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# The Exclusionary Effect on the Cost of Equity

*An empirical study of the direct exclusion effect on tobacco companies' and fossil fuel companies' cost of equity*

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This thesis was written as a part of the Master of Science in Economics and Business Administration at NHH. Please note that neither the institution nor the examiners are responsible – through the approval of this thesis – for the theories and methods used, or results and conclusions drawn in this work.

## Abstract

The purpose of this paper is to examine the exclusion effect on excluded stocks' cost of equity capital. We study the effect by examining European and US tobacco stocks before and after 2010, relative to chosen comparable companies. Our findings suggest that exclusions of tobacco companies can have a significant direct effect on the cost of equity. The direct effect can be explained by Merton's market segmentation model, and a premium for "boycotted" stocks. Exclusionary investing creates a segmented market, which reduces the demand for the excluded stocks, causing limited risk-sharing and restricted diversification opportunities for investors. Thus, investors will require a risk premium for holding excluded stocks, implying a higher cost of equity for excluded stocks.

Additionally, we study coal companies to examine the effects and implications of excluding fossil fuel companies. Our results indicate that the exclusions of coal companies have no significant direct effect on the cost of equity. These findings could imply that there is not a sufficient number of investors who have excluded coal stocks. The coal industry has been the primary focus for exclusions within the fossil fuel industry. Hence, the direct exclusion effect of oil and gas companies on their cost of equity will likely be limited.

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# 1. Introduction

The world is in need of balancing sustainable development and economic growth. In this context, there is a debate about what role the financial market is to play. While traditional investors focus on financial return only, sustainable investors incorporate sustainability into their investment decisions.

In 2018, the total value of global socially responsible investing (SRI) assets was \$30.7 trillion, an increase of \$7.9 trillion since 2016 (GSIA, 2018). This increase is stimulated by investors who incorporate social and environmental factors into their investment process. There are many strategies of SRI, with exclusionary investing as the most used strategy (GSIA, 2018). Exclusionary investing, commonly referred to as exclusion, means that investors restrict their investments based on products or business practices due to ethical and financial concerns (P. J. Trinks & Scholtens, 2017). Tobacco is one of the most common screens due to its severe negative social impact. In recent years, investors have started excluding fossil fuel stocks because of substantial carbon emissions. Exclusionary investing might increase uncertainty for both the firms and the investors. Hence, it should be in their interest to be aware of the implications of exclusionary investing.

This paper examines one implication of exclusionary investing; the direct effect of exclusionary investing on companies' cost of equity capital.

In our main analysis, we study the direct effect by examining tobacco companies which have been excluded by socially responsible investors for a long time. We use our findings to discuss possible implications for the excluded tobacco firms and their investors. Additionally, we perform an analysis of the exclusion of coal companies. We employ the results to discuss possible implications for fossil fuel companies, which currently experience increased pressure from socially responsible investors.

In this section, we describe different approaches to SRI and different motives behind exclusionary investing. Further, we introduce previous research on SRI and exclusionary investing. Finally, we present the motivation and purpose of our study.



## 1.1 Approaches to Socially Responsible Investing

Socially responsible investing is a growing market in which investors incorporate environmental, social, and governance (ESG) factors into their investment decisions (GSIA, 2018).

There are seven main strategies of sustainable investing, as published in the Global Investment Review 2012 (GSIA, 2012).

Screening of investments						
Negative/exclusionary investing	Positive/ best-in-class screening	Norms-based screening	Integration of ESG factors	Sustainability themed investing	Impact/ community investing	Corporate engagement and shareholder action
Restricting its investments based on products or business practices	Investment in the firms that score best on ESG performance relative to peers in the investment universe	Filtering of firms against firm specific violations of international standards and norms, such as those issued by the UN	Integration of environmental, social and governance (ESG) factors in the financial analysis and valuation of the firm	Investing in firms that focus on one or several sustainability related issues (e.g. clean energy and sustainable forestry)	Investment in firms or communities aiming to generate a positive influence with regards to environmental or social issues, in addition to financial return	Active use of ownership through corporate engagement and proxy voting, aiming to influence a firm's corporate behavior with regards to sustainability

