a single-event focus on the Panama Papers leak, which implies our findings may not be generally applicable to other tax scandals or adverse events. Effects can vary both across events (*Pandora Papers, Paradise Papers, Bahamas Leak, etc.*) and types of events (*tax scandals, frauds, regulatory violations, etc.*). Additionally, we limit ourselves in industry and firm type, focusing on intermediaries and the *intermediary industry* (*see 4.3.1 Selection of Industry and Countries*). The limitation of industry is motivated through data availability and representation of the firms in the Panama Papers leak. For the regression on governance quality against reputational effects (*abnormal returns*), we utilize the WGI index as our governance. While this index is broad it might lack important governance elements (*such as media freedom, etc.*) that could be relevant for our study, but as the index still remains broad we delimit the study to it.

2. Literature Review

This section reviews prior research on adverse corporate events and tax avoidance, diving deep into the literature relevant for the Panama Papers. The section is concluded by a reflection on key research gaps and this study's contribution to research.

2.1 Effects of Adverse Events

Adverse corporate events, *such as frauds, ethical misconduct, regulatory violations, etc.*, often impose costs that extend beyond the legal fines. Rather, research has found that reputational damage is the greatest economic consequence following adverse events. Empirical findings support that reputational losses exceed regulatory penalties by around ninefold, suggesting investors heavily discount firms' credibility and value in the case of misconduct disclosure (Armour et al., 2017). Aligned to this, Karpoff et al. (2008) found additional support for this phenomena, revealing firms accused of financial misrepresentation lose around three times the market value than the amount gained through inflation of value. This concludes that around 88% of the loss following financial misrepresentation is attributed to the impaired reputation (*rather than the legal cost*).

Do all firms suffer equally following a reputational hit? Studies have found evidence that prior reputation levels of a firm before a hit offer little protection to the impairment of reputation (Bartov et al., 2021). Since, the firm impact can not be predicted on such a basis prior to a reputation hit. However, it has been shown corporate reputation is malleable not only according to firm actions, but additionally through governance structures of the country in which the firm operates. Soleimani et al. (2014) find evidence for this, revealing governance qualities determine what stakeholders (*shareholders, employees, regulators, local communities, etc.*) have the most power. As a result, identical adverse events can trigger very different reputational and financial consequences depending on national governance (Soleimani et al., 2014). Additionally, media plays an essential role in how reputational effects behave. Bushee et al. (2010) find that business press amplifies capital market reactions of negative events by providing both interpretations and visibility. By narrating framing and tone, investor reactions are implemented more broadly and at a faster pace, thus impacting firm valuation.

The Panama Papers leak had extensive media coverage with street protests and calls for increased transparency laws. Discussions on the leak revolved around tax planning as unethical, suggesting the leak operated as a reputational shock to the intermediaries mentioned (*rather than a financial one*). Concluding the insights from this literature, it is shown that adverse events affecting reputation have real and big consequences to the valuations of firms which is amplified by the media. Furthermore, earlier reputation provides no protection from adverse events. Instead country-level governance factors emerge as a possible explanatory factor for determining the mechanism of the effect.

2.2 Effects of Tax Behavior

Corporate tax behavior and planning occupies a well-discussed legal grey zone that has been significantly evolving since around the late 2000s. In 2004, Christensen and Murphy (2004) provided support that tax planning had not yet been integrated into CSR measures. They point out that a Big Four accounting firm in 2003 reported that a lack of transparency was emerging as a major institutional concern. Further, the closely related topics of meeting tax obligations and avoiding aggressive tax planning strategies were absent from the good governance report. In addition, these issues were not addressed in the AA1000S Assurance Standard released in March 2003 by the UK-based organization Account Ability (Christensen and Murphy, 2004).

This historic segregation of CSR and tax ethics is further elaborated on by Huseynov and Klamm (2012) who state that prior research has treated tax avoidance and corporate social responsibility (CSR) separately. Emphasizing their study as *the first study* to empirically link these two streams of research together, they support CSR affects tax avoidance. Since this, taxation practices have been increasingly integrated into the CSR framework, introducing ethical reflections on tax planning and not solely handling it as a profit-maximizing strategy. Hoi et al. (2013) show that firms with low CSR scores are more likely to engage in aggressive tax avoidance, indicating a correlation between tax responsibility and stakeholder responsibility. While tax ethics grew in attention, it was not until late 2019 that the first global accounting standard for tax, *the GRI 207*, was established. This emphasized a shift in ethical views on tax behavior and planning throughout the 2010s (*GRI - Topic Standard for Tax, GRI 207*).

In line with the increased attention, Dowling (2014) finds that even though corporate tax avoidance might be legally defensible, it poses reputational risk to a firm's legitimacy. Aligning firm tax conduct to ethical expectations is strategic as firms are subject to increased public scrutiny if tax misbehavior is revealed (Dowling, 2014). Hanlon and Slemrod (2009) found that disclosure of tax avoidance can trigger negative investor reactions as aggressive tax avoidance is interpreted as a signal of unethical conduct, poor governance and hidden risk. This interpretation indicates that tax shelter practices becoming public should yield market penalties, in clear contrast with the attitudes of the early 2000s. Modern studies further support adopting a more ethical approach. Empirical evidence indicates that consumers perceive aggressive tax practices as unethical, reducing purchase intentions and brand trust (Antonetti and Anesa, 2017; Hardeck and Hertl, 2014).

A key setting for understanding these tax-related dynamics is leaks revealing tax avoidance behavior. By example, the Panama Papers leak. O'Donovan et al. (2018) have investigated market reactions for the client firms following the leak. They found that the leak caused an average decline of 0.5-0.6% in market value among implicated firms, eliminating approximately $174 billion in shareholder wealth (O'Donovan et al., 2018) Findings of negative market reactions following the Panama Papers tracks with the transformation of the discourse on tax planning ethics throughout the 2010s.

2.3 Reflections on Literature, Research Gaps and Contribution

The reviewed literature demonstrates that reputational damage is a central channel through which adverse events affect firm value. Across settings of fraud, misconduct or tax-related misbehavior, the market reactions exceed the incorporation of direct legal penalties by far, emphasizing investor sensitivity towards perceived legitimacy. Research on tax avoidance similarly portrays tax behavior as an ethical signal where aggressive strategies reduce stakeholder trust, yield negative reactions from consumers and investors, as well as harm the firms' legitimacy.

While evidence of firm-level valuation effects following the Panama Papers leak exist, studies have focused mostly on client firms, whose valuation losses reflect both reputational effects and the removal of tax avoidance benefits. In our context, our study on **intermediaries** in the Panama Papers provides a clear lens through which to examine solely

reputation effects from a global tax scandal. Unlike client firms, intermediaries named in the Panama Papers did not benefit from tax savings of the offshore structures they mediated and engineered. This makes intermediaries the ideal object to examine in this scandal.

In addition, while reputational externalities are documented in diverse settings, possibilities of industry-level spillover effects in tax scandals are unexplored. O'Donovan et al. (2018) explicitly highlight the absence of studies on spillover effects on tax scandals, *and more specifically the Panama Papers leak*, as a main gap that should be prioritized for future research. Likewise, prior studies have not explored how governance quality impacts the transmission of industry reputational effects across borders, despite theoretical evidence that governance environments shape market reactions.

3. Theory and Hypothesis Development

This section investigates theoretical perspectives to explain how the Panama Papers may have affected firm valuations. First we discuss expected market reactions for directly mentioned intermediaries, then we consider spillover effects on industry peers, and finally we examine if country-level governance quality explains spillover variations.

3.1 Corporate Reputational Direct Effects

The Efficient Market Hypothesis (EMH) provides a starting point for understanding stock market reactions to new information. According to Fama (1970), asset prices reflect all publicly available information, and when new information is disclosed prices should adjust instantly. The Panama Papers leak represents such a disclosure event carrying reputational information of interest for investors. Any abnormal returns closely surrounding the release of the Panama Papers can thus be interpreted as the market's response to new information on firm reputation.

From the lens of Information Asymmetry Theory (Akerlof, 1970), offshore involvement in the purpose of tax avoidance is considered hidden information about firm risk. The leak reduces information asymmetry in the market by revealing previously concealed practices, enabling investors to reassess quality and credibility of the affected firms. If investors value transparency and ethical behavior, revelations of tax avoidance practices should cause impairment of firm value.

