The Value of Offshore Secrets – Evidence from the Panama Papers

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First Draft: April 19, 2016

This Draft: November 18, 2016

We thank Morten Bennedsen, Art Cockfield (discussant), Alexander Dyck, Julian Franks, John Gallemore, Nicola Gennaioli, Jim Hines, Karl Lins, Colin Mayer, Tom Neubig (discussant) Bastian Obermayer (Sueddeutsche Zeitung), Marco Ottaviani, Paolo Pasquariello, Uday Rajan, Fabiano Schivardi, Andrei Shleifer, and Joel Slemrod for insights that have benefitted this paper. We also thank participants at the Texas/Waterloo Tax Symposium 2016, the National Tax Association Annual Conference 2016, the Italian Economic Assocation Annual Conference 2016, and seminar participants at Concordia University, McGill University, and the University of Michigan (Finance, Public Finance). We are indebted to the International Consortium of Investigative Journalists for providing access to the Panama Papers data through their webpage. All remaining errors are our own.

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Abstract

We use the data leak of the Panama Papers on April 3, 2016 to study whether and how the use of secret offshore vehicles affects firm value around the world. The data provide insights into the operations of more than 214,000 shell companies incorporated in tax havens by Panama-based law firm Mossack Fonseca. Using event study techniques, we find that the data leak erases US$135 billion in market capitalization among 397 public firms with direct exposure to the revelations of the Panama Papers, reflecting 0.7 percent of their market value. Tax aggressive firms and firms with exposure to perceptively corrupt countries are more adversely affected. This is consistent with the leak (i) reducing firms' ability to avoid taxes and finance corruption, or (ii) increasing regulatory fines for past tax evasion and violations of anti-corruption regulations. Taken together, secret offshore vehicles are used for value-enhancing but potentially illegal activities that go beyond tax avoidance. Offshore intermediaries facilitate such activities.

JEL Classification: G32, G38, H25, H26
Keywords: Panama Papers, tax havens, tax evasion, corruption, offshore vehicle.

In considerable depth, prior research has analyzed how and why firms around the world use offshore subsidiaries. The focus has been on *observable* activities, primarily those aimed at avoiding taxes.[1] In comparison, the use of *secret* offshore vehicles has been associated with a much wider range of activities. Anecdotally, these include tax evasion, financing corruption, money laundering, and violations of sanctions. Such activities are by-and-large illegal and costly to society[2]—yet they oftentimes provide valuable business opportunities.[3]

The goal of this paper is to provide large-scale evidence that firms use offshore vehicles to circumvent regulations—to the benefit of their shareholders. Providing such evidence is challenging because offshore activities are frequently secret and hence inherently unobservable. We tackle this observability problem by exploiting the largest offshore data leak to date.

On April 3, 2016, news sources around the world started reporting about a data leak of confidential documents concerning the business activities of Mossack Fonseca, a Panama-based law firm and provider of corporate services. These so-called Panama Papers comprise 11.5 million documents and provide insights into the operations of over 214,000 shell companies, incorporated in tax havens around the world over the past 45 years. In the wake of the data leak, thousands of news stories from over 100 media organizations with access to the Panama Papers data highlighted that the use of offshore vehicles goes well beyond tax avoidance.[4]

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[1] See Hanlon and Heitzman (2010) for a comprehensive review of the tax avoidance literature. Indirect evidence on other uses of tax haven subsidiaries include Hanlon, Maydew and Thornock (2015; round-trip tax evasion), Slemrod (1985; individual tax evasion), and Bennedsen and Zeume (2016; expropriation of minority shareholders).

[2] Corruption, for instance, is estimated to cost $2.6 trillion per year (5% of global GDP; based on 2001-2002 survey data, World Bank Institute) and reduces investment and growth (Mauro 1995). In some instances, corruption can grease the wheels, e.g. when used to circumvent high tariffs (Dutt and Traca 2010). See Shleifer and Vishny (1993), Bardhan (1997), and Svensson (2005) for reviews of the corruption literature.

[3] Bribe payments, for instance, have been shown to create shareholder value (e.g., Cheung, Rau, and Stouraitis 2012, Karpoff, Lee, and Martin 2015, and Zeume 2016).

[4] See, e.g., 'The Panama Papers: how the world's rich and famous hide their money offshore', April 3, 2016, The Guardian. Retrieved April 14, 2016. The term "Panama Papers" appeared in 1,972 global news stories on April 3, in 9,967 global news stories on April 4, and in 8,856 global news stories on April 5 (Factiva).

Indeed, judging from news stories following the Panama Papers data leak, the financing of corruption as well as tax evasion appear to be the most popular uses of secret offshore vehicles. Two examples illustrate this: Siemens, a German conglomerate, used offshore vehicles, some of them operated by Mossack Fonesca, to run slush accounts that were used to bribe government officials in South and Latin America. Saipem, an Italian energy firm, used shell companies incorporated by Mossack Fonseca to tunnel $275mn in bribes to win more than $10bn in contracts to build oil and gas pipelines in North Africa.[5] Besides these cases of violations of anti-bribery regulations, the leaked data has prompted a surge in tax evasion investigations.[6]

In theory, the unexpected data leak might reduce or increase firm value generated from offshore vehicles through its impact on secret activities. The leak might negatively affect firm value if it makes it harder for firms to avoid future taxes or to use offshore money to bribe foreign government officials. The same applies if the leak increases expected costs of regulatory fines for *past* tax evasion and violations of anti-bribery regulations. Additionally, reputational losses may arise from the revelations. Alternatively, if offshore structures were used by managers to tunnel resources out of the firm at the expense of shareholders, the leak might increase firm value by reducing such activities (see, e.g., Desai, Dyck, and Zingales 2007).

[5] Details about Siemens are reported by Sueddeutsche Zeitung (see e.g. panamapapers.sueddeutsche.de/articles/570e7bb4a1bb8d3c3495bb08), details about Saipem are reported by ICIJ (see e.g. panamapapers.icij.org/20160725-natural-resource-africa-offshore.html). Other prominent examples include BP (The Guardian, theguardian.com/news/2016/may/10/bp-hired-firm-linked-to-bribery-scandal-panama-papers-reveal) and Alcoa (CBC, cbc.ca/news/business/panama-papers-victor-dahdaleh-alcoa-bribery-case-1.3598527).

[6] Authorities from several countries have launched civil and criminal tax evasion investigations in relation to the leaked data. As of October 2016, countries include the U.S., Australia, Canada, Denmark, France, Germany, India, Israel, Malta, Norway, Pakistan, Singapore, Spain, Sri Lanka, Sweden, and Thailand. Examples of anti-bribery regulations include the Foreign Corrupt Practices Act (USA; 1977) and the UK Bribery Act (United Kingdom; 2010); moreover, most OECD countries have signed the OECD Anti-Bribery Convention and thereby agreed to adopt some of its features into national regulation.

We base our empirical analysis on a unique database of publicly traded firms that are connected to the Panama Papers. Specifically, starting with 23,540 publicly traded firms from 73 countries, with a total of 530,393 subsidiaries across 211 sovereign and non-sovereign territories, we match subsidiaries, directors, and directors of subsidiaries of public firms to the leaked data. Our matching process, which we describe in detail below, succeeds in tracing 397 public firms to offshore vehicles incorporated by Mossack Fonseca. Firms that use these vehicles tend to be large firms headquartered across the globe and operating in many industries. These firms tend to be more tax aggressive and more exposed to perceptively corrupt countries, particularly to countries where high-ranked government officials were implicated by name in the leaked data. We use event study methodology to analyze the market returns of these firms around the leak.

Our empirical analysis reveals that firms connected to the Panama Papers experience negative returns around event dates associated with the data leak. In economic terms, the data leak wiped out a total of US$135 billion in market capitalization among firms with exposure to the revelations of the Panama Papers.[7] In our main specification, the average firm with exposure to the Panama Papers experiences a drop in firm value of 0.7 percent relative to same-country and same-industry firms without such exposure. Our results are robust to alternative event windows, alternative risk adjustments, and to matched sample analysis.

