Do anti-bribery laws reduce the cost of equity? Evidence from the UK Bribery Act 2010

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Abstract

We examine the impact of the U.K. Bribery Act of 2010 on expected growth rate and implied cost of equity. Consistent with prior evidence, we find that the Bribery Act decreases the expected growth rate amongst firms with high exposure to bribe-prone countries. However, we also find a significant reduction in the cost of equity amongst firms with high bribery exposure. Further analyses reveal that the Bribery Act is associated with an improvement of anti-bribery management process and a reduction in information asymmetry. Our results suggest that more stringent anti-bribery regulations are not always bad for the firm.

JEL Classification: G30, G38, K22

Keywords: bribery, anti-bribery law, cost of equity, growth rate, discounted residual income valuation, information asymmetry

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1. Introduction

Corporate corruption is prevalent worldwide and is commonly cited as a significant deterrent to economic growth (Sensson, 2005; Bardhan, 1997; Shleifer and Vishny, 1993). Bribery is a common form of corporate corruption and is increasingly becoming an important concern for policymaker as well as corporate stakeholders around the world (Karpoff, Lee, and Martin, 2017; Cheung, Rau, and Stouraitis, 2012). The World Bank Institute estimates that $1 trillion a year is paid in bribes (Rose-Ackerman, 2004). D'Souza and Kaufmann (2013) survey corporate managers in 125 countries and find that more than 60% of these managers believe that their competitors use bribes to secure a public contract. Similarly, the *Dow Jones State of Anti-Corruption Survey* find that a third of companies claim to have lost business to "unethical competitors".

Becker (1968) models corporate misbehaviors as an economic decision that involves trade-offs between benefits and costs. Bribery in foreign countries may benefit firms by helping them expediting through the inefficient bureaucratic process (Huntington, 1968; Leff, 1964). Indeed, Cheung, Rau, and Stouraitis (2012) find that bribing brings an average firm $11 per each dollar of bribe. Karpoff, Lee, and Martin (2017) estimate the costs and benefits of bribery and find that, even after netting out financial and reputational costs, projects involving bribes are still profitable to firms. Using the passage of UK Bribery Act 2010, Zeume (2017) documents a decline in value of UK firms that operates in corrupted countries, and contends that paying bribes is a necessary "cost of doing business".

On the other hand, paying bribes can be costly to the firm. In addition to the risk of penalties and prosecutions (Murphy, Shrieves, and Tibbs, 2009), corporate bribery may put the firm's reputation at risk and strain the firm's relationship with its stakeholders (Serafeim, 2014; D'Souza and Kaufmann, 2013). Focusing on paying bribes to win businesses can also distract firms from

investing in value-enhancing long-term projects (Birhanu, Gambardella, and Valentini, 2016). Further, bribery may make firms more opaque (see e.g. Dass, Nanda, and Xiao, 2016). For instance, firms may enter into concealing transactions in order to divert funds for pay bribes. These can potentially lead to firms being seen as more risky by investors. This motivates us to make the relation between bribery and risk the focus of this study.

We conduct our analysis using the standard discounted residual income model, which model forward earnings yield as a function of expected firm growth and implied cost of equity (Easton, Taylor, Shroff, & Sougiannis, 2002). This approach has several appeals. First, we can estimate the residual income model using only price and accounting variables, which are readily available for firms in our sample. Second, our estimation is less likely to suffer from issues associated with using analyst earnings forecast data, such as forecast bias and timeliness (Guay, Kothari, and Shu, 2011; Lys and Sohn, 1990). Finally and crucially, the residual income model allows us to simultaneously estimate both growth rate and implied cost of capital, our proxy for risk.[1] As growth is an important motive for firms to engage in bribery (Zeume, 2017; Karpoff, Lee, and Martin, 2017; Cheung, Rau, and Stouraitis, 2012), this approach allows us to directly take into account the effect of bribery on firm growth when we estimate the effect of bribery on risk.

Given that bribes are usually undisclosed unless they are caught and getting caught can be considered as a rare event (Karpoff, Lee, and Martin, 2014), we exploit the passage of UK Bribery Act 2010 (the Bribery Act), which criminalizes individuals and firms for failures to prevent bribery. In a recent paper, Zeme (2017) finds that firms affected by the Bribery Act reduce sales,

[1] We construct a measure of bribery exposure using Transparency International (TI)'s Corruption Perceptions Index (CPI). Transparency International assigns each country a score between zero to 100, indicating the higher the score, the less exposure to corruption. Instead of using 'operational subsidiaries' which was used in Zeume's study, we obtain a weighted average score of the CPI for all 'geographic sales segments' by its sales ratio. We classify "high bribery-risk" firms as those with the weighted CPI score below 55.

acquisitions, and expansion of their subsidiaries into countries in which corruption is prevalent. Zeume (2017) shows stock prices of these firms respond negatively to the passage of the Bribery Act, which suggests that equity investors anticipate the Act to curtail growth of these firms.

Our results are consistent with Zeume (2017): we find that UK firms exposed to bribe-prone countries (high bribery exposure firms) experience a 3.7% decline in their expected growth rate. However, while their growth rate decreases, the Bribery Act is associated with a 2.75% reduction in implied cost of equity. Considering that our model estimates the average cost of equity for firms with high bribery exposure to be 11.6%, this is an economically substantial reduction, which amounts to almost a quarter of these firms' cost of equity. Our results suggest that the UK Bribery Act significantly reduces risk of firms that operate in bribe-prone countries.

We perform several robustness checks to validate our main findings as well as our main identifying assumptions. First, we show that our results are not driven by the way we classify firms as having a high exposure to bribery and find that our results are robust to alternative variable definitions and data sources for bribery. Second, our findings are not sensitive to our choice of model specifications. We show that our results hold when we replace forward earnings with analysts forecasts for earnings yield, and when we employ an alternative cost of equity model (Ohlson and Juettner-Nauroth, 2005). Further, we rule out the possibility that our results are due to any pre-existing trend (Atanasov and Black, 2016; Roberts and Whited, 2012) by performing a placebo analysis using several artificial event years. Finally, we confirm that the parallel trend assumption of difference-in-difference design is not likely to be violated by performing our analysis on covariate balanced samples using two balancing techniques: propensity score matching and entropy rebalancing method (Hainmueller, 2012; Hainmueller and Xu, 2013). All these results

support our main conclusion that the Bribery Act significantly reduces the cost of equity of firms with business operations in bribe-prone countries.

We contend that the reduction in firm risk comes from the stipulation in the Bribery Act that criminalizes the failure to prevent bribery in addition to the act of paying bribes. As the focus of the law is the firm's internal control system, we expect the results be stronger amongst firms with weaker governance quality prior to the passage of the Bribery Act. This is precisely what we find. We estimate the effect of the Bribery Act on cost of equity on subsamples based on ASSET4 governance data and find that the results are concentrated on the firms with weakest governance. We further document an improvement in practices related to bribery prevention amongst firms that are most affected by the Act.

Finally, consistent with the notion that the improvement in internal control system results in better corporate transparency (Dass, Nanda, and Xiao, 2016; Jin and Myers, 2006), we find that the Bribery Act is associated with an improvement in common measures for information asymmetry between corporate insiders and equity holders: bid-ask spread and stock price liquidity (Lang, Lins, and Maffett, 2012; Pagano and Volpin, 2012). We further analyze and confirm that the improvement in corporate information environment is a channel through which the Bribery Act reduces a firm's cost of equity. Our overall results indicate that despite the reduction in growth as documented elsewhere, bribery prevention laws can result in firms becoming less risky such that equity investors demand a lower rate of expected return.

This paper complements existing studies on the impact of foreign bribery prevention laws (Karpoff, Lee, and Martin, 2017; Zeume ,2017; Cheung, Rau, and Stouraitis, 2012). In particular, Zeume (2017) also examines the effect of the UK Bribery Act and finds that UK firms significantly decrease their business expansion in bribe-prone countries and conclude that preventing foreign

bribery could curtail a firm's competitiveness in some international markets. While we find that the UK Bribery Act reduces the expected growth rate of affected firms, which support their conclusion, we also find that the Bribery Act also improves the firms' internal control system and enhance corporate transparency. Consequently, equity shareholders demand a lower rate of return, which results in our estimate of a lower cost of equity.