The Reputational Capital Theory explains corporate reputation as an intangible asset whose value is cemented in trust with stakeholders, perceived legitimacy, identity, ethical standards, good name and works. Firms with strong reputation reap benefits such as loyal clients, premium pricing, lower transaction costs, stable revenues and higher investor confidence (Fombrun, 1996). These benefits support future revenue streams, essentially enhancing firm value. When reputation is harmed, these benefits diminish, reducing expected future cash flows and increasing firm risk. In the capital market field, the logic follows the People-as-Asset Pricing Model (PAPM) proposed by Ibbotson et al (2018). The PAPM argues investors price intangible firm assets such as reputation. Since, a firm with positive reputational attributes could expect valuation premium, while firms with reputation damage

experience a value discount. Shapiro (1983) introduces the logic that reputation acts as a signaling mechanism in a market with information asymmetry. An asymmetric market implies investors can not properly assess quality, and thus reputation can act as an information carrier giving clues on a firm's actual value. Drawing on insights from Reputational Capital Theory, PAPM and Shapiro, reputation seems to be considered by investors, and further utilized as a tool to determine firm quality - and since, firm value. Earlier empirics on tax behavior reveals tax planning is perceived as unethical, suggesting the Panama Papers leak operates as a negative *reputational* signaling, further supporting the hypothesis of firm value impairment (Hanlon and Slemrod, 2009).

Intermediaries' business models depend on client trust and legitimacy, revealing a reliance on reputation (Boot and Thakor, 2002). As they typically do not use offshore structures for their own tax avoidance, they reaped no tax benefits pre-leak, and since no lost tax benefits post-leak. Thus, all market reactions following the leak should reflect reputational effects rather than changes in expected cash flows due to improved taxation or litigation costs. Concluding from our reasoning on the Panama Papers leak operating as a negative *reputational* signal for tax misconduct, we expect a decline in market valuation of intermediaries explicitly mentioned in the Panama Papers. Our expectations follow:

> **H_{1a}**: Publicly traded intermediaries explicitly mentioned in the Panama Papers experience ***negative*** and ***significant*** cumulative average abnormal returns in the days around the leak, reflecting loss of reputational capital

3.2 Corporate Reputational Spillover Effects

Our main focus is however how the effect extends beyond the directly affected firms, onto its industry peers through spillover effects. Lang and Stulz (1992) distinguish between two types: contagion effects and competitive effects. The **contagion effects** imply negative information disclosure cause investors to downgrade similar firms due to having a shared perceived risk by association. In contrast, the **competitive effects** follow the logic that the weakened position of one firm benefits its competitors. They continue to elaborate on what effects are caused in what industry depending on industry characteristics. In industries with high leverage and correlated cash flows contagion dominates, whereas in diversified industries with great competition the competitive effect dominates (Lang and Stulz, 1992).

Our chosen industry is the *intermediary industry* (*see 4.3.1 Selection of Industry and Countries for motivation*) which consists of accounting, law and financial firms, as well as banks. Our industry peer sample is heavy on banks (*see 7.2 Appendix, Table 17*), and these firms are characterized by high leverage, dependence on client trust and similar revenue models (Berg and Gider, 2017). Considering these characteristics, banks are subject to the contagion effects. Empirical evidence supports this expectation, Aharony and Swary (1983) show that bank failures correlated across banks cause declined firm value for all banks, as the bank failure of one bank acts as a negative signal for investors. This supports the logic of a shared perceived risk across the industry, with reputation as an industry-level resource. Aligned to this, Slovin et al. (1999) examine diverse bank failures to find support for the contagion effect dominating the results when large banks are involved and market confidence low. Both these studies emphasize investors interpret misconduct in one bank as a signal for industry-wide weakness and lost reputational resources.

Now, the Panama Papers leak was not a traditional bank failure or financial shock. Rather, it was a *scandal* that revealed ethically questionable tax practices that undermined firms' reputational capital. The event was driven by the media and incorporated social reflections. Corporate tax avoidance is argued as socially irresponsible and poses reputational and strategic risks (Christensen and Murphy, 2004; Dowling, 2014). In this sense, industry peers to intermediaries in Panama Papers are subject to a media-driven, reputational spillover effect. For example, research supports that disclosure-related litigation against one firm causes peers to experience negative abnormal returns, as a result of investors grouping governance standards across the industry (Donelson et al., 2022). Similarly, but more media-relevant, An and Xu (2021) documented global industry contagion effects following the Harvey Weinstein-scandal. Results found entertainment firms worldwide experience valuation losses due to the perceived shared governance and ethical failures. These empirics suggest markets respond to not only tangible risks, but further ethical cues that alter perception of trustworthiness and compliance for the entire industry.

Given the intermediaries in the Panama Papers, and their industry peers, are largely banks and other financial-adjunct firms where credibility and reputation is a core intangible asset, it is reasonable to expect that reputational contagion would dominate over competitive effects. Additionally, the ethical topic of the scandal with large media coverage further supports the hypothesis of a contagion effect on industry peers. The investors register the scandal as a

negative signal of industry's ethical practices, causing them to diminish their reputational asset, yielding abnormal negative returns for both the directly mentioned and their industry peers. Our expectations are formulated as:

H_{1b}: Industry peers of intermediaries mentioned in the Panama Papers experience ***negative*** and ***significant*** cumulative average abnormal returns in the days around the leak, reflecting reputational contagion effects

3.3 Governance Quality and Reputational Spillover Effects

Mentioned in the literature, governance quality on a country-level shapes investor behavior, and could since shape the behavior of the reputational spillover effect (Soleimani et al., 2014). Here the Institutional Theory provides a useful lens for analysis. The theory proposes that stakeholders (*such as investors*) respond not only to firm-specific information, but further absorbs the norms and expectations in their broader institutional environment (Meyer and Rowan, 1977). As such, investor reactions vary by country-level governance quality. Given our samples span across multiple countries with distinct governance profiles (*see section 4.3.1*), variation in governance quality is likely to affect the transmission and magnitude of the reputational spillover effect.

Building on Institutional Theory, Campbell (2007) extends the theory to conclude that country-level governance quality shapes investor expectations on transparency and ethical conduct. High-governance countries have strong enforcement and transparency norms, emphasizing investor sensitivity to reputational threats (Campbell, 2007). This suggests firm revaluation could be harsher. In low-governance countries the opposite applies, low enforcement and transparency, high information asymmetry, dampening investor reactions (Campbell, 2007; Bushman et al., 2004; Bushman and Smith, 2001). Applying these theories to the Panama Papers leak, we expect reputational spillover effects to be more pronounced in countries with stronger governance quality, concluded as:

H_2: Firms located in countries with higher governance quality experience more ***negative*** and ***significant*** cumulative abnormal returns around the leak

4. Methodology

This section presents the research design, sample constructions, benchmark selection, assumption tests and robustness checks.

4.1 Research Design

Our study examines whether reputation is priced as an intangible asset for specific firms, or if it exists as an industry-level resource. Additionally, we investigate if it is impaired when intermediaries are exposed in a global tax scandal, and if country-level governance quality moderates the spillover effect. As intermediaries are not subject to tax benefits, observed valuation changes are attributed to reputational effects from the scandal (*see section 1. Introduction for this reasoning*). Since, we proxy changes in reputational capital with changes in stock prices, interpreting these valuation movements as market-based reflections of reputational impairment.

The Panama Papers leak is interpreted as an involuntary disclosure of new information about firms enabling tax avoidance. This gives a suitable setting to examine how markets recognize and price reputation. To capture these effects, we follow the event study methodology in MacKinlay's *"Event Studies in Economics and Finance"* (1997). Event studies are commonly used to analyze market reactions to specific events, making it appropriate to our analysis of the Panama Papers. Under the Efficient Market Hypothesis (Fama, 1970), financial markets absorb new public information into firm values rapidly and rationally. Since, if the leak impaired reputation, we expect abnormal returns for affected firms around the disclosure date. The empirical logic follows (MacKinlay, 1997):

1. Estimate expected returns using a market model
2. Calculate abnormal returns (= *expected returns* - *actual returns*) for the event window
3. Summarize abnormal returns into cumulative measures
4. Significance tests and robustness checks

We apply this framework to exposed intermediaries, their industry peers (*to check for spillover effects*) and a control group to benchmark observations against. Later we adopt a cross-sectional multivariate regression on cumulative abnormal returns against country-level governance index to investigate the relationship between country-level governance quality and reputational spillover effects.