Most but not all offshore activities that came to light through the revelations of the Panama Papers were unobservable prior to the leak. We therefore further investigate whether our main effect—the drop in value of firms with exposure to the Panama Papers—is driven by previously

[7] For this calculation, we consider the 397 firms with direct exposure to the Panama paper data leak. We multiply each of these firms' market valuations at the end of 2015 by their cumulative abnormal returns between March 31, 2016 and April 6, 2016, April 22 and April 28, and May 5 and May 11 (our main event dates). We obtain quantitatively similar results when applying the average drop in firm value after also controlling for country and industry fixed effects.

observable or secret offshore activities. We find that firms are more adversely affected when their offshore activities revealed by the leak are likely to have been entirely secret prior to the leak; firms whose offshore activities were likely observable are not negatively affected. Along similar lines, we also show that our effect is distinct from a general negative market reaction around the data leak for firms that have tax haven subsidiaries. Taken together, these results indicate that the negative market response for firms with exposure to the Panama Papers stems at least in part from firms' use of secret offshore vehicles.

Next, we explore the causes of the negative market response. First, we consider the tax channel previously described. For our tests, we focus on tax aggressive firms, as tax aggressiveness may save taxes and therefore create firm value. We measure tax aggressiveness by the difference between statutory and effective tax rates. We find that tax aggressive firms are indeed significantly more negatively affected by the leak. These results complement a large and growing literature in accounting and finance that has focused on the use of tax havens to avoid taxes.[8] Due to the nature of our sample—we analyze over 23,000 firms headquartered in 73 countries—our measure of tax aggressiveness is necessarily general, and likely to capture both tax avoidance and tax evasion.[9] However, there is suggestive evidence indicating that instances of tax evasion may be revealed in the leaked data and may impact shareholder value: Tax authorities from multiple jurisdictions have tried to obtain the raw leaked data, and have opened tax evasion investigations.

Second, we examine whether the firm value reaction documented above is driven by offshore vehicles being used to finance corruption. We find that firms exposed to the data leak are

[8] Besides the aforementioned literature review by Hanlon and Heitzman (2010), see also Graham and Tucker (2006) on the use of tax shelters as a substitute for debt and Desai, Foley, and Hines (2004) on economic effects of tax havens. Despite their use for tax avoidance, tax havens are costly when managers use excessive cash parked in tax havens to finance inefficient acquisitions (Hanlon, Lester, and Verdi 2015).

[9] Our tax aggressiveness measure on its own may capture country- or industry-level tax law particularities. We alleviate such concerns by controlling for country and industry fixed effects.

more negatively affected when they are also exposed to perceptively corrupt countries, especially to countries where country leaders are implicated by name in the leaked data[10] and to countries that are perceived to be corrupt. For instance, around the data leak, firms with exposure to the leaked data and with a subsidiary in one of ten countries where country leaders were implicated by name are 0.9% more negatively affected than other firms with exposure to the leaked data. This effect is similar in magnitude among firms exposed to the most perceptively corrupt countries. Taken together, this evidence is consistent with the data leak reducing firms' ability to win contracts in perceptively corrupt countries or firms becoming subject to regulatory fines for past violations of anti-bribery regulations. To this end, prior work has studied the benefits of bribery and the costs of anti-bribery regulations for firms[11]—our results highlight that secret offshore vehicles are one previously undocumented channel through which bribes may be paid, and through which anti-bribery regulations are violated.

Third, we consider whether firms incur reputational losses due to the data leak. Revealing a firm's use of secret offshore vehicles for illegal or at least perceptively unethical purposes might have potential for significant reputational losses—particularly given the intense global news coverage the Panama Papers received. However, measuring firm reputation using a range of corporate social responsibility ratings, we find that reputation does by-and-large not explain the magnitude of the market reaction. Thus, while firm reputation is plausibly negatively affected by revealing the use of secret offshore vehicles, the evidence is not consistent with this being a first order consideration by investors.

[10] We use news stories from April 2016 to identify these countries: Argentina, Georgia, Iceland, Iraq, Jordan, Qatar, Saudi Arabia, Sudan, United Arab Emirates, and the Ukraine.

[11] Specifically, firms appear to use bribes to create shareholders value (Cheung, Rau, and Stouraitis 2012, Zeume 2016). Yet prosecution costs associated with detected violations of anti-bribery regulation more than offset the value of contracts obtained through bribe payments if prosecution for bribery is accompanied by charges of financial fraud (Karpoff, Lee, and Martin 2015).

Taken together, our preferred interpretation of the drop in firm value of implicated firms is that activities such as tax evasion and bribery created shareholder value prior to the Panama Papers data leak. The revelations of the Panama Papers destroy some of that value. As previously stated, the sources of value destruction could be two-fold: expected future cash flows from tax evasion and financing corruption may be lower, or regulatory fines may result from past tax evasion and violations of anti-bribery regulations. While we cannot distinguish these two empirically, we note that the average firm loses $340mn in value ($135bn/397 firms), which by magnitude seems unlikely to be explained purely by fines.[12]

We consider three alternative interpretations for the negative market response by firms with exposure to the Panama Papers following the data leak. First, offshore structures may not have been used in the interest of shareholders, but to tunnel resources out of the firm. Consistent with this hypothesis, a small number of cases where Mossack Fonesca vehicles were used for tunneling have appeared in news stories. However, if the leak uncovers these activities and reduces such value destroying activity, one would predict that firms exposed to the leak are positively affected, counter to our finding. Our results suggest that the economic importance of tunneling is relatively limited.

Second, the firms we identify as being connected to offshore vehicles run by Mossack Fonseca may be fundamentally different from other firms, and may have negative returns around relevant event dates for reasons unrelated to the data leak. Consistent with this argument, firms exposed to the Panama Papers are indeed larger and more likely to have subsidiaries in more

[12] An alternative channel for the drop in firm value is that the leak increases firms' discount rate. This would require that, subsequent to the leak, firms' cash flows co-move more with the market. If offshore vehicles facilitate tax evasion, this is unlikely the case because a reduction in tax evasion activities likely reduces cash flows in good times and has no effect on cash flows in bad times. Consistent with this, we do not find evidence of significant changes in equity betas before and after the leak for firms with Panama Papers exposure.

perceptively corrupt countries. Yet we find that all of our results are robust when matching firms on observable firm characteristics.

A final alternative interpretation is that, following the data leak, exposure to tax havens as a risk factor becomes more salient for outside investors. Thus, firms with any exposure to tax havens may be adversely affected around the leak because investors factor in a larger premium for offshore risk. We find that this interpretation does not seem to drive our results because firms that are not implicated by the Panama Papers but that have subsidiaries in Mossack Fonseca's main tax havens are not as adversely affected as firms implicated by the leak. Moreoever, as noted above, firms are more adversely affected when the nature of their involvement with Mossack Fonseca was secret prior to the leak.

Our estimate of the economic magnitude of the effect of secret offshore activities on firm value is likely conservative. For instance, as indicated above, the market reaction we observe is a net effect, as the leak may have positive implications for governance and transparency of firms, at least for some firms. Moreover, firms can circumvent the leak's implications by switching to other offshore service providers or constructing ever more elaborate legal structures.

Methodologically, our paper builds off a fast-growing literature that uses shocks to the transparency of tax haven activities to understand the use of tax haven subsidiaries and its impact on firm value. The passage of TIEAs—which allow tax authorities to exchange information relevant in tax investigations—has been used to document that tax havens are used for round-trip tax evasion (Hanlon, Maydew and Thornock 2015) but also that corporations use tax haven subsidiaries to expropriate minority shareholders (Bennedsen and Zeume 2016).[13] More recently,

[13] Relatedly, Johannesen and Zucman (2014) show that bank deposits respond to the passage of TIEAs.