Figure 1: Strategies of SRI, adopted from the Global Investment Review 2012 (GSIA, 2012)

Europe and the United States have the highest proportion of the globally sustainable and responsibly managed assets, with proportions of 46% and 39%, respectively (GSIA, 2018). The most mature SRI market is currently in Europe. Exclusionary investing is the top strategy, with tobacco, controversial weapons, and other weapons as the most common screens. The US market is growing at a steady pace, with ESG integration and exclusionary investing being the leading investing strategies. Tobacco-related products are one of the top screens in the US, adding up to \$2.9 trillion in assets. Globally, exclusionary investing is the most extensive strategy of SRI, with a total of \$19.8 trillion in assets (GSIA, 2018). Figure 2 shows the asset values of the different strategies in 2018.

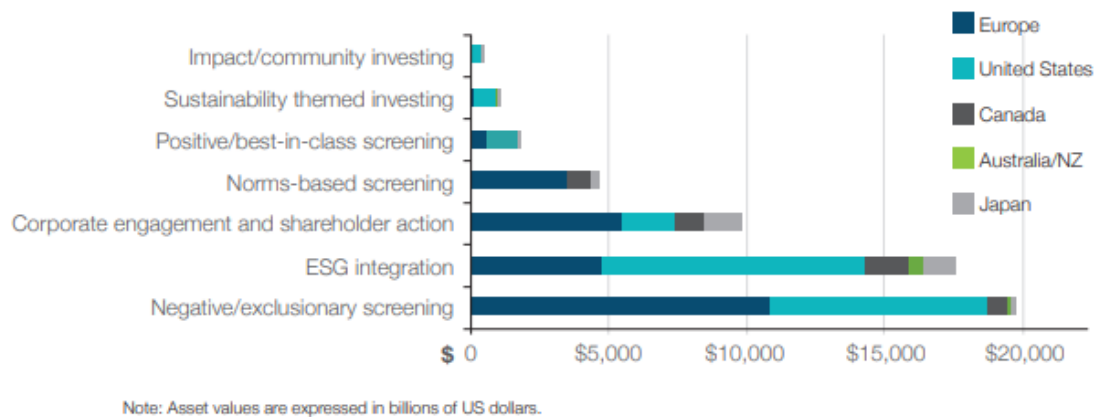


Figure 2: Sustainable investing assets by strategy and region, published in the Global Investment Review 2018 (GSIA, 2018)

### *Characteristics of Exclusionary Investing*

In this paper, we study the effects of exclusionary investing. Langbein and Posner (1980) define socially exclusionary investing as “excluding the securities of otherwise attractive companies from an investor’s portfolio because the companies are judged to be socially irresponsible, and including the securities of certain otherwise unattractive companies because they are judged to be behaving in a socially laudable way”.

Restricted investment opportunities can be costly for investors (e.g. Geczy, Stambaugh, and Levin (2005)), e.g. due to decreased diversification and increased exposure towards systematic risk factors. Following Markowitz (1952) portfolio theory, exclusionary investing can never be financially beneficial as the investment restriction leads to a lower efficient frontier. However, exclusionary investing might have benefits such as the reduced exposure towards possible stranded assets (in the long term) and the possibility of avoiding reputational risk (Schoenmaker & Schramade, 2018).<sup>1</sup>

Non-financial and financial reasons can explain the motives of applying exclusionary investing. In our view, there are three main reasons.

- 1) The investor wants to have “green” hands, either induced by social norms or own values and beliefs (Fama & French, 2007)

<sup>1</sup> Stranded assets are defined as “assets that suffer from unanticipated or premature write-downs, downward revaluations or are converted to liabilities” (Ansar, Caldecott, & Tilbury, 2013).

- 2) By excluding the firm, the investor aims to push the firm into becoming more socially responsible by increasing the firm's cost of capital (Heinkel, Kraus, & Zechner, 2001)
- 3) The investor believes that the excluded firm generates a lower average return in the long term, and finds other firms more attractive (however, the excluded firm might generate more return in the short term)

Non-financial reasons		Financial reasons
The investor wants to have "green" hands, either induced by social norms or own values and beliefs	By excluding the firm, the investor aims to push the firm into becoming more socially responsible by increasing the firm's cost of capital	The investor believes that the excluded firm generates lower average return in the long term, and finds other firms more attractive

Figure 3: Motives of exclusionary investing

In this paper, we are interested in the effect of exclusion on companies' cost of equity, regardless of the motives of exclusion.<sup>2</sup> Due to this, the motives can be both non-financial and financial.