4.1.1 Event Time Frames

Defining appropriate time frames is central to the design of an event study. We establish both an event window, *a period of time where we track market reactions*, and an estimation window, *a period of time where firm-specific parameters are estimated* (MacKinlay, 1997).

The Panama Papers were released on 3rd of April 2016, a Sunday, making the 4th of April 2016 the first trading day on which markets could react. Therefore we set the 4th of April as our event day (t = 0). Consistent with the Efficient Market Hypothesis, price adjustment should occur instantly as trading resumes (Fama, 1970). Thus we adopt a short event window of [-1; +1] trading days. Trading day -1 (*1st of April*) captures potential early reactions, and trading day +1 (*5th of April*) allows for lagged adjustments. Although the event window is three days, it spans over five calendar days, enabling early and late reactions. We keep the window short as long windows risk capturing irrelevant noise (MacKinlay, 1997).

Table 1. Event Window

Trading day (t)	*Date*
-1	01-04-2016
0	**04-04-2016**
1	05-04-2016

For the **estimation window** we follow standard practice and use 120 trading days prior to the event, starting at t = -150 and ending at t = -30. This yields stable observations while avoiding pre-leak information (MacKinlay, 1997). Weekends and international holidays are removed to ensure consistent trading day structures across countries.

Table 2. Estimation Window

Trading day (t)	*Date*
-150	01-09-2015
…	…
-30	04-03-2016

4.1.2 The Market Model

To estimate the expected (*normal*) returns in the event window, we apply the standard market model. The market model is commonly used and assumes a linear relationship between a firm's return and the return of a *relevant* market index. The model is simple, but it has been proven that adding more factors rarely improves explanatory power (MacKinlay, 1997). The equation follows:

$$\text{Daily Return}_{i,t} = \alpha_i + \beta_i \text{ Market Index}_t + \varepsilon_{i,t}$$

The firm-specific betas (β_i) presents the market relationship while the alphas (α_i) acts as a constant firm-specific baseline.

4.1.3 OLS for Firm-Specific Betas and Alphas

Prior to the estimation of firm-specific parameters we prepare daily returns for each firm over the estimation window. The equation follows:

$$\text{Daily Return}_{i,t} = (\text{Closing Price}_{i,t} \div \text{Closing Price}_{i,t-1}) - 1$$

After this, we implement the market model and compute the firm-specific parameters. We adopt ordinary least squares (OLS) regressions for the estimation window, and assume the Gauss-Markov theorem holds (Newbold et al., 2020). The betas and alphas are estimated over the 120-day estimation window (*-150 to -30*) using the prepared daily returns and regional market indexes according to firm listing (*see section 4.3.4*). Formulas for the firm-specific parameters follows:

$$\hat{\beta}_i = \frac{\sum (Market\ Return\ (m,t) - Average\ Market\ Return\ (m)) * (Daily\ Return\ (i,t) - Average\ Daily\ Return\ (i))}{\sum (Market\ Return\ (m,t) - Average\ Market\ Return\ (m))^2}$$

$$\hat{\alpha}_i = \text{Average Daily Return}_i - \hat{\beta}_i * \text{Average Market Return}_m$$

4.1.4 Estimated Normal Returns

Once we have all firm-specific alphas and betas, the expected normal return during our event window can be calculated as follows (*where t will be days -1 to +1*):

$$\text{Expected Normal Return}_{i,t} = \hat{\alpha_i} + \hat{\beta}_i * MarketReturn_{m,t}$$

4.1.5 Cumulative Abnormal Returns

Once expected normal returns are calculated we can compute abnormal returns (ARs) for our event window. The equation follows:

$$\text{Abnormal Return}_{i,t} = \text{Daily Return}_{i,t} - \text{Expected Normal Return}_{i,t}$$

The daily return is the actual return for the specific firm on the specific trading day. The expected one is estimated and serves as a baseline for how the security would behave in case of the event not happening. Abnormal returns are computed for all firms for the event window [-1; +1], and summarized per firm for the entire event window as cumulative abnormal returns (CARs). This gives insight on the performance for the full event window. The equation follows:

$$\text{Cumulative Abnormal Return}_i(t_{-1}, t_1) = \sum_{t=t-1}^{t1} \text{Abnormal Return}_{i,t}$$

As we are interested in the abnormal returns for the full sample categories, we compute sample averages called "cumulative average abnormal returns" (CAARs). Here N_s is the number of firms in the sample categories where the s represents the sample categories ($s \in$ *{mentioned intermediaries, industry peers, control group}*). The calculation follows as:

$$\text{Cumulative Avg. Abnormal Return}_s(t_{-1}, t_1) = \frac{1}{N(s)} \sum_{t=t-1}^{t1} \text{Cumulative Abnormal Return}_{i,t}$$

All these equations are similar to MacKinlay's (1997) equations, with some moderations to adapt to our specific event window.

4.1.6 T-Test

To test whether the CAARs differ significantly from zero, we employ the standard **parametric** t-test used in event studies (MacKinlay, 1997). The hypotheses are:

$$\mathbf{H_0}: \text{Cumulative Avg. Abnormal Returns } (t\text{-}1, t1) \geq 0$$
$$\mathbf{H_1}: \text{Cumulative Avg. Abnormal Returns } (t\text{-}1, t1) < 0$$

The test statistic follows:

$$t = \frac{Cumulative\ Average\ Abnormal\ Return(s)\ (t-1, t+1)}{\sqrt{var(Cumulative\ Average\ Abnormal\ Return(s)\ (t-1, t+1))}}$$

The t-test enables us to see the significance of our findings, and we perform it for all three sample categories. The t-test assumes homoscedasticity, normality and independence of observations (*see section 4.4.2 for more*). Since these assumptions are often violated in an event study we complement our study with a non-parametric test (Brown and Warner, 1985; Kothari and Warner, 2004; Kolari and Pynnönen, 2010).

4.1.7 Sign Test

The sign test is a **non-parametric** significance test that evaluates whether more than half of the CARs in a sample are negative. If the event had no impact on stock prices, abnormal returns should have a 50/50 distribution between positive and negative signs. A difference from this baseline implies there has been a systematic impact on stock prices. The test is robust to outliers, skewness, normality and heteroskedasticity in abnormal returns. We employ the equations from Newbold et al. (2020). The hypothesis follows:

$$\mathbf{H_0}: P \leq 0.5 \quad (\textit{50\% or fewer have negative CARs})$$
$$\mathbf{H_1}: P > 0.5 \quad (\textit{50\% or more have negative CARs})$$

As all sample sizes have sufficient sample sizes ($N_s \geq 20$), we utilize the central limit theorem. This enables us to assume an approximate normal distribution to the binomial distribution (Newbold et al., 2020). Thus, we apply the following test statistic:

$$z = \frac{(Corrected\ Test\ Statistic - Mean)}{Standard\ Deviation}$$

We compute the mean and standard deviation for each sample category in accordance to:

$$\text{Mean} = N_s * P = N_s * 0.5$$

$$\text{Standard Deviation} = \sqrt{(N(s) * P)(1 - P)} = \sqrt{0.25 * N(s)} = 0.5 * \sqrt{N(s)}$$

As our sign test is an upper one-tailed test we apply the following correction for continuity:

$$\text{Corrected Test Statistic} = \text{Number of Securities with Negative CAR} - 0.5$$

4.1.8 Regression on Governance

In addition to our event study we performed a cross-sectional multivariate regression to examine whether differences in country-level governance help explain variations in the reputational spillover reactions of the peers and the control group. While the event study identifies average reaction through the CAAR, the regression explores whether country governance can explain why some firms were affected more or less of the *intermediary* peers.

Country-level governance quality is measured using the World Bank's Worldwide Governance Indicators (Worldwide Governance Indicators, 2024). We average the six dimensions (*Voice and Accountability, Political Stability, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption*) which are all ranging from -2.5 to 2.5 to obtain a composite index ("WGI") reflecting pre-event institutional quality. Using data from 2015 we ensure governance is determined prior to the event.

Following standard practice in event study research we regress CARs from our event window [-1; +1] on the governance index (WGI) along with the control variables: size, leverage, profitability (Palmrose et al., 2004). We include a peer dummy for sample-belonging (*1 for industry peers and 0 for control group*). Finally, to test the moderating relationship we add a moderating effect between the peer dummy and the governance variable, aligned to standard practice (Watson and Woodliff, 2014). For more precise variable definitions, see 7.3 Appendix, Table 18. The equation follows:

$$\text{Cumulative Abnormal Return}_i = \alpha_i + \beta_1 \text{Peer}_i + \beta_2 \text{WGI}_i + \beta_3 \text{Peer}_i \text{ x } \text{WGI}_i + \beta_4 \text{Size}_i + \beta_5 \text{Profitability}_i + \beta_6 \text{Leverage}_i$$

4.2 Sign Expectation

The purpose of this section is to bridge our hypotheses with our method - making interpretation of our results facilitated.