Nesbitt, Outslay and Persson (2016) have used the Luxembourg Leak to show that such leaks may reduce tax uncertainty, which benefits shareholders.

Taken together, the contribution of this paper lies in providing novel large-scale evidence on the use of secret offshore vehicles. Our paper highlights the role played by offshore intermediaries—such as Mossack Fonseca—in facilitating illegal activities. That such activities create shareholder value when undetected motivates the vast market for offshore intermediation and firms' willingness to pay for intermediaries' services.

1. The Panama Papers Data Leak, Methodology, and Data

1.1 The Panama Papers Data Leak

On Sunday, April 3, 2016, news sources around the world started reporting about a data leak of confidential documents concerning the business activities of Mossack Fonseca, a Panama-based law firm and provider of corporate services. Along with this revelation came first news stories concerning firms and politicians. It was confirmed that the leaked data overall comprised an unprecedented 2.6 terabytes of data, or 11.5 million confidential documents. The leaked documents provided insights into the uses of more than 214,000 shell companies during the past 45 years. Of the 214,000 companies that appear in Mossack Fonseca's files, 90 percent were incorporated in just four tax havens - the British Virgin Islands (BVI) (114,000 firms), Panama (48,000), the Bahamas (16,000), and the Seychelles (15,000). The remaining firms were incorporated in Niue (9,600), Samoa (5,300), British Anguilla (3,200), Nevada (1,300), Hong Kong (450), the UK (150), and a few other countries.

Figure 1 presents the time line of the leak. Following April 3, we identify two additional dates relevant for our analysis, and we describe each in turn. On Tuesday, April 26, the International Consortium of Investigative Journalists (ICIJ) announced that a searchable database of the leaked data would be made public. On Monday, May 9, 2016, a searchable database was indeed made available to the public at large through ICIJ's website. This database contains information on more than 200,000 entities incorporated by Mossack Fonseca, as well as relationship information between entities, and individuals such as shareholders and directors attached to the entities. This way, ICIJ allows for illustration of how specific companies and individuals are connected to entities, officers, and intermediaries in the leaked Mossack Fonseca files.

1.2 Methodology

One approach to studying the value created by corporate offshore activities is to collect data from reports about detected tax haven activity. However, there are few detected cases and such cases may differ from undetected cases along dimensions that correlate with the value they create. To alleviate these concerns, we employ event study techniques to study the market response of firms connected to the Panama Paper data leak around the announcement of the leak.

In the first part of the analysis, we study the market response of firms exposed to the data leak around dates relevant to the data leak. Specifically, we run the following regression:

$$CAR_i = \alpha + \beta_1 PanamaPapersExposure_i + \gamma' \mathbf{X_i} + \varepsilon_i, \qquad (1)$$

where CAR_i denotes the cumulative returns of firm i around event days relevant to the revelation of the Mossack Fonseca documents, $PanamaPapersExposure_i$ indicates whether firms are exposed

to the leaked documents, and $\mathbf{X_i}$ is a vector of controls measured before April 2016, including country and industry fixed effects. The coefficient of interest β_1 captures whether exposure to the leaked documents impacts firm value.

In the second part of the analysis, we augment equation (1) by firm characteristics in order to test whether certain types of activities are priced. We run the following regression:

$$CAR_i = \alpha + \beta_1 PanamaPapersExposure_i + \beta_2 FC_i + \beta_3 PanamaPapersExposure_i \times FC_i + \gamma' \mathbf{X_i} + \varepsilon_i, \quad (2)$$

where FC_i is a firm characteristic of interest measured before April 2016. Of particular interest is β_3, which indicates whether firms exposed to the leak are differentially affected when they have specific characteristics.

Equations (1) and (2) use two-way clusters (country and industry).[14]

1.3 Data and Variable Construction

Our paper combines data from several sources. Connections to the Panama Paper data leak are established from files made publicly available by the ICIJ, as well as from subsidiary and director data of all publicly listed firms in Bureau van Dijk's Orbis database as of 2015. Accounting and market data is obtained from Datastream/Worldscope and Orbis. Appendix 1 provides a complete list of variable definitions.

1.3.1 Exposure to the Panama Papers

The data contained in the leak of the Panama Papers presents a unique opportunity to understand the effects of offshore entities on firm valuation. We make use of several files made

[14] We have experimented with alternative dimensions of clusters and obtained similar results. Clustering standard errors at the dimensions mentioned here generally produces the most conservative standard errors.

publicly available by the ICIJ on 9th May 2016, in particular, an "entities" file which contains information on companies, trusts, or funds created in low-tax, offshore jurisdictions by Mossack Fonseca, an "officers" file which contains information on individuals who play a role in the aforementioned entities, and an "intermediaries" file which contains information on middlemen (usually law or accounting firms) who arrange the creation of offshore entities for their clients. We focus on these three dimensions of the data leak—entity existence, operation, and management—and connect them to publicly listed firms in three ways: to a firm through its subsidiaries, to a firm through its directors, and to a firm through directors of its subsidiaries.

We use fuzzy string matching algorithms to match the names of directors and subsidiaries in Orbis to the names in the three Mossack Fonseca files. We require that names in Orbis and in the leaked data are associated with the same headquarter/home country, while allowing for minor variations in the spelling of names across data sources.[15] Specifically, we proceed in two steps, dealing with Orbis subsidiary names and Orbis officer names separately. First, we match the Orbis subsidiaries of publicly listed firms to the Mossack Fonseca files using the subsidiary name and headquarter country code from the subsidiaries file. Second, we match directors of publicly listed firms from Orbis to the Mossack Fonseca files using the director name and country[16] as identifying information. We repeat the matching of director names for directors of subsidiaries of publicly listed firms.

Next, we aggregate the matches between Orbis and the leaked data at the firm level in order to obtain our key variable of interest. The dummy variable *Has Panama Papers Exposure* is equal

[15] Examples of fuzzy string matches with variations in spelling include China-based firms ”Sun Hung Kai Properties limited” (Orbis) compared to ” Sun Hungkai Properties limited” (Mossack Fonseca), and Cyprus-based officer ”Christina Drousiotou” (Orbis) compared to ” Christina Droussiotou” (Mossack Fonseca).

[16] The country in which a director is located is extracted from the Orbis director address field.

to 1 if any entity, intermediary, or person listed in the leaked Mossack Fonseca documents is connected to a subsidiary of a firm, a director of a firm, or a director of a firm's subsidiary, and 0 otherwise. In additional tests, we disaggregate this variable into *Exposure of Observable Activities* and *Exposure of Secret Activities*, for which we distinguish between being connected to an entity listed in the leaked Mossack Fonseca documents and being connected to an intermediary or person in the leaked data.

In order to ensure that we do not falsely classify firms as being connected to the leaked documents, we verify matches manually. Our match is conservative, and it is likely that due to different spelling and naming conventions some firms exposed to the Panama Papers are not captured by our match, which biases our findings against finding an effect.[17]

1.3.2 Measures of firm value

We measure the impact of the data leak on firm value using daily returns for [-1;3] event windows around the three event days. For Sunday, April 3, a non-trading day, we move the event date to the next trading day, Monday, April 4. We obtain daily stock prices from Datastream and apply standard data filters such as dropping penny stocks (prices below US$0.10), stocks not actively traded (stocks with no price changes between March 31, 2016 and April 6, 2016), and firms with assets below US$5mn. We winsorize returns at the 1% and 99% percentiles to remove outliers. Besides using raw returns, we calculate 1-factor alphas, i.e. stock returns in excess of market returns after controlling for firms' exposure to the market index. Alphas are obtained from

[17] Alleviating some of the concerns that we may miss some links, countries that we cannot match to the Mossack Fonseca files tend to show up rarely in the published Mossack Fonseca documents, suggesting that firms from these countries did not use Mossack Fonseca excessively in the first place. For instance, Korea shows up a mere 181 times in the leaked entity, officer, and intermediary files (compared to 1,681 publicly listed Korean firms), and these 181 occurrences may well refer to private Korean firms. In comparison, the U.K. shows up 15,900 times in the leaked entity, officer, and intermediary files (compared to 1,079 publicly listed U.K. firms).

a 1-factor model estimated over March 4, 2015 to March 3, 2016. We require stocks to have at least 100 non-missing return observations during that period. Local market indices and risk-free rates are not available for all of the 73 countries in our sample, we therefore obtain stock prices in USD and use the US market index (CRSP Value-Weighted Return) and US T-Bill as market index and risk-free rate, respectively. Our results are robust to using local indices and local risk-free rates where available.