## 1.2 Previous Research

There are many studies conducted on the effects of SRI on investor performance. In total, 88% of the studies performed on the issues have found neutral or mixed results (Fulton, Kahn, & Sharples, 2012). Bello (2005) and other studies (e.g. Hamilton, Jo, and Statman (1993); Statman (2000)) find that socially responsible mutual funds do not differ significantly from conventional funds in terms of portfolio diversification and risk-adjusted investment performance. In contrast, Geczy et al. (2005) find that SRI can affect portfolio performance if allowing investors to believe in a substantial amount of fund-manager skills.

The effect of exclusionary investing on the investment universe depends on the number of stocks excluded and the respective market value of the applied screens (P. J. Trinks & Scholtens, 2017). P. J. Trinks and Scholtens (2017) find that the negative screening of

<sup>2</sup> If the investor believes the excluded firm will underperform compared to the alternative firm, Adler and Kritzman (2008) argue that it cannot be defined as exclusionary investing, but rather an active management strategy pursuing the highest return.

industries such as alcohol and nuclear power will have a more substantial impact on the market compared to screens on industries with lower market capitalization (e.g. adult entertainment and fur). They explain this by higher diversification costs, the greater the market capitalization of the excluded companies. Previous studies have found limited effects of exclusionary investing. For example, Skancke (2016) finds that the initial effects of exclusion and divestments are limited. Diltz (1995) also finds that ethical screening has little effect on portfolio performance. However, in the longer term, exclusionary investing could have an effect by increasing the norm for acceptable standards (Schoenmaker & Schramade, 2018).

Further, there are numerous studies on the performance of “sin stocks”.<sup>3</sup> Studies such as Lobe and Walkshäusl (2016) find no significant difference in returns between “sin” portfolios and market benchmarks. In contrast, a majority of studies have found that “sin stocks” outperform their comparable stocks. For example, Hong and Kacperczyk (2009) find that the “sin stocks”; alcohol, tobacco, and gaming, outperform its comparable stocks. Additionally, El Ghouli, Guedhami, Kwok, and Mishra (2011) examine the effect on the cost of equity by a firm’s presence in a “sin” industry. The study finds that investors require a premium for investing in “sin stocks”, i.e. that the cost of equity increases.

### **Previous literature on the exclusion of fossil-fuel stocks**

While there is evidence that “sin” industries such as alcohol and tobacco significantly outperform the market (e.g. Hong and Kacperczyk (2009)), the fossil fuel industry shows no signs of such impact from exclusionary investing (A. Trinks, Scholtens, Mulder, & Dam, 2018). A. Trinks et al. (2018) study fossil-fuel portfolios against fossil-free portfolios, aiming to test the effect of exclusion on abnormal risk-adjusted return. They state that excluding fossil-fuel stocks from the investable universe could reduce diversification opportunities for the investors and impose a financial cost in terms of foregone returns (following Markowitz (1952) portfolio theory). However, the study finds that the diversification opportunities from excluding fossil fuels do not seem significantly reduced.

<sup>3</sup> “Sin stocks” refer to stocks that are involved in controversial activities (Luo & Balvers, 2017).

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## 1.3 Motivation and Purpose

The increasing volume of sustainable investing challenges the traditional ways of investing. While “finance-as-usual” aims to create value through maximizing shareholder wealth, sustainable investors aim to create value by optimizing the social and environmental impact with subject to financial factors (Schoemaker & Schramade, 2018).

As mentioned, there is controversy regarding the effects of SRI and the approach of exclusionary investing. Previous studies find that the effect of exclusionary investing on an investor’s portfolio performance is limited (e.g. Skancke (2016)). However, Hong and Kacperczyk (2009) find evidence that screened “sin stocks”<sup>4</sup> as a result of social norms yield higher returns than comparable stocks.