Our study also helps inform the debate on the costs and benefits of anti-bribery laws. Recent high-profile foreign bribery cases have demonstrated that foreign bribery remains prevalent[2], and bring back the debate to the attention of policymakers. Proponents of the anti-bribery laws argue that bribery increases the overall cost of business operation and undermine business confidence (Kennedy and Danielson, 2011), and is deemed to be "a corrosive force that eviscerates the vitality of business and stunt a country's economic potential" (Lagarde, 2017). In contrast, critics of the law argue that the cost imposed by the law results in unnecessarily large costs in terms of compliance (e.g. Weissmann and Smith, 2010). Our results highlight the risk reduction benefit of anti-bribery laws. Though the affected firms face the increasing costs of rearranging their business area (Hines, 1995; Zeume, 2017) and developing sophisticated governance structures or internal control systems to comply with anti-bribery laws (Aguilera & Vadera, 2008; Collins, Uhlenbruck, and Rodriguez, 2009; D'Souza & Kaufmann, 2013), the strengthened internal control system and enhanced corporate transparency can inform investors about hidden firm risk and reduce their adverse selection risk (Pagano & Roell, 1996; Kolstad & Wiig, 2009). Thus, considering the benefits of informed shareholders, the impact of anti-bribery

[2] A recent example is Goldman Sachs' involvement in alleged embezzlement from Malaysia's state-run investment fund. According to court documents, Goldman Sachs' employees paid bribes to state officials in order to secure large underwriting deals. See: hiips://www.nytimes.com/2018/11/01/business/goldman-sachs-malaysia-investment-fund.html.

legislation is not only justified in terms of business but also considered from the perspective of shareholders and other stakeholders.

2. Institutional setting and hypothesis development

2.1.U.K. Bribery Act 2010

The U.K. Bribery Act 2010 was passed in 25 March 2009 and came into force on 1 July 2011. This law substantially increases the severity of penalty relative to previous bribery regulations.[3] Specifically, the Bribery Act imposes unlimited fines and jail terms up to ten years for bribing and taking bribes. Crucially, the Act imposes substantial fines if a corporate fail to prevent bribery by not having a sufficient internal control system in place. The legislation applies to individuals or companies which use bribes in the U.K. or elsewhere, and extends to corporation with U.K. operations, employing U.K. citizens, or providing services to any U.K. organization. Unlike the previous U.K. anti-bribery laws and the U.S. Foreign Corrupt Practices Act (FCPA), the Act covers facilitation payments which have the aim of inducing performance of routine government tasks that are already obligated to be performed (Trautman & Altenbaumer, 2013). It also has a wider scope of application including all forms of bribes, not only foreign public officials but also the private sector.

Under the new legal regime, corporations are required to establish effective anti-bribery systems and controls such as (1) adequate procedures; (2) top (board) level commitment; (3) risk assessment; (4) due diligence; (5) communication and training; and (6) monitoring and review.

[3] Legislations related to bribery in the UK can be traced back to the Public Bodies Corrupt Act 1889, which confined bribery to the public sector and criminalized the soliciting or the receiving of a bribe by a public officer. The law was reformed by the Prevention of Corruption Act 1906, which expanded bribery to the private sector, and the Prevention of Corruption Act 1916, which further lightened the burden of proof of corruption. The Bribery Act 2010 was a result of a potential sanction by the OECD, as the UK government failed to resolve the complexity and uncertainty among the different anti-bribery laws and did not bring a single foreign bribery case to court.

The application of risk-based due diligence is also extended to counterparties like contractors and suppliers. Thus, the Bribery Act changes the basis for corporate criminal liability from focusing on personnel misconduct within the firm to focusing on the quality of the system governing the company's activities (Mukwiri, 2015).

2.2. Bribery and firm growth rate

Recent empirical evidence suggests that bribery in foreign countries facilitates business expansion and, ultimately, firm growth. Cheung et al. (2012) finds that each dollar of bribe paid results in 11 dollars increase in market valuation. Karpoff, Lee, and Martin (2017) find that, even when firms are caught bribing, financial benefits from foreign bribery still more than offset any associated fines, legal expenses, and reputational losses. Further, they find that reputational losses associated with bribery are negligible.

Recent studies also claim that bribery prevention laws can potentially reduce a firm's competitiveness in countries where bribery is prevalent (Iriyama, Kishore, and Talukdar, 2016). Hines (1995) finds that the US Foreign Corrupt Practices Act is associated with a significant reduction of operations of US firms in bribe-prone countries. Similarly, Zeume (2017) finds that the UK Bribery Act reduces growth of UK businesses in corruption-prone countries, and argue that the Act increase the cost of doing business for UK firms overseas.

2.3. Bribery and cost of equity

A firm's cost of equity is determined by the firm's risk, as it is the rate of return at which investors require to compensate for uncertainties associated with holding the firm's stock. The effect of the UK Bribery Act on firm risk from the view of equity holders, and consequently the firm's cost of equity, is theoretically ambiguous. This section discusses the impact of the Bribery Act on the cost of equity and set out our hypotheses.

2.3.1. The Bribery Act reduces cost of equity

The passage of the UK Bribery Act can result in a reduction in firm risk and consequently the cost of equity. The literature recognizes corporate misconducts, including bribery, as business risk (e.g. Lyon and Maher, 2005; Murphy, Shrieves, and Tibbs, 2009), and a result, a law that discourages managers from engaging in misconduct can potentially reduce business risk of the firm. Engaging in bribery may also distort firm investment decisions by distracting firms from investing in value-enhancing projects (Birhanu, Gambardella, and Valentini, 2016). Further, bribery can make firms more opaque. Firms may distort their economic decisions and withhold financial information in order to divert funds to pay for bribes (Das, Nanda, and Xiao, 2015; Smith, 2016). Information risk is documented to be priced by equity holders (Ashbaugh-Skaife, et al., 2009; Beneish, Billings, and Hodder, 2008), and thus can affect cost of equity. By making a failure to prevent bribe a crime, the UK Bribery Act reduces the incentives of managers to engage in bribery and thereby can decrease a firm's risk as well as its cost of equity.

H1: The UK Bribery Act is associated with a *reduction* in cost of equity.

2.3.2. The Bribery Act increases cost of equity

The Bribery Act may increase a firm's risk because it increases the propensity of being caught and the costs associated with being caught. The Bribery Act casts a significantly wider net with regards to activities that are considered to be in violation and imposes a much higher maximum fine compared to previous UK legislations, the OECD Anti-Bribery Convention, and the US's Foreign Corrupt Practices Act. This implies that the adverse financial consequences from being caught of engaging in bribery becomes more severe. Further, the UK Bribery Act potentially leaves UK firms at a disadvantage to the competitors that are not covered by the law, particularly local

competitors in bribe-prone countries (Zeume, 2017). Being prevented from paying bribe can increase the likelihood of losing businesses to local competitors (De Jong, Tu, and Van Ees, 2012).

H2: The UK Bribery Act is associated with an *increase* in cost of equity.

3. Sample, variables, and model

3.1 Sample

Our initial sample comprises 1,884 UK firms which are active on the London Stock Exchange (LSE) or the Alternative Investment Market (AIM) in March 2009. We obtain financial accounting and market data from Datastream/Worldscope. We exclude firms with missing data, financial firms, and firms with negative equity.[4]

Our final sample (see Table 1) comprises 5,503 observations covering 934 firms during the period of 2003-2015 except 2009.

(Table 1 about here)

3.2. Measuring firm exposure to bribery

Following prior literature (Chung et al, 2012; Karpoff et al., 2014; and Zeume, 2017), we assume that a firm's propensity to engage in bribery is positively related to its exposure to bribe-prone countries. Specifically, we use Transparency International's Corruption Perceptions Index (CPI) as a measure of how prevalent bribery is in a country. For each company, we weight CPI scores by the company's sales in those geographical segments.[5] Our measure of bribery exposure, *Segment CPI*, is defined as follows:

[4] Earnings yield less then 0 and book-to-market discount less than -1.

[5] Transparency International assigns each country a score between zero to 100, with higher scores indicating lower exposure to corruption. Where a company reports the geographic segment as combined regions or continents, the average of CPI scores is used.

$$Segment\ CPI_{i,t} = \sum \left(\frac{Segment\ Sales_{i,t,s}}{Total\ Sales_{i,t}} \times CPI_{s,t} \right)$$

where $CPI_{s,t}$ is the CPI score for geographic segment *s* in year *t*. The CPI score ranges from 0 to 100 with less bribe prone countries having lower CPI scores.

We then construct a dummy variable, *Bribery Exposure*, which equals 1 if Segment CPI is less than or equal to 55, one standard deviation below the mean value of Segment CPI, and 0 otherwise.[6] The companies with *Bribery Exposure* equals to 1 are those which are likely to be more affected by the Bribery Act as are therefore classified as treated firms in our setting.