1.3.3 Other Firm Characteristics

Finally, we construct several variables to capture firms' tax aggressiveness and their exposure to corruption. All variables are measured in 2015 in order to ensure that they are not affected by the Panama Paper data leak.

Tax Aggressiveness is the statutory tax rate at the country level less a firm's effective tax rate where the effective tax rate is defined as tax expense over EBIT. A variation of this measure sets *Tax Aggressiveness* to zero when the value would otherwise be negative, e.g. because a firm received a tax credit or paid more taxes than justified by the statutory tax rate.

Has Political 1St Layer Exposure is a Dummy variable equal to one if a firm has at least one subsidiary in any of the countries where country leaders were implicated by name in the Panama Papers. We use subsidiary data from Orbis (2015) and news stories from early April 2016 to identify these countries: Argentina, Georgia, Iceland, Iraq, Jordan, Qatar, Saudi Arabia, Sudan, the United Arab Emirates, and the Ukraine. Initial news stories focused primarily on the use of offshore vehicles by government leaders in these 10 countries. As of 21 April 2016, the list of

potentially implicated individuals had grown to include politicians and other individuals from at least 40 countries.[18]

In order to capture the idea that politicians from many more countries may have been implicated and that politicians from countries perceived to be more corrupt are more likely implicated, we construct *Corruption Exposure*, a dummy variable that is equal to one if a firm is exposed to the most perceptively corrupt tercile of countries using Transparency International's Corruption Perception Index.

2. Descriptive statistics

Table 1 provides summary statistics for firms with and without exposure to the Panama Papers data leak. Panel A of Table 1 shows the number of firms connected to the leak by entity, person, or intermediary. 397 firms, or 1.7% of our sample firms, are connected to the Panama Papers data leak in some way.

-- -- Table 1 about here -- --

We then further disaggregate this connection measure. 89 firms (0.4% of our sample) are connected through the entities file, 296 firms (1.3% of our sample) are connected through the persons file, and 86 firms (0.4% of our sample) are connected through the intermediary file. Some firms are exposed to the leaked data through a combination of these individual files.

Panel B of Table 1 shows a breakdown by country of firms exposed to the Panama Papers data leak, with countries sorted in declining order by fraction of firms connected to the data leak.

[18] Additional countries include Armenia, Australia, Azerbaijan, Bangladesh, Brazil, Canada, Chile, China, Colombia, Cyprus, Egypt, France, Hong Kong, India, Indonesia, Israel, Italy, Malta, Mexico, New Zealand, Norway, Pakistan, Russia, Singapore, Spain, Sweden, Switzerland, Thailand, Tunisia, the UK, and the US.

There is substantial variation across countries, with Hong Kong (almost one in four firms) and the U.K. (one in nine firms) leading the table; the U.S ranks around the middle, with roughly 2 percent of firms using offshore vehicles through Mossack Fonseca. Among large economies, we do not find any exposure to the leak in Brazil and South Korea, and only a single firm in Japan. We selectively double-check our name matching procedure to ensure that this is not driven by different spelling conventions across datasets. Even though we cannot rule out that we miss connections of some firms to the leaked data, such bias will only work against finding results.[19] Additionally, some of the countries for which no firms have any Panama Papers exposure by our measure show up very rarely in the Mossack Fonseca documents. This suggests that firms from these countries rarely used Mossack Fonseca.

Appendix 2 additionally shows results by Fama-French industry. The use of offshore vehicles is particularly pervasive in Trading, Mining, Restaurants and Hotels, Aircraft Manufacturing, and Real Estate. Yet it is striking how the use of offshore vehicles extends across virtually all industries. Only five out of the 47 Fama-French industries in our sample are free of offshore vehicle users in the leaked data.

In Table 2, we examine the characteristics of firms with and without a link to the Panama Papers data leak. Firms connected to the data leak have more subsidiaries, and more of these are foreign subsidiaries, both in absolute and relative terms. Consistent with this, firms connected to

[19] Note that even the leaked internal data of Mossack Fonseca, that are virtually perfectly suited for identifying the true owners and uses of secret offshore vehicles, do not always allow identifing ultimate beneficial owners. For example, offshore vehicles can use nominee *directors*, i.e. individuals that stand in for the true owners but exercise no real power over the firm since they have separately pre-agreed to act upon instruction of another party, and nominee *shareholders*, i.e. individuals or companies that stand in for the true shareholders but have no real power, since they have separately pre-agreed to transfer ownership to another party. A package of nominee directors and nominee shareholders, combined with a third party, such as a private bank, handling all interactions with Mossack Fonseca, may hide the identity of the beneficial owner even from Mossack Fonseca itself, and therefore never appear in its internal data.

the leak are also substantially larger; total assets average $91.6 billion, compared to $5.4 billion for firms without a connection.[20] We control for size throughout our analysis and also use matched samples as a robustness test.[21] Firms connected to the leak are also more likely to have tax haven subsidiaries, they are exposed to more perceptively corrupt countries on average and more likely to have subsidiaries in countries whose politicians were implicated by the data leak.

-- -- Table 2 about here -- --

3. The Market Reaction to the Panama Papers Data Leak

In this section, we analyze the market response to the Panama Paper data leak. We measure firm value by cumulative raw and abnormal returns around the three event dates described in Section 1.1.

3.1 Market Response of Firms Connected to the Panama Papers Data Leak

Table 3 shows regressions of our dependent variables on firms' exposure to the Panama papers and controls. The dependent variable of interest is *Cumulative raw returns* and *Cumulative abnormal returns* around three event dates, shown in Figure 1. The control variable of interest is *Has Panama Papers Exposure,* a dummy variable equal to one if a firm is connected to the data leak. All specifications include country and industry (Fama-French 49) fixed effects.

[20] A smilar picture emerges when we consider market capitalization. Prior to the leak, firms with exposure to the Panama Papers data leak have a market value of $15.5bn on average, while firms without such exposure have a market value of $2.1bn on average. Market values are smaller than total assets on average because our sample contains financial firms, some of them with hundreds of billions in assets.

[21] The results of this univariate split are confirmed when we run multivariate probit regressions in which we control for industry fixed effects, country fixed effects, and size.

--- Table 3 about here ---

Our analysis reveals that firms connected to the Panama Papers data leak have negative cumulative raw returns during the event window. Raw returns are 1.6 percent lower for such firms than for same-country, same-industry firms without a connection to the data leak (Column (1)). Firms with Panama Papers exposure are larger and size may be priced significantly during the event period for other reasons. Controlling for size reduces the coefficient to 1.0 percent, but does not affect statistical significance (Column (2)).

Further, firms with Panama Papers exposure tend to have higher market risk, and high-beta firms may have lower returns during the event period for other reasons. We therefore use *Cumulative abnormal returns* (alphas) as our dependent variable in Columns (3) and (4), and continue to find that firms with exposure to the leaked data are still significantly negatively affected. The economic magnitude is reduced to 0.82 and 0.69 percent, respectively, and we conservatively treat the lowest estimate of abnormal performance, 0.69 percent, as our baseline estimate. Below, we discuss a range of robustness tests, none of which substantially alter our results.