4.2.1 Expected Signs of Cumulative Average Abnormal Returns

For the [-1; +1] event window, we expect **negative** CAARs for the mentioned intermediaries and their industry peers, due to anticipated contagion effects (*see section 3. Theory and Hypothesis Development*). The control group serves as a benchmark and is expected to show a CAAR close to zero.

4.2.2 Expected Outcomes for Significance Tests

To evaluate whether the event caused systematic valuation effects, we perform both a t-test on CAARs as well as a sign test on the proportion of firms with negative CARs. As both tests compute p-values for significance, our expectations concern (1) the sign of the effects and (2) significance levels. For (1) sign of the effects, we expect mentioned intermediaries and industry peers to experience **negative** CAARs, and since the majority of CARs are expected to be negative for these groups. For the control group we expect a CAAR close to zero, indicating no systematic effect, and a distribution of negatives versus positives close to 50/50. For both of these one-tailed tests we adopt a 95% confidence interval, and will since have 5% p-value as our cut-off for significance. Thus, regarding (2) significance levels, we expect both the mentioned intermediaries and industry peers to have significant effects, yielding p-values ≤ 0.05. For the control group we believe the results will be insignificant, as there should be no systematic effect, suggesting a p-value > 0.05.

4.2.3 Expected Outcomes for Governance Regression

Reflecting back on our equation in 4.1.8 we expect the governance variable (WGI) to carry a negative and significant value. In addition, as we believe industry peers should experience a negative effect while the control group is unaffected, thus we expect the sample-belonging-dummy to be negative and significant. Aligned to these reasons, the moderating variable is expected to be negative and significant. As for the event study we adopt a 95% confidence interval, suggesting a p-value threshold of 5%.

4.3 Sample Construction and Data Collection

In this section we will guide through our sample constructions and selection of market indexes. We have three groups of samples:

1. Publicly listed intermediaries mentioned in the Panama Papers
2. Industry peers to intermediaries mentioned in the Panama Papers
3. Control Group

The first group is to test the direct effect in Hypothesis 1a, the second group is to test the spillover effect in Hypothesis 1b and Hypothesis 2, and the last group is for benchmark and Hypothesis 2.

4.3.1 Selection of Industry and Countries

As we are studying an *industry spillover effect* in this thesis we must select a specific industry to observe. To ensure we make selections based on as much data as possible, we analyzed industry-belonging for **all** intermediaries in the ICIJ database. After sample cleaning we concluded 1,991 intermediaries to base selection of, including both private and public companies (*see 7.1 Appendix, Table 14*). It became apparent most intermediary firms belonged to the industries *industrials* and *financials* (*see 7.1 Appendix, Table 15 Panel A*), and while the financial industry resonates as a common intermediary industry, we decided to specify the industrials industry. Thus, we investigated the industrials industry to realize a clear majority of firms in the industrials industry stemmed from the *professional services* subindustry (*see 7.1 Appendix, Table 15 Panel B*). Professional services include legal services and accounting, which are more common areas for intermediaries than the broad "industrials" who include machinery, etc. (Policy Department A: Economic and Scientific Policy, 2017). Concluding from our findings we decided to identify our industry as an "***intermediary industry***" where the financials industry is included as well as the subindustry professional services. All our samples will belong to this industry.

Additionally, we needed to employ a geographical constraint to our samples. For the intermediaries mentioned in Panama Papers, we already suffer a small sample size and will thus include all countries. However, as we examine the industry spillover effect on the industry peers, we want to record changes in returns where a reaction from the Panama Papers is reasonable and probable. Thus, we chose the top 10 recurring countries in our 1,991 sample of intermediaries (*see 7.1 Appendix, Table 16*). The cutoff is conservative to not dilute

our results. The control group follows the logic that a stock market reaction will not happen for firms who belong to the same industry, but are located in countries where very few intermediaries were mentioned in the Panama Papers. Thus, the control group concluded all other countries who weren't reserved for the industry peer sample group. See table below:

Table 3. Country Selection for Samples

Sample Category	*Countries*
Industry Peers	United Kingdom (*including Guernsey & Jersey*), Switzerland, USA, Hong Kong, Luxembourg, France, Netherlands, Germany
Control Group	All countries in the following regions: Emerging Europe, Emerging Asia-Pacific, Middle East, Africa, Latin America and Caribbean Countries in Developed Europe: Andorra, Austria, Belgium, Cyprus, Czechia, Denmark, Finland, Greece, Greenland, Gibraltar, Iceland, Ireland, Italy, Liechtenstein, Malta, Monaco, Norway, Portugal, San Marino, Slovakia, Slovenia, Spain, Sweden, Vatican City Countries in Developed Asia-Pacific: Australia, Japan, New Zealand, Singapore, South Korea, Taiwan Other: Canada

4.3.2 Sample Construction of Intermediaries Mentioned in Panama Papers

The data from the ICIJ has then been cleaned and filtered through the following steps:

Table 4. Sample Construction of Intermediaries from Panama Papers

Step in Data Cleaning Process	*Attribution*	*Sample Size*
All intermediaries mentioned in the ICIJ database		14,388
Used Capital IQ template "identifier" to match the names in the ICIJ database to firms in the Capital IQ database	*-1,110*	13,278
Removed firms with NA stock prices in event window	*-12,645***	633
Manual legitimacy checking of matches from step 2	*-486*	147
Filter so firms belong to the *intermediary industry**	*-101*	46
Removed firms who had any NA in the estimation window	*-4*	42
Removed outlier (*see 4.4.1 Outliers*)	*-1*	**41**

**See section 4.3.1 for motivation of industry selection (the "intermediary industry")*

***The drastic attribution is explained through many intermediaries being private firms*

4.3.3 Sample Construction of Industry Peers and Control Group

As the sample construction was similar between industry peers and the control group we will present the first steps simultaneously.

Table 5. Sample Construction of Industry Peers and Control Group

Step in Data Cleaning Process	*Attribution*	*Sample Size*
Filter for all public firms		72,852
Filter out so no NA in stock price for robust event window [-2; +2] (*see section 4.4.3 Robustness Check Event Window*)	*-44,751*	28,101
Filter so firms belong to the *intermediary industry**	*-24,733*	3,368
Removing outliers (*see 4.4.1 Outliers*)	*-502*	2,866
Industry peer sample**		**1,191**
Control group sample**		**1,675**

**See section 4.3.1 for motivation of industry selection (the "intermediary industry")*

***Sorting based on country-division between sample categories (see 4.3.1 and Table 3)*

4.3.4 Selection of Market Index

As our firms across all sample categories are spread out world-wide (*see 4.3.1 Selection of Industry and Countries*) we settled on 6 indexes. One is USA-specific, since our industry peer sample has a large portion of USA-based firms. For other regions we have broad price return indexes with both emerging and developed countries, aligned to our country selection.

Table 6. Index Selection

Region	*Index*
USA	S&P 500
Canada	S&P/TSX Composite Index - Multi-Utilities
Europe	STOXX Europe 600
Asia Pacific	MSCI AC Asia Pacific Index
Latin America Caribbean	MSCI Fm Latin America & Caribbean Index
Africa	S&P Africa Frontier BMI

4.3.5 Data Collection

The data collection has been from two main sources, the ICIJ database and S&P Capital IQ Pro. The data about the mentioned intermediaries were found in the ICIJ database which is available free for the public. All other information has been extracted from S&P Capital IQ using their Excel plug-in function.

4.3.6 Sample Modification for Governance Regression

Our sample for the governance regression includes all industry peers and control firms (*see Table 5. Sample Construction of Industry Peers and Control Group*). This concludes a sample size of 2,866 firms, but as South Korea and some island-nations had missing governance scores, they were removed (*attribution: -47*). After that, all firms with missing values across our data categories were sorted away (*attribution: -1,220*), leaving us with a sample size of 1,599 firms (*918 control and 681 peers*).