3.3. Empirical model: The standard discounted residual income model

While the focus of this study is estimating the impact of UK Bribery Act 2010 on cost of equity, the literature suggests that growth is an important motive for firms to commit bribery (Zeume, 2017; Karpoff, Lee, and Martin, 2017; Cheung, Rau, and Stouraitis, 2012). Therefore, we simultaneously estimate the implied cost of equity and the expected growth rate using a simple revision of the standard discounted residual income model (Easton et al., 2002).

In addition to allowing us to directly take into account the effect of bribery on firm growth when we estimate the effect of bribery on risk, this approach also allow us to circumvent criticisms in relation to using analyst earnings forecast data. For instance, Guay, Kothari, and Shu (2011) show that analysts commonly update their forecasts following a stock price changes with a delay. Lys and Sohn (1990) find that analyst short-term earnings forecasts contain only 66% of the

[6] The proportion of firms with *Bribery Exposure = 1* is 17.06%. We perform sensitivity analysis based on several cut-off points and present the results in Figure E.1.from Appendix E.

information that is reflected in security prices before the forecast-release date. Additionally, using only price and accounting variables allow us to include more firms in our sample.

The standard discounted residual income model starts by assuming that both future discount and growth rates can be approximated by a constant, and the following test equation can be obtained by simple algebraic calculation (See Appendix A):

$$EY_{i,t} = r + g\ B/M\ discount_{i,t} + \varepsilon_{i,t} \quad (1)$$

where EY_{it} is the forward earnings yield for firm *i* in year *t*, which is measured as earnings at *t+1* divided by market value of equity at *t*. $B/M\ discount_{it}$ is the book to market discount measured by book value of equity minus market value scaled by market value (Easton et al. 2002). The constant *r*, the estimated cost of equity, and the slope coefficient *g*, the long-run growth estimate, are the main variables of interest.

To allow for both cost of equity and growth rate to change after the UK Bribery Act passes, we define a dummy variable *Passage* to equal one after the UK Bribery Act passes, and zero otherwise. We then include this dummy variable into the model as follows:

$$EY_{i,t} = r + r'\ Passage + g\ B/M\ discount_{i,t} + g'\ B/M\ discount_{i,t} \cdot Passage + \varepsilon_{i,t} \quad (2)$$

Here, *r'* and *g'* represent the difference in implied cost of equity and expected growth for the post-legislation period compared to the pre-legislation period. We clarify 2003-2008 as the pre-legislation period and 2010-2015 as the post-legislation period as the draft of the U.K. Bribery Act was passed on March 25, 2009.[7]

[7] We exclude 2009 from our sample period, as the law passed in 2009 but became effective in 2010.

As the Bribery Act 2010 is likely to disproportionately affect firms that operates in bribe-prone countries, we include the *Bribery Exposure* indicator variable and turn the standard discounted residual income model into a difference-in-difference specification as follows:

$$\begin{aligned} EY_{i,t} = r + r'Passage + \beta_1 Bribery\ Exposure_{i,t} + r''Passage \cdot Bribery\ Exposure_{i,t} \\ + g\ B/M\ discount_{i,t} + g'\ B/M\ discount_{i,t} \cdot Passage \\ + \beta_2 B/M\ discount_{i,t} \cdot Bribery\ Exposure_{i,t} \\ + g''B/M\ discount_{i,t} \cdot Passage \cdot Bribery\ Exposure_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (3)$$

where *Bribery Exposure*$_{it}$ is an indicator that takes the value of one of the test firms with high exposure to bribery-prone countries and zero otherwise.[8]

Our coefficients of interest are *r''* and *g''*, which are difference-in-difference coefficients. The coefficient *r''* captures the change in *cost of equity* for firms with high bribery exposure after the Bribery Act passes, relative to the change for firms with low bribery exposure. Similarly, the coefficient *g''* captures the change in *growth rate* for firms with high bribery exposure after the Bribery Act passes, relative to the change for firms with low bribery exposure. We also firm fixed effects (γ_i) to control for any unobserved time-invariant differences firms in our sample.

4. Results

4.1. Main results: Effect of the Bribery Act 2010 on cost of equity and growth rate

Table 2 presents our main results. Column 1 estimates the standard discounted residual income model (Equation 1). The estimated cost of equity for our sample firm is 9% (r), and the estimated growth rate is 3.3% (g). These values are within reasonable ranges for the UK economy between

[8] Our results are robust to using raw segment CPI scores instead of the Bribery Exposure indicator variable.

2003 and 2015, and therefore, can serve as validations for our residual income model.[9] Column 2 allows both cost of equity and growth rate to differ between before and after the Bribery Act passes in 2010. We find that after the Act passes, the cost of capital reduces by 0.9% (r'). While this change is significant at 1% level, the coefficient represents a modest change in cost of equity: the estimates imply that the average cost of equity is 9.6% between 2003-2008 and is 8.6% between 2010-2015. The estimated change in growth rate (g') is 0.3% and is not statistically significant.

[Table 2 about here]

Column 3 presents our difference-in-difference results. Consistent with prior literature which suggests that drive may facilitate growth (Karpoff, Lee, and Martin, 2017; Zeume ,2017; Cheung, Rau, and Stouraitis, 2012), the coefficient for *Passage * Bribery exposure * B/M discount* (g'') is negative and significant at 5% level. This indicates that the growth rate of firms with high exposure to bribe prone countries (our treated firms) drops by 3.7% lower than those with low bribery exposure after the Bribery Act passes.

Turning to cost of equity, we find the coefficient for *Passage * Bribery Exposure* is negative and significant, indicating the reduction in cost of equity amongst firms with high bribery exposure in relation to those with low bribery exposure. The coefficient estimates in Column 3 suggests that the Bribery Act reduces the cost of equity for high bribery exposure firms by 2.75% (r'+r''), whereas for firms with low bribery exposure the reduction is 0.5% (r' which is not statistically significant). Considering that the average cost of equity for firms with high bribery exposure is 11.6% (9.4%+1.4%), this reduction is economically substantial and amounts to almost a quarter of these firms' cost of equity. In order to rule out the possibility that our significant results

[9] UK GDP growth rate for 2003 to 2015 (except the financial crisis 2008-09) is 2.4%. As a reference of cost of equity, the average annual return of FTSE-100 index is 8.4% (including return of 2008) and 11.5% (excluding return of 2008).

are due to any unobserved heterogeneity across different firms and different years, Column 4 include firm and year fixed effects. We find that our difference-in-difference coefficients remain significant and the economic magnitudes of these coefficients remain similar to Column 3.

Overall, while our results are in line with prior works that bribery prevention laws may curb a firm's competitiveness in foreign market and could result in lower growth, we also find that the Bribery Act significantly lowers the cost of equity for firms that are exposed to bribe prone countries. Our evidence suggests that bribery regulations reduce risk for equity holders such that they demand lower rate of return for their investment In Section 5, we further examine the economic channels through which bribery regulations can affect equity risk and find that the Bribery Act leads to an improvement in the internal process as well as enhance transparency of affected firms.

4.2 Robustness checks

We perform several robustness checks and present the results in Table 3. Panel A shows that our main results are not sensitive to how we classify firms as having a high exposure to bribery. In our baseline results, the indicator variable *Bribery Exposure* is equal to one when a firm's segment CPI score is below 55, which one standard deviation below its mean (about the 16th percentile), and is zero otherwise. In Columns 1, 2, and 3, we relax this threshold to below the 20th percentile, the 40th percentile, and the median. We find that the results become monotonically weaker as we relax the threshold, suggesting that the effect of the Bribery Act is stronger amongst firms with higher exposure to bribe-prone countries. In Column 4, we replace our *Bribery exposure* indicator, with raw segment CPI scores and show that our findings continue to hold. As a lower segment CPI score indicate a lower sale exposure to bribe-prone countries, we find that the coefficient for *Passage * Segment CPI* is positive and significant. In Column 5, instead of using scores from

Transparency International, we use firm-level bribery exposure data from FTSE4Good, find that our results continue to hold. Overall, these results confirm that our findings indeed indicate that firms with high bribery exposure experience a significant decrease in their cost of equity after the passage of the UK Bribery Act.