Portfolio theory can explain the evidence of the higher return of screened stocks. Exclusionary investing causes investors to become less homogenous, as some investors restrict their investments. According to Modern Portfolio Theory, a restricted portfolio will lead to a less efficient portfolio (Markowitz, 1952). Exclusionary investing cannot be financially beneficial since investors face limited investment opportunities, leading to increased idiosyncratic risk. Thus, the excluded firms have to offer higher returns, i.e. a higher cost of equity, to attract a sufficient number of investors. Therefore, systematically screened firms can exhibit a higher cost of equity capital compared to firms not screened. Consequently, exclusionary investing affects both companies and investors.

We contribute to the research on exclusionary investing by examining the cost of equity of the excluded firms. To examine the effect on the cost of equity, we study the exclusion of tobacco firms. The tobacco industry has been subject to negative social norms for the last four decades, and socially responsible investors have avoided the industry for a long time (Hong & Kacperczyk, 2009).

<sup>4</sup> “Sin stocks” are associated with a bad reputation and are avoided by investors due to social norms, own beliefs and litigation risk (Kim, An, & Kim, 2015)

In contrast to tobacco firms, the trend of excluding fossil fuels has emerged in recent years. The exclusion trend started with the Fossil Fuel Divestment Campaign at US universities in 2011. The coal industry is the most polluting fossil fuel (Cadan, 2019).

The purpose of this study is to provide research on how exclusion can affect a company's cost of equity. We examine the effect on firm-level and not on investors' portfolio performance by investigating tobacco exclusions. Additionally, we study coal exclusions and use these results combined with our tobacco analysis to discuss possible implications for fossil fuel companies. Hence, we contribute to the literature on exclusionary investing.

## **2. Theoretical Frameworks and Research Questions**

In this section, we present the direct and indirect effects of exclusion on a firm's cost of equity. Further, we present relevant theories that provide context for our analysis. Based on these theories and previous research, we state our research questions along with the hypothesis for the study on tobacco firms.

### **2.1 Direct and Indirect Effect of Exclusion**

Exclusionary investing can influence a firm's cost of equity capital through two effects; the direct effect and the indirect effect. When examining the direct effect, we refer to the financial effect of investors excluding a stock. The direct effect emerges from investors moving or restricting their capital from socially irresponsible firms. In theory, this restriction creates a segmented market with two type of investors; those who are restricted and those who are not. A segmented market leads to limited risk-sharing, which further affects the cost of equity.

Further, exclusion can have an indirect effect on a firm's cost of equity capital. Exclusion strategies might lead to changes in social norms (Ansar et al., 2013), which can affect the perceived riskiness of the firm e.g. due to pressure towards new legislations or regulations. Also, these changes in social norms might pressure excluded firms into transforming their operations, causing a different business risk.

This paper studies the direct effect of exclusion. In the following sections, we present relevant theories used to examine the direct effect of exclusion. To examine how a firm's cost of equity is affected by exclusionary investing, we need to understand how investors make their investment decisions. Hence, we present the relevant cost of equity and portfolio theory.

### **2.2 Relevant Theories**

#### **2.2.1 Cost of equity**

A firm's cost of equity is the expected rate of return demanded by the equity holders. The higher the rate of return, the more expensive it is for the firm to finance its business. Further,

the cost of equity is reflected in the firm's stock price, which implies what the investor is willing to pay for the firm's expected cash flow, given the expected rate of return.

There are several asset-pricing models used to estimate the cost of equity. Basic finance theory states that higher risk is compensated with higher returns (Markowitz, 1952). Thus, valuable insight in all models is that a firm's exposure to underlying systematic risk factors determines the returns.

One of the best know asset-pricing models is the Capital Asset Pricing Model (CAPM) (Lintner, 1965; Sharpe, 1964). Assuming the CAPM is true, a firm's cost of equity is estimated as:

Equation 1: Capital Asset Pricing Model

$$r_e = r_f + \beta(r_m - r_f)$$

*r<sub>e</sub>* = return on equity for equity holders, i.e. the firm's cost of equity

*r<sub>F</sub>* = risk-free rate, usually estimated as the 10-year Treasury bond

*r<sub>M</sub>* = return on the market portfolio

*β* = the firm's systematic risk, calculated as covariance of the stock's return with the return of the market, divided by the market variance

According to CAPM, the return on equity is determined only by the firm's systematic risk, expressed by beta. Beta represents the firm's exposure to the market. Therefore, a reduced beta can lower the cost of equity, e.g. through decreasing the variability of the firm's performance against the market. The firm's unsystematic risks are assumed to be eliminated through diversification.