4.4 Statistical Considerations and Robustness

Before conducting the statistical t-tests on cumulative average abnormal returns (CAARs), we do diagnostic procedures to verify underlying assumptions hold. In addition, we control for outliers and conduct robustness checks. We do similar efforts for governance regression.

4.4.1 Outliers

As we do not want our results on any of the tests, or the calculations of CAARs, to be distorted due to outliers we use the Cook's Distance. The Cook Distance will measure the influence of observations on estimated parameters. Since, firm-specific CARs with a Cook's Distance exceeding 4/n are removed from the sample to not dilute any results. We further conduct descriptive analytics (*such as boxplot quartiles*) of our data to reason on distribution (*see 5.1 Description of Data*).

4.4.2 Assumption Testing for the T-Test

The t-test assumes a **normal distribution** which is often violated in an event study (Brown and Warner, 1985). To test the normality of our CARs we do both visual (*Q-Q plot and histograms*) and statistical methods such as the Kolmogorov-Smirnov test. Additionally, as the test is sensitive to normality it is sensitive to significant **outliers** as well. As stated, this is

addressed through the Cook's D. Further, the t-test assumes **homoskedasticity**, which implies that the variance of cumulative abnormal returns remains constant across the sample. To test this, the Breusch-Pagan and White tests will be performed. The **independence of observations** assumption requires that each observation of CARs be unrelated to others. However, since all firms experience the same event (*disclosure of the Panama Papers*) on the same date, their CARs are subject to cross-sectional dependence due to shared market reaction (Kolari and Pynnönen, 2010). This is acknowledged as a limitation. Accounting for limitations and eventual violated assumptions of the t-test, we do the non-parametric sign test as a robustness (*see 4.1.7 Sign Test*).

4.4.3 Robustness Checks for Event Study

Elaborated on in section 4.1.1 Event Time Frames, we chose the event window of [-1; +1] trading days. As a robustness check we will do all tests for the **longer [-2; +2] event window** too. We believe all market reactions should be detected in the shorter event window, but in case of private information pre-disclosure or lagged reactions we test for a longer window too, for all samples.

Additionally, while the 3rd of April represents the release of the Panama Papers, with journalists publishing articles and documents, it is not the date of the database launch. Instead, the ICIJ's searchable database containing all documents was released on the 9th of May 2016 (ICIJ, 2016). The database made information easy for users to obtain, in contrast to the data-dump released earlier in April. Since, it is probable that intermediaries mentioned in the Panama Papers had investor reactions on the 9th of May rather than the 3rd of April, we compute an event study for the event window [-1; +1] for **event day 9th of May** too as a robustness check. We employ this additional test only for the mentioned intermediaries, as industry peers should observe effects at the actual release, given that many articles on intermediaries' role and industry were released within our original event window (Christensen, 2016; Mossack Fonseca, 2016).

Revealed in *4.3.2 Sample Construction of Intermediaries Mentioned in Panama Papers* the final sample of mentioned intermediaries is 41 firms. This is a very small sample size, limiting statistical power. In table 4 one can see the sample size diminished by 101 firms when we sort out for the *intermediary industry*. While the sorting has the purpose of keeping our study focused on the same industry for all sample categories, we will as a robustness

perform all statistical tests, including the robustness check for the **larger sample size with *intermediaries mentioned including all industries***. The sample size goes from 147 to 136 (*attribution: -11*) when we remove outliers and firms who had NA values in the estimation window (*see 4.4.1 Outliers*).

4.4.4 Assumption Testing and Remedies for Governance Regression

Assumptions for the regression include linearity, no multicollinearity, normality of errors and homoskedasticity (Newbold et al., 2020). Linearity will be checked visually with a scatterplot and homoskedasticity with the Bresuh-Pagan test. For normality of errors the Kolmogorov-Smirnov test and a visual check of histograms will be performed. We expect mechanical multicollinearity due to the inclusion of the moderation term which will be tested by Variance Inflation Factor (VIF). This potential problem is solved by mean-centering the continuous WGI variable before creating the moderation term according to standard practice. This reduces multicollinearity, and makes the coefficients more interpretable (Huang et al., 2012). Mean-centering changes the reference point so the industry peer sample-belonging-dummy will represent the value when WGI is at its average level, rather than zero**.** This does not affect the significance levels. In addition, we perform a correlation matrix for the additional variables in the regression to ensure no variables have high correlation, as this can dilute results (Newbold et al., 2020).

4.4.5 Robustness Checks for Governance Regression

For robustness checking of the regression on governance quality we run the test without influential points. While CAR outliers have already been removed for this sample in accordance with 4.4.1, this step extends to exclude outliers in profitability, size and leverage through the Cook's D (*attribution: -41*). Since, the adjusted sample size becomes 1,558 firms. This is done to see if results are dependent on influential points.

5. Results

In this section we present the result we have found through our empirical studies. We investigate what our data looks like, (cumulative) abnormal returns across our event window and significance tests. We review results from our regression on governance as well as our assumption testings and robustness checks.

5.1 Description of Data

Table 7 reports firm-level CARs over the event window of [-1; +1] for all three samples. For mentioned intermediaries, CARs are centered close to zero with a relatively narrow interquartile range with no extreme outliers. For industry peers, the mean CAR is more negative while the median is closer to zero. This, in combination with the wide range suggests there were a few very large negative observations, even after outlier control. For the control group the CAR is around zero with a quite symmetric interquartile range, consistent with our expectation of no obvious systematic effect.

Table 7. Descriptive Statistics of CARs for Event Window [-1; +1]

Sample Category	*Mean*	*Min*	*Q1*	*Median*	*Q3*	*Max*
Mentioned Intermediaries	-0.0028	-0.0748	-0.0095	-0.0007	0.0062	0.0655
Industry Peers	-0.0338	-7.2850	-0.0174	-0.0019	0.0061	0.9894
Control Group	0.0008	-0.9462	-0.0193	-0.0008	0.0144	1.1354

Sample size: 41 Mentioned Intermediaries; 1,191 Industry Peers; 1,675 Control Group

5.2 Abnormal Returns in Event Window

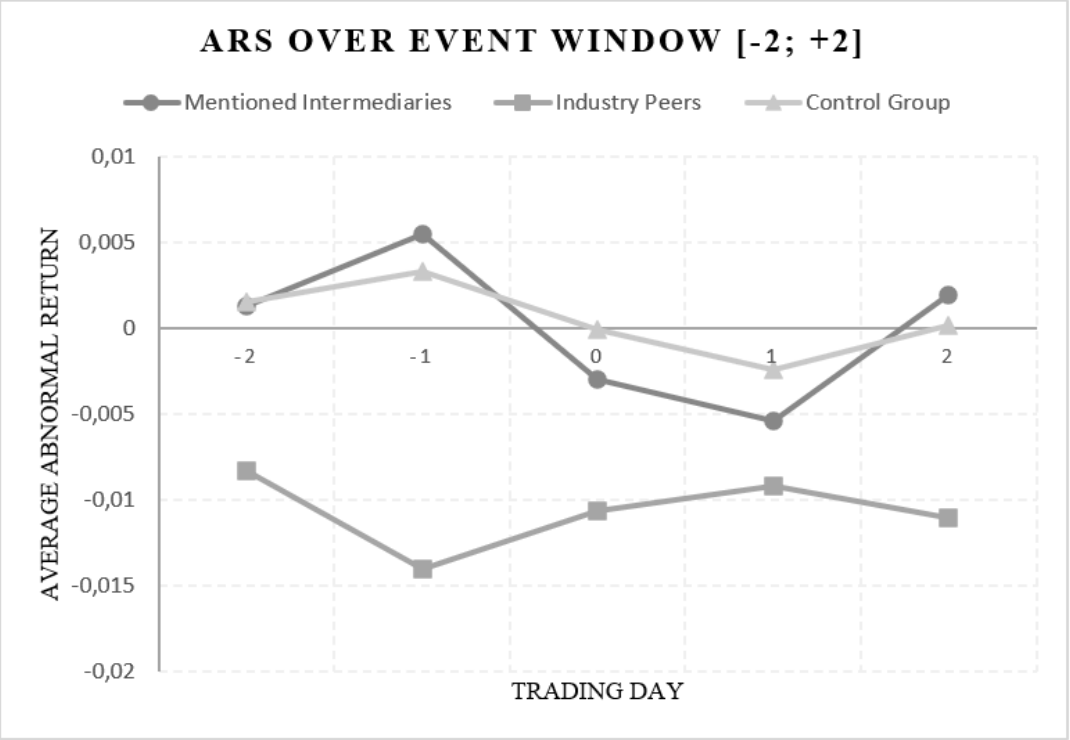
Table 8 shows AARs and CAARs for the event window [-1; +1]. The mentioned intermediaries experience a small negative CAAR of -0.28% while the industry peers have a CAAR of -3.38% with consistently negative AARs over the event period. For control group AARs are close to zero on all three days, consistent with an expectation of no meaningful market reaction. Figure 2 maps out the AARs for the robust event window of [-2; +2]. It is apparent that mentioned intermediaries' and control groups experience a dip in returns for trading day 0 and 1, while the industry peers have a dip already on day -1.