[Table 3 about here]

Column 1 of Panel B replaces the forward earnings yield with the values computed from I/B/E/S equity analyst forecasts, and show that our findings continue to hold. In Column 2, we also find similar results when estimating the implied cost of equity based on Ohlson and Juettner-Nauroth (2005) model.[10]

In Panel C, we further confirm that the reduction in cost of equity is indeed due to the passage of the Bribery Act, and not because of any pre-existing trend (Atanasov and Black, 2016). We conduct placebo analyses by replacing the actual event year (2009), with artificial event years – 2005, 2006, and 2007. Consistent with our expectations, we do not find any significant change in neither cost of equity nor growth rate around any of the artificial event years

4.3. Covariate balancing

In this section, we further strengthen our identification strategy by combining our shock-based difference-in-differences design with covariate balancing. The validity of our identification and

[10] Under the assumptions that market price equals present value of expected dividends with two different growth rates, short-term growth (g_2) and perpetual growth rate (g_p), the Ohlson and Juettner-Nauroth (2005) assume the following pricing equation:

$$P_0 = \frac{eps_1}{r_e} + \frac{(eps_2 - eps_1 - r_e(eps_1 - dps_1))}{r_e(r_e - g_p)}$$

where eps_1 and eps_2 are analysts' earnings per share forecasts at FY1 and FY2, respectively. dps_1 is expected net dividend per share. The short-term growth rate, g_2, is obtained from eps_2 less eps_1 scaled by eps_1. The long-term growth rate, g_p, is approximated by 10-year UK government bond yield. From the pricing equation, we obtain the cost of equity, r_e.

our results hinges on an untestable parallel-trend assumption (Atanasov and Black, 2016; Roberts and Whited, 2012); that is, absent the Bribery Act 2010, the cost of equity and growth rate of all our sample firms should move in the same way regardless of their exposure to bribe prone countries. This can plausibly be violated when there are significant different in characteristics of our treated and control firms.

Panel A of Table 4 presents the means of various fundamental characteristics of our sample firms: firm size (log market capitalization), book-to-market ratio, leverage, ownership concentration, working capital ratio, and operating cash flows. We find that firms that we classified as having a high exposure to bribery are on average larger, has a lower market-to-book ratio and maintain a higher level of working capital.

[Table 4 about here]

To ensure that our results are not due to the possibility that our treatment and control firms are fundamentally different, we covariate balance our sample in two ways. First, we construct a matched sample using Propensity Score Matching (PSM). Specifically, we estimate a logit regression predicting the likelihood that a firm will have a high exposure to bribery using the covariates listed in Panel A of Table 4. We then match each treatment firm with a control firm using the nearest-neighborhood technique with replacement (Dehejia and Wahba, 2002). Second, we employ entropy rebalancing method (Hainmueller, 2012; Hainmueller and Xu, 2013). Specifically, this method allows the regression model to place more emphasis on similar observations in the control and treatment groups in order to produce a covariate balanced sample. An advantage to using entropy rebalancing is that it allows more observations to remain in the sample, compared to using propensity score matching.

Panel B of Table 4 presents the means of key firm fundamentals across treatment and control groups after covariable balancing. We show that the there is no significant difference in mean across the two groups for any firm characteristics. We present the covariate balanced difference-in-difference results in Panel C. We find that the coefficient for *Passage * Bribery exposure* remains negative and significant in both covariate balanced samples. These results further suggest that our main findings are not driven by the differences between firms with high and low exposure to bribery.

5. Mechanism

We find that the passage of the UK Bribery Act 2010 is associated with a significant reduction in cost of equity amongst firms with high exposure to bribe prone countries. We postulate that this reduction in cost of equity is due to firms becoming less risky to equity holders such that they demand a lower rate of return (Lang, Lins & Maffett, 2012). This section provides evidence of potential mechanisms through which the Bribery Act reduces risk. We first show that firms most affected by the Bribery Act improves their internal control system. This limits the possibility of negative outcomes associated with bribe paying (Serafeim, 2014; D'Souza and Kaufmann, 2013; Birhanu, Gambardella, and Valentini, 2016). As a better internal control system is associated with better corporate transparency, we show that affected firms experience a reduction in common measures of corporate transparency and show that corporate transparency is indeed a channel through which the Bribery Act decreases cost of equity of firms that have high exposure to bribes. Consistent with this interpretation, we also show that the effect of the Bribery Act on cost of equity is stronger amongst firms with high ex ante measures for agency cost.

5.1. Strengthened internal control system

One key distinction of the UK Bribery Act 2010 is that it requires firms to put in place an internal control system for bribery and corruption prevention. Prior literature has documented evidence of the association between a firm's internal control system and cost of equity (Ashbaugh-Skaife, et al., 2009; Beneish, Billings, and Hodder, 2008).

As the Bribery Act requires a minimum level of internal control system in place and significantly increases the personal and legal liability of managers if the internal control system fails to prevent bribery (Bargeron, Lehn, & Zutter, 2010; Litvak, 2008), the effect of Bribery Act to be stronger amongst firms that exhibit poor governance prior to the passage of the Act.

In Panel A of Table 5, we divide our sample into two groups based on ASSET4's corporate governance scores. Column 1 comprises sample whose governance scores are in the lowest quartile while Column 2 includes the remaining observations. We find the coefficient for Passage * Bribery exposure is significant only amongst the observations with poor governance scores in Column 1, suggesting that the effect of the Bribery Act is indeed stronger amongst firms with poor governance.

[Table 5 about here]

In Panel B, we evaluate the effect of the Bribery Act on internal control system of our sample firms. We use ASSET4's data on anti-bribery provisions[11], and construct a variable *ASSET4 Scores*, which ranges from 0-6. A higher score indicates that the firm has a stronger internal control system.

[11] ASSET4's anti-bribery data comprises six indicators whether the company: 1) mentions a public commitment to anti-bribery/corruption at the senior management or the board level; 2) strengthens anti-bribery/corruption in its code of conduct, 3) adopts an internal management tool for bribery/corruption such as hotlines or whistle-blowing systems, 4) has a policy to cope with bribery/corruption in business transactions, 5) communicates bribery-relevant issues with employees in organizational processes, and 6) conducts employee training on anti-bribery/corruption.

We find that the passage of the Bribery Act is associated with a moderate increase in ASSET4 anti-bribery scores. Specifically, in Model 1, we find that the coefficient for *Passage* * *Bribery exposure* is positive and significant. Crucially, the coefficient for *Bribery Exposure* is not statistically significant. This indicates that prior to the Bribery Act, firms that have business exposure to bribe prone countries do not have a weaker internal control system that other firms, and the results suggest these high bribery exposure firms enhance their internal control system in response to the UK Bribery Act.

5.2. Reduction in information asymmetry

A consequence of having an enhanced internal control system in place is that it reduces information asymmetry between the firm and shareholder (Beneish, Billings, and Hodder, 2008). Information asymmetry means that the rational investors must bear additional information risk and this as a consequence increases the firm's cost of external funding (Healy et al., 1999; Healy and Palepu, 2001; Lang et al., 2012; Merton, 1989).

Table 6 shows that the Bribery Act is associated with a decrease in information asymmetry amongst firms with high bribery exposure. In Column 1, we use bid-ask spread as a proxy for information asymmetry (Glosten & Milgrom, 1985; Kyle, 1985; Easley & O'Hara, 1987) and find that high bribery exposure firms experience a significant decline in bid-ask spread after the Bribery Act passes. Following Amiram, Owens, & Rozenbaum (2016), Column 2 include additional control variables and shows that our findings continue to hold. We reach the same conclusion in Columns 3 and 4 when employ the illiquidity measure of Amihud (2002) as an alternative measure of firm transparency.

[Table 6 about here]

5.3. Mediation analysis

We further show in Table 7 that information asymmetry is indeed a mechanism through which the Bribery Act reduces cost of equity. Specifically, we perform a mediation analysis by including our measures for information asymmetry in the standard discounted residual income model (see e.g. Baron and Kenny, 1986; Hammersley, 2006). If information asymmetry is a mediator in the relationship between the Bribery Act and cost of equity, we will find that the coefficients for information asymmetry proxies are significant.

Column 1 is the same as Column 4 of Table 2, and is presented here as a benchmark. The results in Columns 2 and 3 are consistent with our expectation. We find that the information asymmetry proxies (bid-ask spread and the illiquidity measure) enter the model significantly. Crucially, when we interact our information asymmetry proxies with *B/M discount* to examine whether they also moderate the relation between the Bribery Act and growth rate, we find that the interaction terms do not enter the model significantly. Overall, the results are consistent with our conjecture that the Bribery Act decreases cost of equity amongst firms with high bribery exposure firms because of the improved internal control system and the reduction in information asymmetry.