In the real world, there is evidence suggesting that other risk factors unique to a company or industry also determine a firm's cost of equity (Fama & French, 2007; Merton, 1987). Therefore, other asset-pricing models (e.g. Fama French Three-Factor model) incorporate other systematic risk factors into the model, such as a size and growth factor.



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## 2.2.2 Portfolio theory

A standard assumption in finance theory is that investors only have one objective, which is to maximize future expected wealth (Markowitz, 1952). The portfolio theory, based on Markowitz (1952), assumes homogenous investors with mean-variance preferences. When constructing a portfolio following Markowitz (1952), investors aim to diversify their portfolio by holding the market, which is the value-weighted portfolio of all available stocks. Hence, in theory, both “green” investors and “neutral” investors should hold the market portfolio if they want to maximize their portfolio, given their risk preferences.<sup>5</sup>

Exclusionary investing causes investors to become less homogenous, as some investors restrict their investments. Based on the portfolio theory of Markowitz (1952), exclusionary investing cannot be financially beneficial since it lowers the investor’s efficient frontier. Hence, exclusion can increase risk and reduce return, harming the exclusionary investors. However, some investors are not only concerned with financial return (Schoemaker & Schramade, 2018). Therefore, other factors, such as socially responsible investing, can affect investor behavior (Geczy et al., 2005).

Exclusionary investing results in demand differences for the excluded and the non-excluded firms, leading to excess demand for the non-excluded firms (Dam & Scholtens, 2015; Fama & French, 2007; Heinkel, Kraus, & Zechner, 2001). In contrast, there will be a shortage of demand for the excluded stocks, implying underpriced stocks and limited risk-sharing opportunities for the “neutral” investors who holds these stocks (Merton, 1987). Consequently, “neutral” investors will require a return premium on the excluded stocks, i.e. higher cost of equity.

Firms that face reduced demand due to exclusionary investing have to offer higher returns, a stock premium. There are different interpretations of this risk premium. In the following, we present the market segmentation model (Merton, 1987) and a model for the “boycott premium” (Luo & Balvers, 2017).

<sup>5</sup> “Green” investors refer to investors who perform exclusionary investing. “Neutral” investors refer to those who do not perform exclusionary investing.

### 2.2.3 Market segmentation theory and HKZ model

A market with two types of investors (“green” and “neutral”) creates a segmented market. Merton (1987) argues that a segmented market will affect stock prices. First, a segmented market causes increased idiosyncratic risk due to limited diversification opportunities and limited risk-sharing, which in turn increases expected returns. Second, due to limited risk-sharing, Merton argues that CAPM no longer holds, as idiosyncratic risks in addition to beta matter for pricing.

Building on Merton’s (1987) market segmentation theory, Heinkel et al. (2001) develop an equilibrium model to study the effect of the exclusion of polluting firms induced by social norms and ethical investing. The model can be applied to examine the exclusion effect on a firm’s stock price and cost of equity, as well as the firm’s corporate behavior. The model assumes;

- Two types of investors; “neutral” investors and “green” investors
- That firms act to maximize share price
- A finite number of firms, each having one production technology (“clean” or “polluting”)
- A constant number of investors
- Three types of firms: acceptable, unacceptable, and reformed

The “green” investors will only invest in acceptable firms, i.e. those firms that meet their ethical criteria. The “neutral” investors will invest in all investment opportunities, including both acceptable and unacceptable firms. The reformed firms are former unacceptable firms that have paid a fixed cost to transform into an acceptable firm.

If a significant amount of the investor base restricts its investments in unacceptable firms, the “neutral” investors have to increase their ownership share in those firms, given a constant level of outstanding equity capital. According to Markowitz (1952) portfolio theory, “neutral” investors will thus own more than the optimally diversified portfolio. Consequently, a rational investor will require a return premium for increased idiosyncratic risk.