3.2 Secret and Observable Offshore Activities, Tax Haven Salience

Most but not all offshore activities that came to light through the revelations of the Panama Papers were unobservable prior to the leak. We therefore further investigate whether our main effect—the drop in value of firms with exposure to the Panama Papers—is driven by observable or secret offshore activities. For these tests, reported in Table 4, we divide firms into subsamples by the specific way in which firms are connected to offshore vehicles. In a nutshell, we capture

whether the offshore activities revealed by the leak are likely to have been entirely secret prior to the leak, or whether outside investors plausibly could infer the existence of these activities from data that is publicily available *prior* to the leak.

In Panel A of Table 4, we separate exposure to the Panama Papers into three types—exposure of activities that are (plausibly) observable prior to the link, exposure of activities that are secret prior to the link, and exposure of activities that are mixed. As the results show, previously observable activities do not cause any drop in value. Iinstead, the value loss is entirely driven by the exposure of previously secret activities, at -0.94 and -1.07 percent, respectively (Columns (3) and (4)).

--- Table 4 about here ---

Following the data leak, exposure to tax havens as a risk factor may have become more salient for outside investors. Thus, firms with any exposure to tax havens may be adversely affected around the leak because investors factor in a larger premium for offshore risk. In Panel B, we show that the market impact on firms with Panama Papers exposure is still statistically and economically distinct from a potential general negative market reaction by firms with tax haven exposure around the leak.

Specifically, we create four portfolios among our 23,540 sample firms, firms with Panama Papers exposure but no actual subsidiaries in any of the tax havens most frequenly used by Mossack Fonseca (Panama, British Virgin Islands, Bahamas, Seychelles), firms that have such subsaridies but no exposure to the Panama Papers, firms that have both subsidiaries and exposure to the Panama Papers, and the vast majority of firms that have neither. These portfolios allow a clean identification of the treatment effect of Panama Papers exposure. All coefficients have negative signs, with the Panama Papers exposure coefficient being significant, and the coefficient

for both Panama Papers and TOP4 Tax Haven Exposure being larger but not significant. This evidence is consistent with investors discounting tax haven exposure around the leak, specifically exposure to tax havens heavily used by the firm at the center of the leak, but discounting firms with exposure to the specific revelations by the data leak even more.

3.3 Robustness

We perform a number of robustness tests in Table 5. First, in Panel A, we decompose the cumulative abnormal return in response to the data leak into the market response on the three specific dates around which information about the leak is released into the market, which we refer to as Day 1, Day 2, and Day 3. These results, shown in Columns (1) to (3), document a negative market reaction on all three days. The second day, on which the ICIJ announced the future publication of a database of the leaked documents, has the economically largest negative return at 0.41 percent. This could be related to investors with some knowledge of the previously secret offshore activities of the firm selling around that date, or to outside investors correctly assessing the probabilities of specific firms to be exposed in the database 2 weeks later.

--- Table 5 about here ---

Second, in Columns (4) and (5), rather than cumulating returns over days [-1;3] around relevant event dates, our results similarly hold when cumulating over event dates [-2;2] and [0;4]. Thus, the negative market response documented abve is not driven by abnormal trading prior to the leak. Third, in Panel B, we consider several alternative risk adjustments to the abnormal returns we obtain, as well as several ways of matching firms exposed to the Panama Papers to otherwise comparable firms. Our baseline result obtains under all alternative specifications.

4. Cross-sectional Variation in the Market Reaction to the Data Leak

We have so far established that firms exposed to the Panama Papers data leak had more negative returns around events associated with the leak. We now turn to potential channels that may explain this negative effect. In turns, we examine whether the data leak had more adverse effects on tax aggressive firms and on firms exposed to corruption.

4.1 Tax aggressiveness

If tax avoidance and evasion create shareholder value—or if past tax evasion is expected to result in regulatory fines—tax aggressive firms with Panama Papers exposure should experience more negative returns around events related to the data leak. Table 6 shows regressions of *Cumulative abnormal returns* around three event dates on firms' exposure to the Panama papers and controls, most importantly measures of tax aggressiveness.

--- Table 6 about here ---

In Columns (1)-(3), the tax aggressiveness measure of interest is *Tax Aggressiveness 1*, the statutory tax rate at the country level less a firm's effective tax rate (missing for firms with negative EBIT). We start by examining whether *Tax Aggressiveness 1* on its own explains returns in the subset of firms with Panama Papers exposure. Indeed, firms that are more tax aggressive have significantly more negative returns around days associated with the data leak (Column (1)). Next, in order to alleviate concerns that all tax aggressive firms are adversely affected around relevant event dates for reasons unrelated to exposure to the Panama Papers, we repeat our analysis in the

full sample. Indeed, tax aggressive firms only have significant negative returns when they are also exposed to the Panama Papers.

In Columns (4)-(6), we extend this analysis to an alternative tax aggressiveness measure. The previous measure may be negative, e.g. because firms obtained a tax credit or because firms paid higher taxes than the statutory tax rate. We replace negative values by zero and reconfirm our previous results. Economically, a one standard deviation increase in tax aggressiveness is associated with a 0.7%(=14.9%*4.498%) more negative firm value response (Column (4)), and this effect is similar in magnitude among firms exposed to the Panama Papers in the full sample of firms (Columns (4)-(5)).

4.2 Financing corruption

Besides tax motives, offshore vehicles may have been used to finance corruption, as was revealed by various news stories illuminating links between firms, governments, and middlemen in the Panama Paper documents. If corporations did indeed use offshore vehicles to finance corruption, and if such activities created shareholder value, firms exposed to the leaked data and exposed to perceptively corrupt countries should have a more negative share price response because they are less able to secretly transfer funds to foreign politicians or because they may face regulatory fines for violating bribery regulations. In Table 7, we examine this idea further. The table shows regressions of *Cumulative abnormal returns* around three event dates on firms' exposure to corruption.

-- Table 7 about here --

Among firms with exposure to the Panama Papers, having a subsidiary in a country whose government officials were implicated by the data leak is associated with 1.0% more negative abnormal returns (Column (1)). In order to alleviate concerns that this effect is merely driven by negative news for any firm exposed to countries whose government officials were implicated by the data leak, we augment the specification to all our sample firms. Indeed, firms with exposure to such countries and exposure to the Panama Papers are still statistically and economically more negatively affected (Columns (2)-(3)).

Next, we move to an alternative measure of exposure to perceptively corrupt countries (Columns (4)-(6)). Notably, we document that firms with exposure to the leaked data and exposure to the most perceptively corrupt countries are again more negatively affected. Specifically, being exposed to perceptively corrupt countries and the leaked data is associated with a 0.9% more negative share price response.

Finally, we consider whether firms incur reputational losses due to the data leak. Revealing a firm's use of secret offshore vehicles for illegal or at least perceptively unethical purposes might potentially result in significant reputational losses—particularly given the intense global news coverage the Panama Papers received. Empirically, measuring firm reputation is challenging in our setting, given our cross-country sample. We use firm-level data from KLD, which covers US firms, and construct a range of corporate social responsibility ratings in 2014 that we we aggregate at the Fama French industry level. The results (untabulated for brevity) show no consistent evidence that reputation explains the magnitude of the market reaction. Thus, while firm reputation may arguably be negatively affected by the revelations of the use of secret offshore vehicles, and while specific firms may be more subject to this risk, we do conclude that such reputation concerns are not a first order consideration for investors on average.

Taken togher, the results of this section suggest that investors believe firms will have reduced ability to (aggressively) avoid or even evade taxes in the future, and that the data leak reduces firms' ability to win contracts in perceptively corrupt countries. Alternatively, regulatory fines for past tax evasion and past violations of anti-bribery regulations may explain some of the negative response.