[Table 7 about here]

6. Conclusions

This paper examines the effect of the UK Bribery Act 2010 on cost of equity and growth rate. Consistent with prior studies (e.g. Karpoff, Lee, and Martin, 2017; Zeume ,2017; Cheung, Rau, and Stouraitis, 2012), we find that the Bribery Act decreases expected growth rate of firms who conduct business in bribe-prone countries. However, we also find that implied cost of equity of

these firms significantly decreases, implying that equity holders believe these firms are less risky and assign a lower required rate of return. We find that our results are concentrated amongst firms with poor governance before the passage of the law, and the Bribery Act is associated in improvement of corporate anti-bribery practices. Finally, we find that corporate transparency increases as a result of the law, and show that this is a mechanism through which the Bribery Act influences cost of equity.

Given that the costs and benefits of anti-bribery laws remains a debate amongst both policy maker and academics alike, our results help inform this debate by showing a positive impact of the law. Despite the concern that the law may impede business expansion in some foreign market and the increase in compliance cost, we highlight significant benefits in terms of improved internal control system and corporate transparency. Our findings suggest that anti-bribery laws have a direct benefit to equity investors.

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Table 1. Summary Statistics

Variable	n	Mean	S.D.	Q1	Median	Q3
EY	5503	0.08	0.06	0.04	0.07	0.10
B/M discount	5503	-0.37	0.55	-0.72	-0.53	-0.21
Segment CPI	5503	68.54	13.18	60.67	72.69	80.05
ln(Market capitalization)	3427	13.01	1.88	11.71	13.01	14.23
Book-to-market	3427	0.54	0.52	0.25	0.41	0.68
Leverage	3427	0.19	0.15	0.05	0.17	0.28
Ownership concentration	3427	21.40	21.11	2.49	15.35	34.34
Working capital ratio	3427	1.60	1.21	0.98	1.34	1.81
Cash flow from operation	3427	0.10	0.08	0.06	0.09	0.14
ASSET4_Bribery	2450	2.05	2.14	0.00	2.00	4.00
Bid-Ask Spread	3860	0.041	0.058	0.003	0.025	0.053
Illiquidity	3913	219.76	532.42	1.28	31.51	164.27
Volatility	3913	0.02	0.02	0.02	0.02	0.03
Average Volume	3913	1234.22	3829.32	37.87	143.56	780.14
ASSET4_GOV	1855	72.68	18.30	62.20	76.94	87.52

This table reports descriptive statistics of the sample data. Our main DiD regression includes *EY, B/M discount*, and *Segment CPI* (for the treatment effect) except control variables. *ln(Market capitalization), Book-to-market, Leverage, Ownership concentration, Working capital ratio*, and *Cash flow from operation* are used for the alternative estimation of the cost of equity (Table 3-B) and for the analysis of anti-bribery management including *ASSET4_Bribery* (Table 5). *Bid-Ask Spread* and *Illiquidity* are dependent variables of information-risks analyses and *Volatility* and *Average Volume* are used as control variables (Table 6) for 2005-2013

Table 2. Effects of Bribery Risk on Cost of Equity and Firm Growth

DV = Forward earnings yield	(1)	(2)	(3)	(4)
B/M discount * Passage * Bribery exposure (g'')			**-0.037*** **	**-0.033** **
			(0.014)	**(0.014)**
Passage * Bribery exposure (r'')			**-0.027*** **	**-0.026*** **
			(0.009)	**(0.009)**
B/M discount * Passage (g')		-0.004	0.001	
		(0.006)	(0.006)	
Passage (r')		-0.009***	-0.005	
		(0.003)	(0.004)	
Bribery exposure (β1)			0.014*	0.024**
			(0.009)	(0.010)
B/M discount * Bribery exposure (β2)			0.026**	0.035**
			(0.013)	(0.015)
B/M discount (g)	0.033***	0.036***	0.032***	0.028***
	(0.003)	(0.005)	(0.005)	(0.005)
Constant (r)	0.090***	0.096***	0.094***	0.099***
	(0.002)	(0.003)	(0.003)	(0.004)
Firm FE	N	N	N	Y
Year FE	N	N	N	Y
Observations	5,503	5,503	5,503	5,503
Number of Firms	934	934	934	934
Adjusted R-squared	0.086	0.090	0.095	0.088

This table reports our main results of the effects of bribery risk on firms' cost of equity and long-run growth for 2003-2015 except 2009. The dependent variable is the forward earnings yield (EY) measured as earnings at t+1 divided by market value of equity at t. Model (1) estimates the implied cost of equity and the long-run growth of all the UK firms. Model (2) measures the changes in the cost of equity and growth rate after the Bribery Act. Model (3) estimates the additional changes in the variables of interest (*r''* and *g''*) according to firms' bribery risk. Model (4) presents the estimated results when including firm-fixed effects and year dummies. In this case, *Bribery exposure* is dropped off as the indicator is time-invariant. Robust standard errors clustered at the firm level are presented in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10% levels respectively.

Table 3. Robustness Test Results

Panel A. Sensitivity Tests for Bribery Exposure Measure

	Alternative cut-offs for segment CPI scores			Raw segment CPI scores	FTSE4Good bribery exposure data
	20th percentile	40th percentile	50th percentile		
	(1)	(2)	(3)	(4)	(5)
Passage * Bribery exposure (r'')	**-0.023****	**-0.016****	**-0.010**	**0.054*****	**-0.020***
	(0.009)	**(0.007)**	**(0.006)**	**(0.017)**	**(0.011)**
B/M discount * Passage * Bribery exposure (g'')	-0.030**	-0.012	0.001	-0.006	-0.008
	(0.013)	(0.011)	(0.008)	(0.009)	(0.016)
Other variables	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Observations	5,503	5,503	5,503	5,503	3,139
Number of Firms	934	934	934	934	387
Adjusted R-squared	0.089	0.088	0.088	0.089	0.045

Panel B. Alternative Model Specifications

	I/B/E/S earnings yield	Ohlson & Juettner-Nauroth (2005)'s cost of equity
Variables	(1)	(2)
Passage * Bribery exposure (r'')	**-0.014****	**-0.009***
	(0.007)	**(0.005)**
B/M discount * Passage * Bribery exposure (g'')	**-0.025*****	
	(0.008)	
Passage	-0.019***	-0.003
	(0.004)	(0.003)
B/M discount	0.056***	
	(0.008)	
B/M discount*Passage	-0.017**	
	(0.008)	
ln(Market capitalization)		-0.018***
		(0.004)
Book-to-market		0.047***
		(0.008)
Leverage		0.054
		(0.036)
Working Capital Ratio		0.005
		(0.009)
Operating cash flows		-0.085***
		(0.027)
Ownership concentration		-0.000
		(0.000)
Constant	0.116***	0.347***
	(0.003)	(0.054)
Firm FE	Y	Y
Observations	4,802	3,427
Number of Firms	816	638
Adjusted R-squared	0.335	0.070

Panel C. Artificial Event Periods

Artifical event year =	2005	2006	2007
DV = Forward earnings yield	(1)	(2)	(3)
Passage * Bribery exposure (r'')	-0.003	0.010	0.010
	(0.018)	(0.016)	(0.013)
B/M discount * Passage * Bribery exposure (g'')	-0.007	0.007	0.004
	(0.025)	(0.021)	(0.018)
Other variables	Y	Y	Y
Firm FE	Y	Y	Y
Year FE	Y	Y	Y
Observations	2,724	2,724	2,724
Number of Firms	734	734	734
Adjusted R-squared	0.113	0.113	0.114

This table reports robustness test results. **Panel A** presents DiD regression results with different measures of bribery exposure with firm- and year-fixed effects. Model (1) uses Bribery exposure indicator based on the p20 value of Segment CPI score instead of 55. Model (2) uses Bribery exposure indicator based on the p40 value of Segment CPI score. Model (3) uses Bribery exposure indicator based on the p60 value of Segment CPI score. Model (4) uses the continuous variable, Segment CPI score, instead of the dummy variable of Bribery exposure. For convenience, Segment CPI is scaled by 100. Model (5) uses an alternative measure of bribery exposure instead of our indicator. We use the bribery risk data (high or low) of FTSE4Good 2009 for the whole test period. The measure does not vary over time so that it is not included into the DiD regression.

Panel B shows DiD regression results using alternative estimation models. Model (1) presents the DiD regression result of forward earnings yield (EY) using I/B/E/S analysts' earnings forecasts instead of actual forward earnings with firm-fixed effects.

Model (2) presents the DiD regression result of the implied cost of equity (re), which is estimated using Ohlson & Juettner-Nauroth (OJ, 2005) model, on our measure of bribery exposure and firm-characteristics.
Panel C presents the DiD regression results using artificial event periods instead of 2009, to test whether unobservable shocks that are not related to the U.K. Bribery Act drive our results. 2005, 2006, and 2007 are used as an artificial event period in Model (1), (2), and (3) respectively.