Table 8. (Cumulative) Average Abnormal Returns for Event Window [-1; +1]

Sample Category	*AAR (t -1)*	*AAR (t 0)*	*AAR (t +1)*	*CAAR*
Mentioned Intermediaries	0.0055	-0.0030	-0.0054	-0.0028
Industry Peers	-0.0140	-0.0106	-0.0092	-0.0338
Control Group	0.0033	-0.0001	-0.0024	0.0008

Sample size: 41 Mentioned Intermediaries; 1,191 Industry Peers; 1,675 Control Group

Figure 2. AARs over the Robust Event Window [-2; +2]



5.3 Significance Tests and Assumption Testing

Here we present results relevant for hypothesis testing and connect it to 4.2 Sign Expectation.

5.3.1 Results from Assumption Testing for T-Test

Due to the shared event day the assumption of independent observations is violated for all samples (*see 4.4.2*). For mentioned intermediaries CARs are consistent with normality and the White test indicates homoskedasticity. For industry peers and control group normality is formally rejected by the Kolmogorov-Smirnov test. For both samples the White test suggests homoskedasticity. Given the large sample size, the t-test remains informative, but the sign test will be more appropriate for analysis.

5.3.2 Results from T-Test

Table 9 summarizes the results from the t-test. For mentioned intermediaries, CAAR is -0.28% with a p-value of 0.2608 disabling us to reject the null hypothesis (threshold p-value ≤ 0.05). Since, there is no significant evidence of a negative market reaction for H_{1a}. For industry peers, CAAR is -3.38% with a p-value < 0.0001, yielding significant results (threshold p-value ≤ 0.05). The null hypothesis can be strongly rejected, providing support for H_{1b}. For the control group CAAR is 0.08% with an insignificant p-value, indicating no significant effect, just as expected.

Table 9. T-Test Results Event Window [-1; +1]

Sample Category	*Sample Size*	*CAAR*	*t-value*	*p-value*
Mentioned Intermediaries	41	-0.0028	-0.641	0.2608
Industry Peers	1,191	-0.0338	-4.840	< 0.0001*
Control Group	1,675	0.0008	0.457	0.6763

**Significant result at 5% significance level*

5.3.3 Results from Sign Test

Table 10 holds the sign test results. For mentioned intermediaries, 53.7% of firms have a negative CAR with a p-value of 0.3774 (threshold p-value ≤ 0.05). Hence, results do not support a systematic negative effect for mentioned intermediaries (H_{1a}). For industry peers 58.7% of CARs are negative with a p-value < 0.0001. This strongly confirms that negative CARs are more frequent in this event for industry peers than under the 50/50 benchmark of no systematic events, supporting H_{1b}. For the control group, 52.4% of CARs are negative, and the p-value of 0.0253 indicates a significant negative systematic effect, which we did not expect.

Table 10. Sign Test Results Event Window [-1; +1]

Sample Category	*Sample Size*	*% Negative*	*z-value*	*p-value*
Mentioned Intermediaries	41	53.7%	0.312	0.3774
Industry Peers	1,191	58.7%	5.943	< 0.0001*
Control Group	1,675	52.4%	1.955	0.0253*

**Significant result at 5% significance level*

5.3.4 Results from Assumption Testing and Remedies for Governance Regression

The correlation matrix we ran detected no dramatic correlations (*see 7.3 Appendix, Table 19*). However, as expected, we detected mechanical multicollinearity (*see section 4.4.4 Assumption Testing and Remedies for Governance Regression*). This was remedied by centering our governance variable (WGI), as explained in 4.4.4. This decreased the multicollinearity measure VIF for the sample-belonging-dummy and the moderation term from around 53 and 54 to both being under 9 and thus acceptable levels. The other variables all had VIF scores under 2, indicating no multicollinearity. Furthermore, we detect heteroskedasticity which is remedied by using robust standard errors. The assumption of normality is rejected but given the large sample size, the t-test remains informative. The data followed linearity.

5.3.5 Results from Regression on Governance

Table 11 reports the results of the regression of CARs on peer status (*dummy*), governance quality (WGI), their interaction term and firm level-level control variables:

$$\text{Cumulative Abnormal Return}_i = \alpha_i + \beta_1 \text{Peer}_i + \beta_2 \text{WGI}_i + \beta_3 \text{Peer}_i \text{ x WGI}_i + \beta_4 \text{Size}_i + \beta_5 \text{Profitability}_i + \beta_6 \text{Leverage}_i$$

Reviewing our results, the coefficient for the peer dummy is close to zero and statistically insignificant (β_1 = -0.0005, p-value = 0.9294), indicating there is no difference in CARs between the peer firms and the control group when we account for other variables. Additionally, the interaction term between peer status and governance (Peer_i x WGI_i) is small and insignificant (β_3 = 0.0039, p-value = 0.6381), implying that governance levels do not moderate the relationship between the sample-belonging-dummy and the reputational spillover. Thus, the effect of governance on CARs operates similarly for both peers and control firms, and CAR differences do not stem from sample group belonging (*peer versus control*). Rather, governance scores (WGI) show a statistically significant negative association with CARs (β_2 = -0.0072, p-value = 0.0031). This implies that firms located in higher-governance countries experienced more negative cumulative abnormal returns during the event window, aligned to H_2. The control variables are all insignificant. The model explains a small proportion of the variations in CARs (R^2: 1.957%).

Table 11. Results from Regression on CAR from Industry Peers

	Coefficient	*Std. Error*	*t-value*	*p-value*
(Intercept)	0.0029	0.0158	0.1815	0.8560
Peer	-0.0005	0.0056	-0.0886	0.9294
WGI	-0.0072	0.0024	-2.9646	0.0031*
Peer x WGI	0.0039	0.0083	0.4704	0.6381
Size	-0.0004	0.0010	-0.4390	0.6607
Profitability	-0.0171	0.0139	-1.2305	0.2187
Leverage	-0.0019	0.0029	-0.6482	0.5169

**Significant result at 5% significance level*
Number of observations: 1,599
R^2: 1.957%

To further understand our event study results (*t-test and sign test*) for the industry peers and control group through the lens of governance quality, we examine the governance regression results for the sample groups separately. In table 12 we have CAARs and the weighted average governance WGI scores for both sample groups, along with the proportion of sample firms with a WGI under 0 (*implying % of firms operating in countries with low governance*). It's apparent the industry peers all (*100%*) operate in countries with a high governance quality, proven by an average WGI of 1.2756 and a negative CAAR of -0.56%. In contrast, the control group has an almost-even distribution between high versus low governance quality for a firm's country-belonging (*48% low governance*). Quantified by an average WGI of 0.4230, the control sample has a wider range in governance quality, and this yields a lower CAAR of -0.13%..

Table 12. Country Governance Distribution Among Control and Industry Peers

	Sample Size	*CAAR**	*WGI Weighted Avg.*	*% of WGI < 0*
Industry Peers	681	-0.0056	1.2756	0%
Control Group	918	-0.0013	0.4230	48%

**Event Window of [-1; +1]*

While the industry peers seem governance homogenous, we dissect the control group even further to gain clarity in its scattered governance quality range. As seen in table 13, we split the control group sample into two groups: one with low governance and one with high. For the low governance half (WGI < 0), the average WGI is -0.3595, resulting in a CAAR of 0.39%, a slightly positive tilt. For control group firms with high governance (WGI > 0), the average WGI is 1.1527 and the CAAR becomes -0.61%. Comparing these findings with the industry peers in table 12, we can see the results from high governance control firms are very similar to the industry peers who are all high governance.

Table 13. Dissection of Control Group based on WGI-Scores

	Sample Size	*CAAR**	*WGI Weighted Avg.*
WGI < 0 (*low governance*)	443	0.0039	-0.3595
WGI > 0 (*high governance*)	475	-0.0061	1.1527

**Event Window of [-1; +1]*

While these dissections of WGIs and analyses towards CAAR (*table 12 and 13*) give insightful information, the lack of significance tests on the *"new"* CAARs supports conservative assumptions from the results. However, it still operates as an indicator.