5. Conclusion

We use the data leak of the Panama Papers on April 3, 2016 to study whether and how the use of secret offshore vehicles affects valuation around the world. Using event study techniques, we find that the data leak erased US$135 billion in market capitalization among 397 firms with direct exposure to the revelations of the Panama Papers, reflecting 0.7 percent of their market value. Tax aggressive firms and firms with exposure to perceptively corrupt countries are more adversely affected.

Taken together, we conclude that secret offshore activities created value, e.g. through facilitating tax evasion and bribery. The revelations of the Panama Papers destroy some of that value through reducing firms' ability to avoid taxes and finance corruption, or increasing regulatory fines for past tax evasion and violations of anti-corruption regulations. Besides providing novel large-scale evidence on the use of secret offshore vehicles, our paper also highlights the role played by offshore intermediaries—such as Mossack Fonseca—in facilitating illegal activities under the veil of offshore secrecy. We leave the analysis of real responses by firms connected to the data leak to future research.

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Table 1

Summary Statistics

This table shows summary statistics of firms with and without exposure to the Panama Papers data leak. Panel A shows the number of firms connected to the leak by legal entity, person, and intermediary. Details on the procedure to establish these connections can be found in Appendix 1. Panel B shows number and fraction of firms connected to the leak by country for countries with at least 50 firms; countries with fewer than 50 firms are aggregated to *Rest of the World*. All variables are defined in Appendix 1.

Panel A: Firms with Exposure to the Panama Papers Data Leak

Firm is connected to offshore vehicle via	N Firms	N Firms w/exposure	% w/exposure
…a legal entity (shell)	23,540	89	0.38%
…a person	23,540	296	1.26%
…an intermediary	23,540	86	0.37%
…any of the three	23,540	397	1.69%

Panel B: Firms with Exposure to the Panama Papers Data Leak by Country

Country	*N* Firms	*N* Panama Papers Exposure	Percent Panama Papers Exposure	Avg. *N* Subs.	Country	*N* Firms	*N* Panama Papers Exposure	Percent Panama Papers Exposure	Avg. *N* Subs.
Hong Kong	161	37	23.0	46	Turkey	279	1	0.4	8
UK	1,080	124	11.5	40	Poland	352	1	0.3	9
Russia	100	5	5.0	33	Japan	3,442	1	0.0	16
Belgium	108	5	4.6	36	Argentina	63	0	0.0	7
Austria	66	3	4.6	77	Brazil	251	0	0.0	11
Italy	216	7	3.2	37	Bulgaria	83	0	0.0	9
France	551	17	3.1	49	Chile	111	0	0.0	14
Australia	587	15	2.6	28	Croatia	71	0	0.0	10
Greece	81	2	2.5	18	Egypt	89	0	0.0	11
Germany	493	12	2.4	61	Finland	115	0	0.0	35
Spain	124	3	2.4	86	Indonesia	56	0	0.0	11
Singapore	305	7	2.3	18	Korea	1,681	0	0.0	4
Philippines	90	2	2.2	7	Kuwait	73	0	0.0	13
US	3,506	75	2.1	50	New Zealand	90	0	0.0	15
Netherlands	107	2	1.9	62	Pakistan	129	0	0.0	2
Israel	326	6	1.8	13	Peru	91	0	0.0	3
Norway	127	2	1.6	23	Romania	55	0	0.0	9
Sweden	257	4	1.6	22	South Africa	179	0	0.0	25
Canada	696	9	1.3	12	Sri Lanka	117	0	0.0	8
China	2,269	28	1.2	11	Switzerland	210	0	0.0	39
Mexico	109	1	0.9	20	Thailand	206	0	0.0	9
Denmark	111	1	0.9	27	Vietnam	385	0	0.0	1
Malaysia	602	4	0.7	14	Rest of world	637	10	1.6	18
Taiwan	1,120	7	0.6	7					
India	1,583	6	0.4	7	**Total**	**23,540**	**397**	**1.7**	**23**

Table 2

Univariate Analysis

This table shows characteristics of firms with and without exposure to the Panama Papers data leak. The column labeled *Difference* captures the difference in means between the two groups. All variables are defined in Appendix 1. All continuous variables are winsorized at the 1% and 99% levels. *,**, and *** indicate statistical significance at a 10%, 5%, and 1% level, respectively.

Sample	Firms with Panama Papers Exposure		Firms without Panama Papers Exposure		*Diff*
	N Firms	Avg	*N* Firms	Avg	
Total assets ($mn)	397	91,642	23,143	5,421	-86,200***
N subsidiaries	397	155	23,143	20.3	-134.7***
Has foreign subsidiary (Dummy)	397	91.4%	23,143	43.9%	-47.5%pts***
Perc. foreign subsidiaries	397	47.8%	23,143	20.4%	-27.4%pts***
N foreign subsidiaries	397	16.9	23,143	2.9	-14.0***
Tax Aggressiveness 1	306	15.5%	15,220	15.1%	-0.4%pts
Tax Aggressiveness 2	306	17.9%	15,220	17.6%	-0.3%pts
Political 1st Layer Exposure (Dummy)	397	32.0%	23,143	6.0%	-25.9%pts***
Corruption Exposure (Dummy)	396	44.9%	23,083	14.6%	-30.4%pts ***

Table 3
Abnormal Returns of Firms Exposed to the Panama Papers Data Leak

This table analyzes returns of publicly listed firms around the data leak. The dependent variable is *Cumulative raw return* in Columns (1) and (2) and *Cumulative abnormal return* in Columns (3) and (4). Returns are cumulated over days around three dates related to the data leak. These three dates are described in Figure 1 and the event window is [-1;3] with respect to each date. *Has Panama Papers Exposure* is a dummy that takes the value of 1 if any entity, intermediary, or person listed in the leaked Mossack Fonseca documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary, and 0 otherwise. *Size* is the natural logarithm of a firm's assets in $000s. Appendix 1 provides detailed variable definitions. All continuous variables are winsorized at the 1% and 99% levels. Country and industry fixed effects (Fama–French 49) are included as indicated. Standard errors are clustered at country and industry level (2-way cluster). *t*-statistics are given in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Dependent variable	Raw Returns	Raw Returns	Alpha	Alpha
Has Panama Papers Exposure	-1.601***	-0.999***	-0.820*	-0.694***
	(-2.89)	(-2.58)	(-1.95)	(-2.62)
Size		-0.263***		-0.055
		(-3.23)		(-0.56)
Country FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
N	23,540	23,540	23,540	23,540
Adj. R2	0.167	0.170	0.094	0.094

Table 4
Abnormal Returns and Secret Offshore Activities

This table analyzes returns of publicly listed firms around the data leak. In both panels, the dependent variable is *Cumulative raw return* in Columns (1) and (2) and *Cumulative abnormal return* in Columns (3) and (4) as defined in Table 3. In Panel A, *Exposure of Secret Activity* is a dummy variable that takes a value of 1 if a person or an intermediary listed in the leaked Mossack Fonseca documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary, but if no entity in the leaked Mossack Fonseca documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary. *Exposure of Observable Activity* is a dummy variable that takes a value of 1 if an entity in the leaked Mossack Fonseca documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary, but if no person and no intermediary in the leaked Mossack Fonseca documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary. *Both Types of Exposure* is a dummy variable that takes a value of 1 if both (i) an entity and (ii) a person or an intermediary in the leaked Mossack Fonseca documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary. In Panel B, *TOP4 Tax Haven Exposure* is a dummy variable equal to 1 if a firm has at least one subsidiary in any of the four main tax havens used by Mossack Fonseca (Panama, British Virgin Islands, Bahamas, Seychelles). *Has Panama Papers but no TOP4 Tax Haven Exposure* is a dummy variable equal to 1 if a firm has exposure to the Panama Papers as defined in Table 1 Panel A (any of the three) but no exposure to a TOP4 haven. *Has no Panama Papers but TOP4 Tax Haven Exposure* is a dummy variable equal to 1 if a firm has no exposure to the Panama Papers as defined in Table 1 Panel A (any of the three) but exposure to a TOP4 haven. *Has both Panama Papers and TOP4 Tax Haven Exposure* is a dummy variable equal to 1 if a firm has both (i) exposure to the Panama Papers as defined in Table 1 Panel A (any of the three) and (ii) exposure to a TOP4 haven. Appendix 1 provides detailed variable definitions. All continuous variables are winsorized at the 1% and 99% levels. Country and industry fixed effects (Fama–French 49) as well as a control for size are included as indicated. Standard errors are clustered at country and industry level (2-way cluster). *t*-statistics are given in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Secret versus observable Panama Papers Exposure