All continuous variables are winsorized. Robust standard errors clustered at the firm level are presented in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10% levels respectively.

Table 4. DiD Regressions after Covariate Balancing

	Panel A. Difference between Treatment and Control Firms before Covariate-Balancing			**Panel B. Difference between Treatment and Control Firms after Covariate-Balancing**					
	Baseline sample			Propensity score matching			Entropy balancing		
	Bribery exposure		Diff	Bribery exposure		Diff	Bribery exposure		Diff
	High	Low		High	Low		High	Low	
ln(Market capitalization)	12.61	11.84	0.772***	12.25	12.59	-0.34	12.67	12.67	0.00
Book-to-market	0.59	0.64	-0.051***	0.39	0.39	0.00	0.60	0.60	0.00
Leverage	0.16	0.17	-0.005	0.16	0.17	-0.01	0.16	0.16	0.00
Ownership concentration	30.61	30.10	0.514	29.99	29.92	0.07	30.02	30.02	0.00
Working capital ratio	2.50	1.67	0.827***	2.65	1.91	0.75	2.44	2.44	0.00
Cash flow from operation	0.09	0.10	-0.004	0.07	0.07	0.00	0.10	0.10	0.00
Observations	932.00	4571.00	5503.00	80.00	66.00	146.00	850.00	4149.00	4999.00

Panel C. DiD Regression Results with the PSM- and E-Balancing Samples

	Propensity score matching	Entropy balancing
DV = Forward earnings yield	(1)	(2)
Passage * Bribery exposure (r'')	-0.021*	-0.025***
	(0.011)	(0.005)
B/M discount * Passage * Bribery exposure (g'')	-0.039**	-0.019**
	(0.016)	(0.008)
Other variables	Y	Y
Firm FE	Y	Y
Year FE	Y	Y
Observations	1,057	2,304
Number of Firms	146	312
Adjusted R-squared	0.147	

The table shows the difference between treatment and control firms before (**Panel A**) and after covariate balancing (**Panel B**). In the Propensity Score Matching (PSM), 2007 dataset is used to obtain firms' propensity scores. In the Entropy Balaning, all the dataset in the period 2003-2015 except 2009 is used to obtain firms' fitted weights. The sample balancing applies to firms' covariates which are used in our main DiD analysis.

Panel C reports the DiD regression results with a PSM sample (Model 1) and an Entropy Balanced sample (Model 2). The PSM method pairs the treated and the control units that are similar in terms of their observable characteristics. We implement this procedure by using firms' propensity scores obtained from the logit regression of Bribery exposure and matching them with a nearest neighbourhood technique with replacement. The logit regression includes *ln(Market capitalization), Book-to-market, Leverage, Working capital ratio, Cash flow from operation, Return*, and *Sales Growth*. After the PSM, we conduct the DiD regression with the balanced PSM-sample.

The Entropy Balancing method reweights the data from the control group to match a set of moments that is computed from the treatment group data. We specify both the 1st and 2nd covariate moments (mean and variance) to be adjusted for *ln(Market capitalization), Book-to-market, Leverage, Working capital ratio, Cash flow from operation, Return, Sales Growth*, and *Ownership concentration*. Then, the fitted weights are implemented as a weighted least squares regression to estimate the effect of bribery exposure in the reweighted data. Robust standard errors clustered at the firm level are presented in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10% levels respectively.

Table 5. Bribery Act and Internal Control System

Panel A. Effect of Governance System

	Q1	Q2-Q4
DV: EY	(1)	(2)
Passage * Bribery exposure (r'')	-0.111**	0.005
	(0.044)	(0.021)
B/M discount * Passage * Bribery exposure (g'')	-0.137***	0.024
	(0.051)	(0.025)
Bribery exposure	0.077**	-0.027
	(0.035)	(0.019)
B/M discount	-0.008	0.026***
	(0.021)	(0.009)
B/M discount * Bribery exposure	0.118***	-0.041*
	(0.037)	(0.023)
Constant	0.087***	0.099***
	(0.016)	(0.012)
Firm FE	Y	Y
Year FE	Y	Y
Observations	375	1,480
Number of Firms	174	255
Adjusted R-squared	0.119	0.098

Panel B. Effect of Bribery Act on Firms' Anti-Bribery Management

DV: Asset4_Bribery	(1)	(2)
Passage * Bribery exposure	0.527**	0.455**
	(0.232)	(0.216)
Bribery exposure	-0.271	-0.190
	(0.234)	(0.221)
ln(Market capitalization)		0.053
		(0.097)
Leverage		0.239
		(0.386)
Working capital ratio		-0.044
		(0.033)
ln(Ownership concentration)		-0.009
		(0.023)
Book-to-market		0.022
		(0.069)
Constant	0.599***	-0.162
	(0.096)	(1.357)
Firm FE	Y	Y
Year FE	Y	Y
Observations	2,450	2,292
Number of Firms	267	266
Adjusted R-squared	0.578	0.577

Panel A reports the impact of governance system on the relationship between Bribery Act and the test variables (implied cost of equity and long-run growth) for 2003-2015 except 2009. The governance system is measured by ASSET4's Governance Score. It measures a firm's systems and processes which ensures its executives and board members to act in the best interests of its shareholders. The sample is divided into two subgroups: a subsample of Q1 in Model (1) and a subsample of Q2~Q4 in Model (2) because of long left-tail distribution.

Panel B presents DiD regressions of the firms' anti-bribery provision score (ASSET4_Bribery) on the bribery exposure around the passage of the Bribery Act for 2003-2014. The anti-bribery provision score is constructed with six indicators related to anti-bribery/corruption provisions, which are collected by Asset4. In our sample, the firms having the data for Asset4 anti-bribery provisions are included into the analysis. The indicators are 1) whether the company mentions public commitment to avoid bribery and corruption at the senior management and the board level, 2) states anti-bribery and anti-corruption in its code of conduct, 3) has internal management tools over bribery and corruption like whistle blowing systems, or hotlines, 4) has a policy to withstand bribery and corruption in its business transactions, 5) communicates relevant issues with employees at the organizational processes, and 6) has relevant employee trainings. Asset4 records "Yes" or "No" for each indicator so that we assign the value of one to "Yes" and zero to "No". All values are aggregated and the total score ranges from zero to six. Higher score means better anti-bribery management.
Model (1) reports the estimated coefficients of DiD regression without control variables, whereas Model (2) includes control variables. All continuous variables are winsorized. Robust standard errors clustered at the firm level are presented in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10% levels respectively.

Table 6. Bribery Exposure and Information Risks

	DV: ln(Bid-Ask Spread)		DV: ln(Illiquidity)	
VARIABLES	(1)	(2)	(3)	(4)
Passage * Bribery exposure	-0.320***	-0.164**	-0.266*	-0.269**
	(0.095)	(0.078)	(0.142)	(0.119)
Bribery exposure	0.053	-0.002	-0.033	0.053
	(0.104)	(0.084)	(0.150)	(0.128)
Volatility		4.147**		0.447***
		(1.890)		(0.028)
ln(Average Volume)		-0.110***		-0.654***
		(0.026)		(0.053)
ln(Market capitalization)		-0.250***		
		(0.057)		
ln(Market Price)		-0.264***		
		(0.054)		
Constant	-3.662***	-0.128	-2.262***	0.277
	(0.036)	(0.605)	(0.057)	(0.288)
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	3,860	3,860	3,913	3,913
Number of Firms	870	870	899	899
Adjusted R-squared	0.280	0.454	0.219	0.396

This table reports the regression results of information risks on bribery exposure for ±4 years. In April 2014, there was "Stamp Duty Exemption" which exempted the SDRT (Stamp Duty Reserve Tax) for the AIM transactions and high-growth segments. To avoid the effect of regulation on liquidity, we restrict the test period from 2005 to 2015 (except 2009). We use three measures of information risks: bid-ask spreads, analyst coverage, and illiquidity. Model (1) and (2) measure the effect of bribery exposure on the natural logarithm of bid-ask spreads. The bid-ask spread used in the regression is measured by annual average of the daily closing ask price less the closing bid price scaled by the midpoint of the closing ask and bid prices available from the Datastream. Model (3) and (4) measures the effect of bribery exposure on the natural logarithm of illiquidity. The illiquidity means price response associated with one GBP of trading volume (Amihud, 2002), which is obtained by 10^5*the average of daily ratio of absolute stock return to GBP trading volume. Bid-ask spread is winsorized at 1% and 99%. Illiquidity is truncated at 1% and 99%. Other continuous variables are winsorized at 1% and 99%. Robust standard errors clustered at the firm level are presented in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10% levels respectively.