5.4 Robustness Analyses

We perform robustness tests to ensure results are rigid (*see sections 4.4.3 and 4.4.5*).

5.4.1 Event Window [-2; +2]

Table 20 in 7.4 Appendix shows that extending the event window leaves the main conclusions unchanged. For mentioned intermediaries, CAAR is essentially zero (0.04%), % negative from the sign test is 43.9%, but both the t-test and the sign test are insignificant. For the industry peers CAAR becomes even more negative (-5.35%) and proportion of negative signs increases to 59.3%. Both tests display significant results (p-value < 0.0001). For the control group, the CAAR maintains around zero and the proportion of negatives is 51.3%. Both results are insignificant, which is a contrast to the regular event window of [-1; +1] where the sign test left significant results.

5.4.2 Event Day 9th of May for Mentioned Intermediaries

Table 21 in 7.4 Appendix gives results for the alternative event day of 9th of May 2016. For the 41 mentioned intermediaries, CAAR over [-1; +1] is positive with 1.46% and only 41.5% of firms have negative CARs. However, both tests remain insignificant. For the event window of [-2; +2] the CAAR is around zero (-0.20%) and the proportion of negative signs is 43.9%, both results are insignificant. Concluding from this it is apparent that switching to the database launch date does not reveal any systematic valuation losses for the mentioned intermediaries.

5.4.3 Larger Sample for Mentioned Intermediaries

Table 22 in 7.4 Appendix we have results for the larger robust mentioned intermediaries sample where all industries are included. Across all specifications (3rd of April versus 9th of May, [-1; +1] versus [-2; +2]) CAARs remain very small (ranges between 0.09% to -0.47%) and proportion of negatives ranges between 45.6% to 50.0%. All results for the t-tests and sign tests are insignificant. Since, enlarging the sample did not change any of our findings. It remains true that directly mentioned intermediaries did not experience a systematic negative market reaction according to our tests.

5.4.4 Controlling for Outliers in Governance Regression

As a robustness check we ran the regression after adjusting for outliers. We detected 41 influential points (*outliers*), concluding an adjusted sample size of 1,558. The results from this adjusted regression yielded a remaining negative WGI estimate with an even more significant p-value (β_2 = -0.0069, p-value < 0.0001). These results confirmed the stability of our main test and its findings. Additionally, profitability became significant with β_5 = -0.0150 and p-value < 0.001, indicating that earlier profitable firms suffer from larger reputational spillover effects. The rest of the variables remained insignificant.

6. Analysis and Discussion

In this section we analyze our results and connect it to our hypotheses, theory and prior literature. In addition, we reflect on contribution, limitations of our study, suggestions for future research and end with some concluding remarks.

6.1 Analysis

In this study we aimed to study the following **research question**: "*does reputation operate as a firm-specific intangible asset or as a shared industry-level resource, and under what circumstances is it impaired?*". We formulate hypotheses to test this: one regarding direct effect, one on industry spillover effects and lastly one on governance quality's role in the reputational spillover effects. Through this we gain understanding on whether reputational capital functions on a firm-level or an industry-level, and if country-level governance quality impacts reputational spillover effects.

6.1.1 Hypothesis Testing of Reputational Direct Effect (H_{1a})

We return to the hypothesis on the direct effect as we now have our results:

> **H_{1a}**: Publicly traded intermediaries explicitly mentioned in the Panama Papers experience ***negative*** and ***significant*** cumulative average abnormal returns in the days around the leak, reflecting loss of reputational capital

In section *3.1 Direct Effect of Corporate Reputation* we reasoned we expected a negative and significant CAAR for the intermediaries explicitly mentioned in the Panama Papers, reflecting a loss of reputational capital following the tax scandal. However, across all event windows, event dates and sample definitions (*the 41 core sample versus the robust 136 sample*), CAARs remain small and statistically insignificant. Additionally, the sign tests show no excess of negative CARs. Drawing from this we find **no support for H_{1a}**. This implies the leak did not cause price discounts for the mentioned intermediaries within our chosen event windows. A small sample size significantly diminishes statistical power, suggesting it could be the reason for our insignificant findings (*see 6.3 Limitations*).

6.1.2 Hypothesis Testing of Reputational Spillover Effects (H_{1b})

Our main hypothesis, H_{1b}, on the industry spillover effect follows:

> **H_{1b}**: Industry peers of intermediaries mentioned in the Panama Papers experience ***negative*** and ***significant*** cumulative average abnormal returns in the days around the leak, reflecting reputational contagion effects

In section *3.2 Spillover Effects of Corporate Reputation* we concluded an expectation of a reputational contagion effect, expecting the CAAR of industry peers to the mentioned intermediaries to be significantly negative. For this hypothesis testing, evidence remains strong and consistent. Industry peers show significantly negative CAARs in both event windows ([-1; +1] and [-2; +2]), and the AARs are negative for all event days. Additionally, the sign tests prove a clear majority of the sample have negative CARs for both event windows. Results from both the t-tests and the sign tests are highly significant, concluding our evidence proves **strong support for H_{1b}**. This implies that reputational damage from the Panama Papers was priced at industry-level, with *uninvolved* industry peers suffering broad value decline. The results further exist as evidence of the reputational capital being impaired in the event of a tax scandal (*the Panama Papers leak*). These findings are consistent with the expectation of a contagion effect on perceived reputational risk.

A final point on H_{1b} is regarding the control group's results. Their CAAR is close to zero and insignificant in the t-test, but for the sign test they display a small - but significant - deviation from the 50/50 benchmark (52.4% negative CARs). While the deviation from the benchmark 50/50 is small and the significance did not hold for the longer robust event window, it implies some firms in the sample experienced a systematic effect from the Panama Papers leak. As the control group was designed to include countries with minimal exposure to the Panama Papers-mentioned intermediaries, the significance of the result suggests the industry spillover effect extends beyond countries we assumed would be the most affected. Since, it seems the spillover effect operates beyond our industry peer/control group classification (*see 4.3.1 Selection of Industry and Countries*). We further investigate and analyze the significance of the control group's sign test through our governance regression.

6.1.3 Hypothesis Testing of Governance Quality and Spillover Effects (H_2)

Our second hypothesis on governance quality was:

> **H_2**: Firms located in countries with higher governance quality experience more ***negative*** and ***significant*** cumulative abnormal returns around the leak

Our results from section 5.3.5 reveal that the governance quality coefficient (WGI) is negative and significant. In addition, the robustness check confirmed the findings (*see section 5.4.4*). Through these results we find **support for H_2**, implying firms (in the *intermediary* industry) located in countries with high governance quality experience a magnified, negative impairment of their reputational capital in contrast to firms in low governance countries.

In 5.3.5 we noted both the sample-belonging industry peer dummy and the interaction term are proven insignificant. This implies there is no empirical evidence that belonging to the industry peer sample impacts the reputational spillover effect. Our initial division of firms between industry peers and the control group based on local exposure (*see 4.3.1 Selection of Industry and Countries*), is concluded insignificant. The effect was spread globally even to low-exposure countries in our control sample. Instead the reputational spillover effects within the *intermediary* industry is conditional to the governance quality of the country in which the firm is located.

Tables 11 and 12 provide a simple explanation to why industry peers reacted stronger in our event study: the sample simply consisted of many more firms in high governance countries. While these findings are insightful, it remains true the model's explanatory power is limited (R^2: 1.957%). This is common for regressions on cross-sectional return models, where idiosyncratic noise dominates (Brown et al., 1999). As even highly cited accounting studies often display a low explanatory power, our analysis focuses on model findings rather than the explanatory power (Johannesson et al., 2023).

6.2 Contribution

Our study provides three contributions for literature on reputational capital, tax scandals and industry spillover effects. Our main contribution is towards literature on reputational capital through our investigation of *reputation as a firm-level intangible asset or industry-level resource*. Through our study of industry spillover effects for the Panama Papers we find reputation operates as an industry-level resource. Understanding what level reputational capital operates on assists reputation and risk management. Our finding challenges traditional views of reputation as firm-specific (Fombrun, 1996; Ibbotson et al., 2018).