Heinkel et al. (2001) argue that when the difference in return between an acceptable firm and an unacceptable firm is significant, paying a fixed cost to reform into an acceptable firm will be optimal for the unacceptable firms. The fixed costs vary depending on the firm and industry.

According to the model, 25% of the investor base must be “green” to induce unacceptable firms to reform. The fixed cost will then be lower than the alternative cost of a restricted investor base. However, only 10% of the investor base needs to be “green” to raise the cost of equity capital for unacceptable firms. Hence, exclusionary investing can affect corporate behavior.

### **Rivoli: Relationship between cost of equity and Green investors**

Angel and Rivoli (1997) follow Merton’s (1987) market segmentation model and study whether ethical investing impose a cost upon the firm.

Equation 2: Angel and Rivoli (1997) model

$$\lambda_k = \frac{1 - q_k}{q_k} * x_k * \delta \sigma_k^2$$

Their model specifies a relationship between the cost of equity and the proportion of “green” investors. They argue that the change in the cost of equity ( $\lambda$ ) increases as the fraction of available investors fall ( $q_k$ ) (i.e. the fraction of “green” investors increase). Further, the cost of equity will increase the larger the weight of the firm in the market portfolio ( $x_k$ ), when the investors’ risk aversion ( $\delta$ ) is high, and when the variance of the firm’s return due to firm-specific factors ( $\sigma$ ) increase.

### **2.2.4 The boycott premium**

In an “excluded world”, “green” investors and “neutral” investors have different preferences and unequal investment opportunities. Thus, they will diversify their portfolios by holding different risky portfolios (Fama & French, 2007). This world consists of a restrictive portfolio and an unrestrictive portfolio. The unrestrictive portfolio holds all stocks available in the investment universe, whereas the restrictive portfolio does not include the excluded stocks (Luo & Balvers, 2017). Thus, the efficient frontier of the restricted portfolio lies inside the efficient frontier of the unrestricted portfolio. Hence, the mean return is higher for the unrestricted portfolio, since it includes the return of both excluded and non-excluded stocks. The return premium of the unrestricted portfolio compared to the restricted portfolio is called the “boycott premium”.

The “boycott premium” can be interpreted as a systematic risk factor, in which the exposure to the risk factor determines the return. Hence, the standard CAPM no longer holds. In market

equilibrium, the mean return of all stocks, both excluded and non-excluded, positively correlated with the excluded stocks will be affected. The change depends on the extent of correlated stocks in the market and whether the stock is excluded or not.

Further, since “neutral” investors hold all excluded stocks in an “excluded world”, the portfolio will be unbalanced with regards to diversification (Luo & Balvers, 2017). Consequently, “neutral” investors will require a premium for holding a surplus of the excluded stocks. Also, “neutral” investors will move their capital away from non-excluded stocks that correlate with the excluded stocks. Similarly, “green” investors seek to diversify their portfolio by buying more non-excluded stocks that correlate with the stocks they have excluded.

Lastly, stocks that have a low correlation to the market have a higher demand than high-correlation stocks due to diversification. Consequently, the exclusion of stocks with low correlation to the market is associated with the highest diversification costs for “green” investors.

## 2.3 Research Questions and Hypothesis

We study tobacco firms and examine the direct effect of exclusion, i.e. that the cost of equity changes due to a constrained investor base, limited diversification opportunities, or reduced demand for the stock. To find the direct effect, we have to isolate the indirect effect by controlling for legal, regulatory and reputational risks that change across time, or assume that these risks remain unchanged in the period of interest.

The tobacco industry has faced negative social norms for the last four decades. The tobacco industry is estimated to cause five times more costs than benefits for society (Deutsche Asset Management, 2017). Therefore, the industry has been avoided by socially responsible investors for a long time (Hong & Kacperczyk, 2009). Several regulations have been imposed on the tobacco industry, which potentially could hurt the tobacco firms’ reputation and lower their revenues.<sup>6</sup> However, there are fewer regulations in emerging markets, which make up 80% of the tobacco demand. This might mitigate the effect of regulations imposed in

<sup>6</sup> According to WHO, only a 10% share of tobacco taxes is sufficient in reducing the demand for cigarettes (Deutsche Asset Management, 2017).