When we test our hypotheses based on one-sided test results of estimation coefficients, all the null hypotheses are not rejected following as: Model (1) & (2) H0: the coefficient of *Passage*Bribery exposure*<=0 (p-value=0.9996, 0.9824, respectively). Model (3) & (4) H0: the coefficient of *Passage*Bribery exposure*<=0 (p-value=0.9694, 0.9878, respectively). Model (5) & (6) H0: the coefficient of *Passage*Bribery exposure*>=0 (p-value=0.9937, 0.9763, respectively).

Table 7. Bribery Exposure, Information Risk, and Cost of Equity (Mediating Analyses)

	Baseline Model	Bid-Ask Spread	Illiquidity
DV: EY	(1)	(2)	(3)
Passage * Bribery exposure	-0.026***	-0.025***	-0.024**
	(0.009)	(0.009)	(0.010)
ln(Bid-Ask Spread)		0.007***	
		(0.002)	
ln(Illiquidity)			0.006***
			(0.001)
B/M discount * Passage * Bribery exposure	-0.033**	-0.038***	-0.034**
	(0.014)	(0.014)	(0.015)
B/M discount * ln(Bid-Ask Spread)		-0.001	
		(0.002)	
B/M discount * ln(Illiquidity)			0.000
			(0.001)
Bribery exposure	0.024**	0.024**	0.022**
	(0.010)	(0.010)	(0.010)
B/M discount	0.028***	0.021**	0.025***
	(0.005)	(0.010)	(0.005)
B/M discount * Bribery exposure	0.035**	0.038**	0.034**
	(0.015)	(0.015)	(0.015)
Constant	0.099***	0.120***	0.107***
	(0.004)	(0.007)	(0.004)
Firm FE	Y	Y	Y
Year FE	Y	Y	Y
Observations	5,503	5,486	5,472
Number of Firms	934	931	930
Adjusted R-squared	0.088	0.094	0.099

This table reports the regression results of our baseline DiD model before-/after including information risk variables. This mediation analysis is to examine whether information risk is an important channel for the relationship between bribery exposure and cost of equity. If the information risk variable mediates the relationship, the coefficient of the original independent variable (*Passage*Bribery exposure*) will be reduced over the first-stage regression (Model 1), which is the same as Model (4) of Table 2, and the mediator (information risk) will be significant (Hammersley, 2006). In this analysis, we use ln(Bid-Ask Spread) in Model (2), and ln(Illiquidity) in Model (3). The bid-ask spread and illiquidity are obtained by the same methodology of Table 6. Robust standard errors clustered at the firm level are presented in parentheses. ***, **, and * denote statistical significance at the 1, 5, and 10% levels respectively.

Appendix A. Estimation of implied cost of equity and expected growth rate

One of the prevalent methods of estimating cost of capital in the financial economics literature is the discounted residual income valuation model (Claus & Thomas, 2001; Gebhardt, Lee, & Swaminathan, 2001). This estimation model obtains the implied cost of capital estimate by equating the present value of the expected future payoffs to the current market value of equity. In this process, analysts' earnings forecasts are used as the market's expectation of future cash flows, suffering from subjective bias and timeliness problems of the forecasts related to the accuracy of estimating the implied cost of capital. To avoid these issues, we use a simple revision of the standard discounted residual income model which simultaneously estimates the implied cost of equity and the expected growth rate (Easton et al., 2002). With this measure, we can also avoid the need for making invalid assumptions about the expected growth rate.

For the simultaneous estimation of the cost of equity *r* and the rate of long-term growth *g*, we can start from the standard residual income valuation model. It assumes market value of equity as book value of equity plus present value of future expected residual income following as:

$$\mathrm{V_t} = \mathrm{B_t} + \sum_{\mathrm{t}}^{\infty} \frac{(\mathrm{E_{t+1}} - \mathrm{r\ B_t})}{(1+\mathrm{r})^{\mathrm{t}}}$$

where V_t is market value of equity in year *t*; B_t is book value of equity; E_{t+1} is future earnings; *r* is future discount rate. When we assume that varying future discount rates and growth rate of future earnings are approximated by constant equivalents, *r* and *g*, the previous model can be modified as follows:

$$V_t = B_t + \frac{(E_{t+1} - rB_t)}{(r-g)}$$

After some straightforward algebra, we can obtain our estimation model as in the following:

$$\frac{E_{t+1}}{V_t} = r + g\left(\frac{B_t - V_t}{V_t}\right)$$

Then, we estimate it in a panel regression model as:

$$EY_{i,t} = r + g\, BTMD_{i,t} + \varepsilon_{i,t}$$

where $EY_{i,t}$ is forward earning yield of *i* firm at year *t*, which is measured as earnings at *t+1* divided by market value of equity at *t*. Instead of analysts' earnings forecasts, actual forward earnings are used in our estimation. $BTMD_{i,t}$ is book-to-market discount and $\varepsilon_{i,t}$ is error term.

Appendix B. Variable Definitions

Variables	Definitions
EY	Forward earning yield measured as EPS at *t+1*, which is obtained from net income available to common equity (Worldscope code WC01751) scaled by shares outstanding (WC05301), divided by year-end market price of equity (WC05001) at *t*
B/M discount	Book-to-market discount measured from book value of equity less market value, then scaled by market value; Alternatively, this value is obtained from book value of equity (WC03501) divided by market capitalization (WC08001), then minus one
Passage	Indicator variable for the passage of the UK Bribery Act, equals 1 if the year is post-legislation period (after 2009) and 0 otherwise
Bribery exposure	Indicator variable for bribery exposure, equals 1 for the test firms with high bribery exposure and 0 otherwise
Segment CPI	Indicator variable for bribery exposure, which is obtained by summing up a firm's sales ratio of each geographic segment multiplied by TI's CPI (corruption perception index) score for the geographic region. When the company reports the segment as combined continents, the average of CPI scores is used. Then, the bribery exposure is assigned to 0 for the total score (Segment CPI) larger than 55 and 1 otherwise. (The geographic segment sales are obtained from WC19601, WC19611 to WC19691 and the geographic segment regions are obtained from WC19600, WC19610 to WC19690.)
r	Implied cost of equity capital estimated from Easton et al. (2002) model
r’	A change in the implied cost of equity after the passage of the UK Bribery Act
r’’	An additional change in the implied cost of equity according to firms’ bribery exposure
g	Expected growth rate estimated from Easton et al. (2002) model
g’	A change in the expected growth rate after the passage of the UK Bribery Act
g’’	An additional change in the expected growth rate according to firms’ bribery exposure
ln(Market capitalization)	Natural logarithm of firm's market capitalization (WC08001)
Book-to-market	Book-to-market ratio measured by book value of common equity (WC03501) scaled by market value of equity (WC08001)
Leverage	Total debt (WC03255) scaled by total assets (WC02999)
Ownership concentration	Ownership concentration measured by a percentage of closely-held equity of shareholders at least 5 percent of equity ownership within the firm (WC08021)
Working capital ratio	Working capital ratio measured as a ratio of current asset (WC02201) to current liability (WC03101)
Cash flow from operation	Cash flow from operation calculated by cash flow from operations (WC04860) scaled by total assets (WC02999)
ASSET4_GOV	A firm’s governance pillar score (CGVSCORE) available from ASSET4
ASSET4_Bribery	A firm’s anti-bribery provision score constructed by six indicators (SOCODP008, SOCODP0017, SOCODP0037, SOCODP0067, SOCODP 0107, SOCODP0127) related to anti-bribery/corruption policy, process, and management, which are collected by ASSET4.