Our second and third contributions cover conditions for reputational impairment. The second one finds reputation, *and firm value*, is deducted following a tax scandal for firms in the same industry as firms object to the scandal. This empirical finding contributes to literature on tax scandals and adverse events through exploring monetary consequences following a scandal. Further, it contributes to literature on industry spillover effects in adverse events, enabling deeper analysis of firm implications for industry-belonging. The third contribution embeds insight for literature on country governance too, as we find country-level governance quality shapes industry spillover effects for a tax scandal. This gives understanding of how governance context shapes spillover effects and investor behavior. Both contributions contribute to literature on reputational capital as they cover impairment conditions.

6.3 Limitations

Although our study provided evidence for an industry-level reputational spillover effect, several limitations should be acknowledged. Firstly, the t-tests for the event-study had assumptions only partially satisfied *(see 5.3.1 Results from Assumption Testing for T-Test*). Thus, the significant results for industry peers are since analyzed in a critical lens. While a complementary non-parametric test was conducted, the violation of normality is still a methodological limitation in our study. In addition to this, our sample of intermediaries explicitly mentioned in the Panama Papers suffered a small sample size of 41. While we performed robustness checks on an enlarged sample of 136 firms, results remained insignificant. Such small sample sizes reduce the statistical power of the tests significantly, and in our case it could be the reason we failed to find support for H_{1a}. Since, one of our main limitations was the data availability of publicly listed intermediaries mentioned in the Panama Papers.

6.4 Suggestions for Future Research

As we conclude our research topic as important and of interest for many literature disciplines, *contributing to insight on reputational capital, tax scandals and industry spillover effects,* we suggest future research to continue to investigate the topic. Drawing on the limitations of our study we faced problems with data availability, denting our statistical power. Since, for future research we suggest alternative methods of sample construction (*scrapping, algorithmic matching, etc.*) to maximize sample size. If not, expanding the study to multiple tax scandals (*Paradise Papers, Bahamas Leak, etc*) gives larger sample sizes and more robust outcomes. Further, we direct attention to the research field of mechanics behind industry spillover effects. While we delimit to one industry (*the intermediary industry*), broadening to multiple industries would determine if our findings are applicable also in other settings. We also encourage further investigation of governance qualities' relationship with spillovers. For example, examining individual parts of country governance (*financial transparency regulations, corruption index, auditing regulations, etc.*) would give a more nuanced understanding of spillover conditions.

6.5 Concluding Remarks

Returning to our **research question** "*does reputation operate as a firm-specific intangible asset or as a shared industry-level resource, and under what circumstances is it impaired?*" our study finds support for some answers. Whether *reputation operates as a firm-specific intangible asset or as a shared industry-level resource* our results support the conclusion that reputational capital functions as a shared industry-level resource. This conclusion is based on the significant negative market reactions for industry peers following the Panama Papers. Following up *under what circumstances it [reputational capital] is impaired* we find support reputational capital is impaired in the event of the Panama Papers leak, which can be generalized into a global tax scandal. Investigating governance quality's role in the industry cross-borders spillover effect we further gain support that the spillover effect, *and since the impairment of reputational capital*, is conditional to countries' governance quality. Taken together, our findings demonstrate that reputational capital is priced on an industry-level and is impaired for the industry following a tax scandal, where high country-level governance quality is conditional for firm impairment. Reflecting limitations and findings, we suggest future research should prioritize testing the direct effect on mentioned intermediaries through a larger sample size as well as the mechanics behind cross-border industry spillover effects.

7. Appendix

7.1 Appendix: Construction and Analysis of All Intermediaries

Table 14. Sample Construction for All Intermediaries

Step in Data Cleaning Process	*Attribution*	*Sample Size*
All intermediaries mentioned in the ICIJ database		14,388
Used Capital IQ template "identifier" to match the names in the ICIJ database to firms in the Capital IQ database	*-1,110*	13,278
Remove firms with blanks for country and/or industry	*-4,742*	8,536
Legitimacy checking of matches from step 2 through various matching tools in Excel (*random checks were done to ensure accuracy*)	*-6,545*	**1,991**

Table 15. Industry Belonging for All Intermediaries

Panel A. Industry

Sector	*# Firms*	*% of Firms*
Industrials	780	39%
Financials	739	37%
Consumer Discretionary	153	8%
Real Estate	90	5%
Other	229	12%
Sum	*1991*	*100%*

Panel B. Dissection of the Industry "Industrials"

Subindustry	*# Firms*	*% of Firms*
Professional Services	481	62%
Commercial Services and Supplies	107	14%
Construction and Engineering	83	11%
Trading Companies and Distributors	36	5%
Other	73	8%
Sum	*780*	*100%*

Table 16. Country Belonging for All Intermediaries (*Top 10*)

Country	*# Firms*	*% of Firms*
United Kingdom	527	26%
Switzerland	205	10%
USA	197	10%
Hong Kong	154	8%
Luxembourg	112	6%
France	51	3%
Guernsey*	50	3%
Jersey*	44	2%
Netherlands	38	2%
Germany	34	2%
Others	579	29%
Sum	*1,991*	*100%*

**Will be included into United Kingdom*

7.2 Appendix: Subindustries of Industry Peers

Table 17. Dissection of Subindustries for Industry Peers

Subindustry	*% of Firms*
Bank	57%
Asset Management	22%
Research and Consulting Services	7%
Investment Banks, Brokers and Capital Markets	5%
Speciality Finance: Consumer Focused	2%
Speciality Finance: Commercial Focused	2%
Mortgage Banks and Brokers	2%
Holding Companies, Patent Owners, and Trusts or Estates	2%
Central Banks	> 0%
Credit Unions and Mutuals	> 0%
Sum	*100%*

7.3 Appendix: Material for Governance Regression

Table 18. Variable Definition for Governance Regression

Variable	*Definition*
WGI	Average governance score ranging from -2.5 to 2.5*
Peer	"Sample-belonging-dummy" variable where industry peer takes on 1 and control group members 0
WGI x Peer	Interaction term, the moderating effect
Size	Natural logarithm of total assets*
Profitability	Buy-and-hold return from t = -120 to t = -1 with regards to 4th of April 2016
Leverage	Total Long Term Debt/Total Assets*

**End of Fiscal Year 2015*

Table 19. Correlation Matrix for the Governance Regression Variables

		(1)	(2)	(3)	(4)	(5)	(6)
CAR	(1)	1.00					
Size	(2)	0.03	1.00				
Profitability	(3)	-0.09	-0.17	1.00			
Leverage	(4)	-0.08	-0.15	0.25	1.00		
WGI	(5)	-0.08	-0.35	-0.02	0.00	1.00	
Peer	(6)	-0.04	-0.22	0.07	-0.04	0.54	1.00

7.4 Appendix: Robustness Analyses

Table 20. CARs and Significance Results for Event Window [-2; +2]

Sample Category	*CAAR*	***T-test** p-value*	*% Neg.*	***Sign test** p-value*
Mentioned Intermediaries	0.0004	0.5254	43.9%	0.8256
Industry Peers	-0.0535	< 0.0001	59.3%	< 0.0001*
Control Group	0.0025	0.8473	51.3%	0.1412

**Significant result at 5% significance level*
Sample size: 41 Mentioned Intermediaries; 1,191 Industry Peers; 1,675 Control Group

Table 21. CARs and Significance Results for Mentioned Intermediaries 9th of May

Event Window	*CAAR*	***T-test** p-value*	*% Neg.*	***Sign test** p-value*
Event Window [-1; +1]	0.0146	0.9915	41.5%	0.8256
Event Window [-2; +2]*	-0.0020	0.4019	43.9%	0.8256

**Robustness checks on event windows*
Sample size: 41

Table 22. CARs and Significance Results for Mentioned Intermediaries Robustness

Event Window	*CAAR*	***T-test** p-value*	*% Neg.*	***Sign test** p-value*
Event Window [-1; +1]	-0.0001	0.4870	45.6%	0.8675
Event Window [-2; +2]*	0.0009	0.5675	50.0%	0.5342
Event 9th of May [-1; +1]*	-0.0047	0.2140	48.5%	0.6659
Event 9th of May [-2; +2]*	-0.0043	0.2880	46.3%	0.8272

**Robustness checks on event windows*
Sample size: 136

7.5 Appendix: Use of AI

Our work is original and based on our own ideas and reasonings. However, throughout this thesis we utilized ChatGPT version 5.1 from OpenAI for grammar check and programming. We used it between 2025-09-01 to 2025-12-05 and the link is: https://chatgpt.com/.

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