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developed markets, which can be seen by the companies' steady cash flows and revenues (Ansar et al., 2013). Further, tobacco firms have limited opportunities to change their business without removing their tobacco production (Skancke et al., 2014).<sup>7</sup> Based on this, we argue that the indirect effect on the tobacco firms' cost of equity is limited. Hence, the tobacco industry is appropriate for isolating the indirect effect, which is necessary to examine the direct effect only.<sup>8</sup>

Our paper attempts to answer the following research question:

**What is the direct effect of exclusionary investing strategies on tobacco firms' cost of equity capital?**

Our hypothesis is:

*The direct effect of exclusion has a significant impact on a tobacco firm's cost of equity capital.*

Following Heinkel et al. (2001), we believe this will be true if there is a sufficient number of investors who exclude the company.

***Supplementary research question***

Additionally to tobacco companies, we analyze the exclusion of coal companies to discuss the implications of excluding fossil fuels, leading to the following supplementary research question:

**Will exclusionary investing have a significant direct effect on the cost of equity for fossil fuel firms?**

<sup>7</sup> Heinkel et al. (2001) state that if a sufficient number of investors exclude tobacco firms, the firms might want to change their business to become "acceptable" for socially responsible investors. However, tobacco firms have limited opportunities to change their business without removing their tobacco production (Skancke et al., 2014). This further supports our assumption that there are limited indirect effects from excluding tobacco.

<sup>8</sup> Other "sin" industries not analyzed are discussed in Appendix 10.8.

### 3. Empirical Methodology

This section presents the econometric model used to determine the direct effect of the exclusion of tobacco firms on the cost of equity capital. The specified model in this study exploits the benefits of the panel data by using a difference-in-difference estimation with a fixed effects model. The model estimates the causal effect of exclusion by controlling for firm- and country-specific factors. Due to the assumption that tobacco companies are not able to reform, the estimation measures the direct effect of exclusion, i.e. the effect of investors selling the stock. Following Hong and Kacperczyk (2009), we employ a research design in which we compare tobacco stocks relative to stocks with comparable characteristics. This design enables us to separate other factors relating to the industry or the market, such that we capture the *direct* effect of exclusion.

#### 3.1 Panel Study

This study examines tobacco companies along with comparable companies over the period ranging from 2000 until 2018.<sup>9</sup> Since the data consists of both cross-sectional and time-series data with several panel members not observed in every period, it is an unbalanced panel study (Wooldridge, 2012). Equation 3 presents a typical linear regression of panel data.

Equation 3: Panel data model

$$y_{it} = \beta * X_{it} + a_i + \delta_t + u_{it}$$

In Equation 3,  $y$  denotes the dependent variable and  $X$  the independent variable in which these variables vary over time  $t$  and between firms  $i$  (Wooldridge, 2016).  $\beta$  explains the change in  $y_{it}$  due to a one-unit change in  $X_{it}$ . The three remaining terms represent the error (the unobserved effects). The variable  $a_i$  captures unobserved, time-constant cross-sectional factors that affect  $y_{it}$  (Wooldridge, 2016). Since  $i$  denotes firms in this analysis,  $a_i$  is a firm fixed effect (such as firm strategy, culture, and employee ability).  $\delta_t$  represents a time-varying term which is constant across units (such as economic cycles). The term  $u_{it}$  is a time-varying error, referred to as idiosyncratic error.

<sup>9</sup> The chosen time-period is explained in the Data Section.

---

Panel data differs from an independently pooled cross-section and has several advantages, such as a higher number of observations and greater precision. However, for econometric analysis, the assumption of independently distributed observations across time does not longer hold (Wooldridge, 2016). Thus, special models are used to analyze these types of data.

The most used and simple model for analyzing panel data is pooled OLS (Wooldridge, 2016). The model ignores the time-invariant and individual-specific specific effects as well as the time-specific and individual-invariant effects. Thus, the model collects all observations in a “pool” as a big cross-section. In order for the model to provide a causal relationship between  $X$  and  $y$ , one must assume that the unobserved effects  $a_i$  and  $\delta_t$  is uncorrelated with  $X_{it}$ , otherwise, the model would give heterogeneity bias (e.g. omitted variable bias) (Wooldridge, 2016).