	(1)	(2)	(3)	(4)
Dependent variable	Raw Return	Raw Returns	Alpha	Alpha
Exposure of Observable Activity	-0.005	0.465	0.399	0.496
	(-0.01)	(0.76)	(0.61)	(0.73)
Exposure of Secret Activity	-1.937***	-1.322***	-1.068**	-0.941***
	(-3.52)	(-3.62)	(-2.42)	(-3.63)
Both Types of Exposure	-1.244	-0.528	-0.641	-0.493
	(-1.03)	(-0.53)	(-0.92)	(-0.90)
Size		-0.262***		-0.054
		(-3.23)		(-0.56)
Country FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
N	23,540	23,540	23,540	23,540
Adj. R2	0.167	0.170	0.094	0.094

Panel B – Panama Papers Exposure vs. Other Tax Haven Use

	(1) Raw Returns	(2) Raw Returns	(3) Alpha	(4) Alpha
Has Panama Papers Exposure	-1.055***		-0.728***	
	(-2.64)		(-2.69)	
Has Panama Papers but no TOP4 Tax Haven Exposure		-0.964***		-0.616***
		(-3.35)		(-2.59)
Has no Panama Papers but TOP4 Tax Haven Exposure	-0.403	-0.407	-0.243	-0.248
	(-1.50)	(-1.50)	(-1.08)	(-1.10)
Has both Panama Papers and TOP4 Tax Haven Exposure		-1.246		-0.963
		(-1.27)		(-1.27)
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
N	23,540	23,540	23,540	23,540
Adj. R2	0.170	0.170	0.094	0.094

Table 5
Decomposing Abnormal Returns and Robustness

This table provides a breakdown of individual events associated with the data leak and alternative event windows in Panel A, and a range of robustness tests in Panel B. In Panel A, Cumulative Abnormal Returns are measured over each individual event day (Columns (1)-(3)) and for all three event days but using a [0;4] event window around each event date (Column (4)) as well as a [-2;2] event window around each event date (Column (5)). In Panel B, Column (1) provides robustness tests for the main specification (Table 3 Panel (4)). In Column (1), all controls other than *Has Panama Papers Exposure* are omitted. In Columns (2) and (3), alpha is constructed using 3- and 5-factor models based on US factor-mimicking portfolios (from Kenneth French's Data Library). The next two Columns restrict the sample to firms with exposure to the Panama Papers and firms matched by country and size (Column (4)) and additionally by industry (Column (5)). Firms are matched without replacement. Appendix 1 provides detailed variable definitions. All continuous variables are winsorized at the 1% and 99% levels. Country and industry fixed effects (Fama–French 49) as well as a size control are included as indicated. Standard errors are clustered at country and industry level (2-way cluster). *t*-statistics are given in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Market Response by Individual Event Day

	(1)	(2)	(3)	(4)	(5)
Dependent variable	Alpha	Alpha	Alpha	Alpha	Alpha
Event days	Day 1	Day 2	Day 3	Days 1-3, Alternative event window [0;4]	Days 1-3, Alternative event window [-2;2]
Has Panama Papers Exposure	-0.156	-0.408*	-0.142	-0.740**	-0.578**
	(-0.87)	(-1.66)	(-1.16)	(-2.27)	(-2.40)
Controls	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
N	23,540	23,091	22,980	23,540	23,522
Adj. R2	0.086	0.050	0.140	0.060	0.052

Panel B: Robustness

	(1)	(2)	(3)	(4)	(5)
Dependent variable	1-Factor Alpha	3-Factor Alpha	5-Factor Alpha	1-Factor Alpha	1-Factor Alpha
Sample	All	All	All	Matched by Country and Size	Matched by Country Industry Size
Has PPE	-1.247**	-0.932***	-1.105***	-0.642**	-0.610***
	(-2.01)	(-3.00)	(-3.31)	(-2.33)	(-3.02)
Controls	N	Yes	Yes	Yes	Yes
Country FE	N	Yes	Yes	N	N
Industry FE	N	Yes	Yes	N	N
N	23,540	23,540	23,540	754	734
Adj. R2	0.000	0.175	0.151	0.014	0.024

Table 6

Tax Avoidance

This table analyzes returns of publicly listed firms around the data leak controlling for firms' tax aggressiveness. The dependent variables are *Cumulative abnormal returns* around three event days associated with the leaked Mossack Fonseca documents. The sample consists of all publicly listed firms with non-missing daily returns in the 5 days surrounding at least one of the three event dates. *Has Panama Papers Exposure (PPE)*, a dummy that takes the value of 1 if any entity, intermediary, or person listed in the leaked Mossack Fonseca documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary. In Columns (1)-(3), the tax aggressiveness measure of interest is *Tax Aggressiveness 1*, the statutory tax rate at the country level less a firm's effective tax rate (missing for firms with negative EBIT). In Columns (4)-(6), the tax aggressiveness measure of interest is the same as before but set to zero when the measure is negative, e.g. because firms obtained a tax credit or because firms paid higher taxes than the statutory tax rate. Controls include size and fixed effects as indicated. Appendix 1 provides detailed variable definitions. All continuous variables are winsorized at the 1% and 99% levels. Standard errors are clustered at country and industry level (2-way cluster). *t*-statistics are given in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Tax Variable	Tax Aggressiveness 1			Tax Aggressiveness 2		
Has *PPE*		-0.067	-0.024		0.291	0.246
		(-0.17)	(-0.06)		(0.68)	(0.57)
Tax Variable	-3.921**		0.308	-4.498*		-0.312
	(-2.59)		(0.75)	(-1.71)		(-0.46)
Interaction		-2.791**	-3.073**		-4.417***	-4.154**
		(-2.32)	(-2.44)		(-3.07)	(-2.56)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
N	306	15,526	15,526	306	15,526	15,526
Adj. R2	0.176	0.110	0.110	0.176	0.110	0.110