Bid-Ask Spread	Annual average of the daily closing ask price (Datastream code PA) less the closing bid price (Datastream code PB) scaled by the midpoint of the closing ask and bid prices available from the Datastream
Illiquidity	Annual Average of daily ratio of absolute stock return to dollar trading volume (VO*P#S)
Volatility	Annual standard deviation of daily stock returns
Average Volume	Annual average of daily trading volumes (Datastream code VO)
Sales Growth	Sales growth rate measured as a difference between current and past sales (WC01001) scaled by past sales
ln(Market Price)	Natural logarithm of firm's year-end close price (WC05001)
Return	Market return measured by a ratio of a difference between adjusted stock prices (DataStream code P#S) at the calendar year end of *t* and *t-1* to adjusted price at *t-1*

Appendix C. Sample Selection

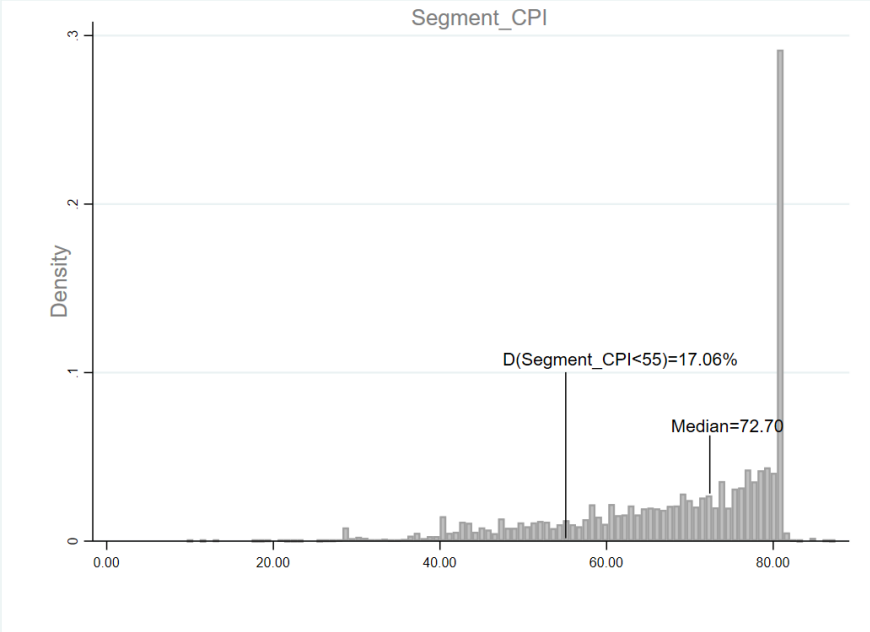
Panel 1. Main DiD Regression	Number of Firms
Entire UK stocks listed on all UK markets: FBRIT (Domestic research stocks) and DEADUK from Datastream as of 30 August 2017	1,506 (active) and 9,118 (dead)
Less cases with no historical price data around March 2009, of non-primary equity, and not listing on the LSE or the AIM	(9,496)
=Total number of initial sample	1,884
Less missing variables of *EY, B/M discount*, Segment CPI	(379)
Less financial firms (ICB Industry=8)	(282)
Less outliers on *EY, B/M discount*, Market Price variables by truncating the 1st and 99th percentiles	(18)
Less cases with negative equity (*EY*<0 and *BM*<0)	(263)
Less the number of firms excluded from the main DiD regression as they were listed only in 2009	(8)
=Total number of final sample	**934**
Panel 1-A. DiD Regression using I/B/E/S Earnings Forecasts	
Less cases with no analysts' EPS forecasts from I/B/E/S	(118)
=Total number of subsample	816
Panel 1-B. DiD Regression using the OJ (2005)'s Estimated Cost of Equity	
Less cases with neither forecasted earnings for share at FY1 and FY2 nor expected net dividend per share from I/B/E/S	(295)
=Total number of subsample	639
Panel 1-C. DiD regression using FTSE4Good Bribery Risk Measure	
Less cases with no bribery risk data (high or low) from the FTSE4Good 2009	(547)
=Total number of subsample	387

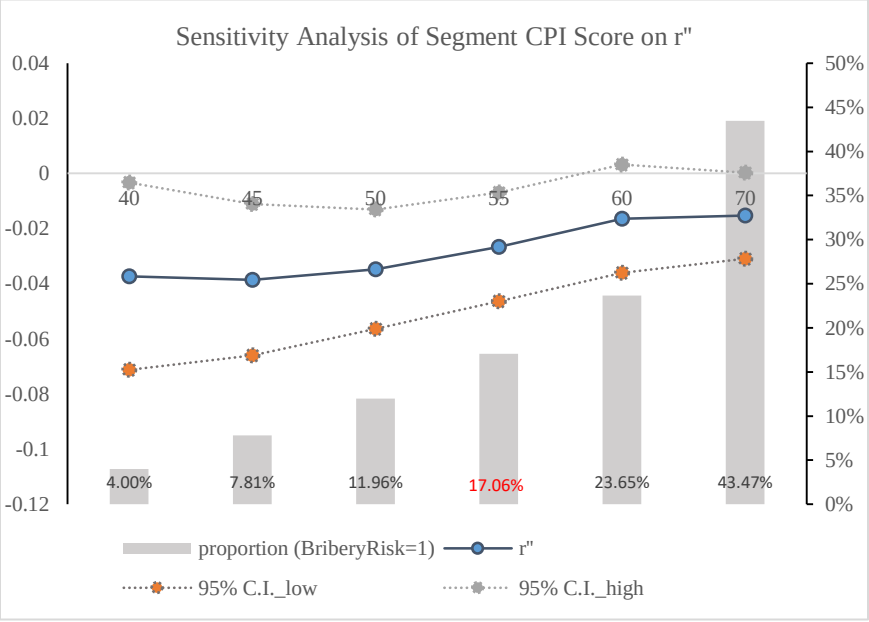
Appendix D. Correlation

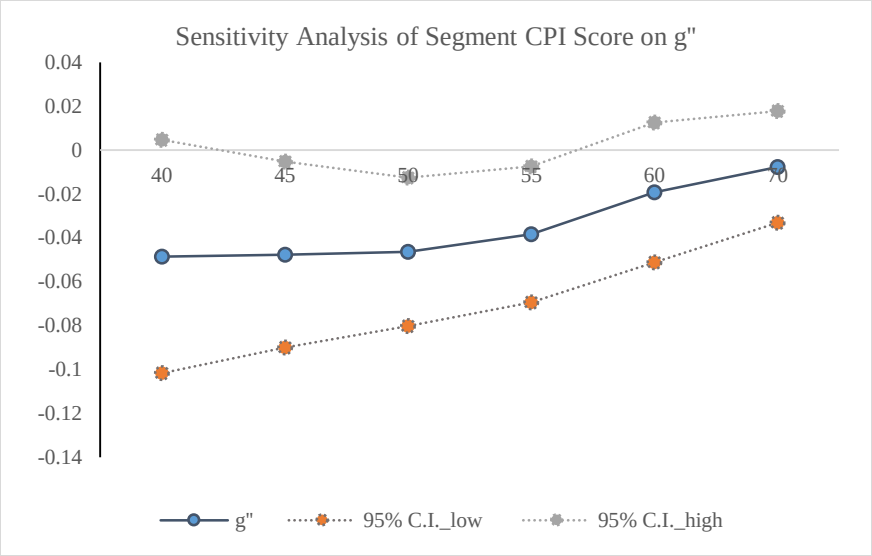
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	EY	1.00													
2	BTMD	0.30	1.00												
3	Segment CPI	0.05	0.09	1.00											
4	LnMarketCap	-0.21	-0.41	-0.21	1.00										
5	BM	0.30	1.00	0.09	-0.41	1.00									
6	Leverage	0.01	-0.03	0.03	0.25	-0.03	1.00								
7	WCR	-0.04	0.03	-0.19	-0.12	0.03	-0.30	1.00							
8	CFO	-0.01	-0.22	-0.02	0.19	-0.22	-0.10	-0.04	1.00						
9	ConcenOwn	0.11	0.17	0.03	-0.51	0.17	-0.14	0.12	-0.04	1.00					
10	Bid-Ask Spread	0.15	0.30	0.12	-0.64	0.30	-0.11	0.10	-0.15	0.41	1.00				
11	Illiquidity	0.06	0.18	0.06	-0.22	0.18	-0.03	0.03	-0.05	0.15	0.32	1.00			
12	Volatility	0.15	0.24	-0.07	-0.30	0.24	-0.05	0.09	-0.11	0.15	0.35	0.21	1.00		
13	AverageVO	-0.01	-0.04	-0.07	0.35	-0.04	0.09	-0.06	0.01	-0.17	-0.13	-0.04	-0.03	1.00	
14	ASSET4 Governance	-0.02	0.04	-0.02	0.38	0.04	0.06	-0.08	-0.04	-0.27	-0.42	-0.03	-0.13	0.09	1.00

Appendix E

Figure E.1 Sensitivity Analyses of Segment CPI Score on Cost of Equity *r''* and Growth Rate *g''*







The first figure presents the median of the Segment CPI scores of our sample and the distribution of firms' Segment CPI scores. The latter two are the results of sensitivity analyses of Segment CPI score on the estimated cost of equity (*r''*) and the long-term growth rate (*g''*) when using different measures for dividing the treatment and the control firms. The histogram shows the proportion of treatment firms using different values of Segment CPI ranging from 40 to 70 for the measure of bribery exposure.