Table 7
Financing Corruption

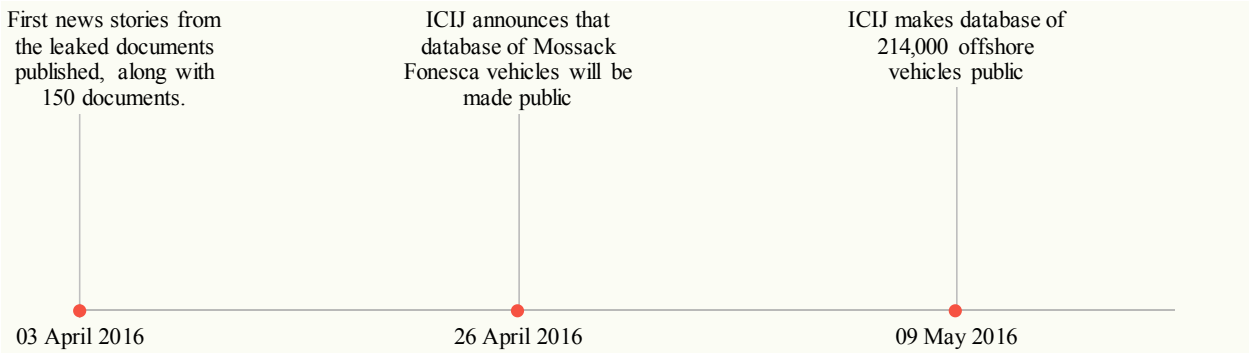
This table analyzes returns of publicly listed firms around the data leak controlling for firms' exposure to perceptively corrupt countries. The dependent variables are *Cumulative abnormal returns* around three event days associated with the leaked Mossack Fonseca documents. *Has Panama Papers Exposure* (*PPE*) is a dummy that takes the value of 1 if any entity, intermediary, or person listed in the leaked Mossack Fonseca documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary. In Columns (1)-(3), the measure of interest is *Political 1st Layer Exposure*, a Dummy variable equal to one if a firm has at least one subsidiary in any of the countries whose presidents or major officials were implicated by the Panama Papers (Argentina, Georgia, Iceland, Iraq, Jordan, Qatar, Saudi Arabia, Sudan, United Arab Emirates, Ukraine). In Columns (4)-(6), the measure of interest is Corruption exposure, measured by a Dummy variable that is equal to one if a firm is exposed to the most perceptively corrupt tercile of countries using Transparency International's Corruption Perception Index. Controls include size and fixed effects as indicated. Appendix 1 provides detailed variable definitions. All continuous variables are winsorized at the 1% and 99% levels. Standard errors are clustered at country and industry level (2-way cluster). *t*-statistics are given in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(1)	(2)	(3)
Corruption Variable	Political 1st Layer Exposure			Corruption Exposure (most corrupt tercile)		
Has PPE		-0.371	-0.384*		-0.134	-0.213
		(-1.64)	(-1.69)		(-0.62)	(-0.92)
Corruption Variable	-0.958**		-0.121	-0.497		-0.454**
	(-2.07)		(-0.63)	(-1.16)		(-2.39)
Interaction		-0.998**	-0.893**		-1.252***	-0.881**
		(-2.41)	(-2.36)		(-3.18)	(-2.30)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
N	397	23540	23540	396	23479	23479
Adj. R2	0.184	0.094	0.094	0.181	0.094	0.094

Figure 1

Timeline of the Panama Papers data leak

This figure shows the relevant event dates associated with the Panama Papers data leak.



Appendix 1: Data Appendix

All continuous variables are winsorized at the 1% and 99% levels.

Description	Description (detailed)	Source
Alpha [a;b]	Cumulative daily abnormal returns in % from closing on day *a*-1 to closing of day *b* relative to some event date. Daily abnormal returns are obtained from parameters of a one-factor model estimated over days [−294; −41] relative to event dates. *Excess return on the market* is the return of the local index in USD over and above the US risk-free rate.	Datastream
Cumulative raw returns [a;b]	Cumulative daily stock returns in % from closing on day *a*-1 to closing of day *b* relative to some event date.	Datastream
Has Panama Papers Exposure	A dummy variable equal to 1 if any entity, intermediary, or person listed in the leaked Mossack Fonseca documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary, and 0 otherwise. Persons are matched using exact home country matches and fuzzy name matches. Entities and intermediaries are matched using exact incorporation country matches and fuzzy name matches. All fuzzy matches are hand-checked.	ICIJ, Orbis
Exposure of Observable Activity	A dummy variable equal to 1 if an entity in the leaked Mossack Fonseca documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary, but if no person and no intermediary in the leaked Mossack Fonseca documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary.	
Exposure of Secret Activity	A dummy variable equal to 1 if a person or an intermediary listed in the leaked Mossack Fonseca documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary, but if no entity in the leaked Mossack Fonseca documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary.	
Both Types of Exposure	A dummy variable equal to 1 if both (i) an entity and (ii) a person or an intermediary in the leaked Mossack Fonseca documents is connected to a subsidiary of a firm in our sample, a director of a firm in our sample, or a director of a sample firm's subsidiary.	
Has TOP4 Haven Exposure	A dummy variable equal to 1 if a firm has at least one subsidiary in any of the four main tax havens used by Mossack Fonseca (Panama, British Virgin Islands, Bahamas, Seychelles).	Orbis
Tax Aggressiveness 1	The statutory tax rate at the country level less a firm's effective tax rate. The effective tax rate is defined as tax over EBIT. Observations with negative EBIT are denoted as missing.	KPMG, Orbis
Tax Aggressiveness 2	As *Tax Aggressiveness 2* but set to zero when the measure is negative, e.g. because firms obtained a tax credit or because firms paid higher taxes than the statutory tax rate.	KPMG, Orbis
Political 1st Layer Exposure	A dummy variable equal to 1 if a firm has at least one subsidiary in any of the countries whose presidents or major officials were implicated by the Panama Papers (Argentina, Georgia, Iceland, Iraq, Jordan, Qatar, Saudi Arabia, Sudan, United Arab Emirates, Ukraine).	Orbis
Exposure to Most Corrupt Tercile	A dummy variable that is equal to one if a firm is exposed to the most perceptively corrupt tercile of countries using Transparency International's Corruption Perception Index.	
Total Assets	Total assets. Regressions use the natural logarithm.	Datastream
Number of subsidiaries	Number of domestic and foreign subsidiaries.	
Has foreign subsidiary	Dummy variable equal to 1 if a firm has at least one subsidiary outside of its parent headquarter country.	Orbis
% Foreign Subsidiaries	Fraction of a firm's subsidiaries headquartered outside of its parent headquarter country.	Orbis
Number of Foreign Countries	Number of foreign countries in which firm has subsidiaries.	Orbis

Appendix 2: Firms Connected to the Panama Papers Data Leak by Industry

Industry	*N* Firms	*N* Panama Papers	Percent Panama Papers	Avg. *N* Subs.	Industry	*N* Firms	*N* Panama Papers	Percent Panama Papers	Avg. *N* Subs.
Trading	881	58	6.6	24	Wholesale	674	9	1.3	21
Mining	188	7	3.7	22	Automobiles and Trucks	307	4	1.3	31
Restaraunts Hotels	303	11	3.6	30	Construction Materials	625	8	1.3	19
Aircraft	56	2	3.6	52	Msrmt/Ctrl Equipment	159	2	1.3	33
Real Estate	795	27	3.4	45	Shipping Containers	88	1	1.1	16
Construction	499	13	2.6	37	Beer & Liquor	179	2	1.1	26
Apparel	192	5	2.6	26	other	7,432	83	1.1	17
Retail	620	16	2.6	33	Food Products	508	5	1	21
Insurance	39	1	2.6	81	Agriculture	220	2	0.9	15
Entertainment	163	4	2.5	25	Consumer Goods	365	3	0.8	23
Transportation	536	13	2.4	30	Printing and Publishing	127	1	0.8	27
Machinery	713	16	2.2	21	Chemicals	633	4	0.6	20
Banking	224	5	2.2	30	Computers	167	1	0.6	14
Recreation	91	2	2.2	13	Rubber and Plastic Products	200	1	0.5	13
Petroleum Gas	461	10	2.2	28	Pharmaceutical Products	634	3	0.5	17
Precious Metals	149	3	2	11	Electrical Equipment	498	2	0.4	18
Personal Services	156	3	1.9	25	Textiles	293	1	0.3	7
Coal	53	1	1.9	22	Defense	8	0	0	23
Business Services	1,708	32	1.9	23	Fabricated Products	67	0	0	7
Steel Works	417	7	1.7	17	Healthcare	153	0	0	67
Utilities	476	8	1.7	37	Shipbuilding, Railroad	51	0	0	28
Electronic Equipment	553	9	1.6	16	Tobacco Products	24	0	0	38
Medical Equipment	203	3	1.5	23					
Communication	433	6	1.4	29					
Business Supplies	219	3	1.4	22	**Total**	**23,540**	**397**	**1.7**	**23**