A major advantage of collecting panel data is to control for time-constant and individual-specific unobserved factors ( $a_i$ ) as well as time-varying and individual-constant unobserved factors ( $\delta_t$ ), which may be correlated with the independent variables in the model (Wooldridge, 2016). Individual-constant factors are features that are constant across time but vary between individuals (e.g. managerial skills for firms). Time-specific factors are factors that vary over time but are constant between individuals (e.g. the financial crisis). Such unobserved constant factors, also called unobserved fixed effects, might be correlated with the explanatory variables, violating the assumptions for pooled OLS and causing heterogeneity when not being included in the model. Unobserved heterogeneity will likely not lead to a successful model. One solution is to add more control variables, but it may be challenging to determine which variables to add and how to add them. The issue can be removed by using a fixed effects estimation, which treats the unobserved factors as constants over time (Wooldridge, 2016). By doing so, one must only assume that the time-variant error term  $u_{it}$  is uncorrelated with  $X_{it}$  in all time-periods.

The framework for the fixed effects model is described further throughout this section.

### **3.1.1 Fixed effects estimation**

A fixed effects transformation is a model that can remove the unobserved individual-fixed effects,  $a_i$  (Wooldridge, 2016). By assuming that  $a_i$  is constant over time, the unobserved fixed effects can disappear by time-demeaning the data on  $y$ . Consider the equation for panel data below.

$$(1) y_{it} = \beta_1 * X_{it} + a_i + u_{it}$$

Then, one must take the average for each  $i$  over time:

$$(2) \bar{y}_{it} = \beta_1 * \bar{X}_i + a_i + \bar{u}_{it}$$

The fixed effects model then subtracts equation 1 from equation 2:

$$(3) y_{it} - \bar{y}_{it} = \beta_1(X_{it} - \bar{X}_i) + (a_i - a_i) + (u_{it} - \bar{u}_i)$$

Which can be written as:

$$(4) \check{y}_{it} = \beta_1 \check{X}_{it} + \check{u}_{it}$$

The fixed effects transformation has now removed the within-unit but time-invariant variations for both outcome and treatment variables (Imai & Kim, 2018). Hence, the term  $a_i$  has disappeared, meaning that the unobserved time-constant effects on the dependent variable can be correlated with the explanatory variables in any time-period. However, it is assumed that the unobserved time-invariant term  $u_{it}$  is uncorrelated with the explanatory variables in all time-periods. To remove the within-time but unit-invariant variations, time dummies can be included for all years minus one (e.g. to account for macro factors). The equation can then be estimated using pooled OLS (Wooldridge, 2016).<sup>10</sup>

Another way to obtain the fixed effects model is to include individual dummy variables for each cross-sectional observation, such that the unobserved effect is added explicitly in the model and treated as the coefficient of the individual-specific dummy variable (Dougherty, 2011). This method is known as the least squares dummy variable regression model (LSDV) and can be applied easily to software programs.<sup>11</sup>

### 3.1.2 Difference-in-differences estimation

Our study could be designed as a quasi-experiment, meaning that an exogenous event leads to a change in the environment in which the individuals operate (Wooldridge, 2016). A quasi-experiment design is based on two time periods and two groups; one treatment group affected by a treatment and one control group not affected. In the first period, no group is treated, and

<sup>10</sup> The OLS assumptions are explained in Appendix 10.2.

<sup>11</sup> We use the LSDV approach in our estimations and apply the method in R.



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in the second period, the treatment group is affected by the treatment, whereas the control group is not (Wooldridge, 2016).

In a “true” experiment, the treatment applies to individuals that are randomly selected from a group of individuals with similar characteristics. A potential change after the treatment can then be explained by the treatment itself and not other factors that differ between the groups. However, when the treatment is not randomly assigned but applied to chosen individuals, the design may suffer from selection bias in which can affect the validity of the results.

The Difference-in-Difference (DiD) design overcomes this potential selection bias as long as the parallel trends assumption holds (Angrist & Pischke, 2008; Imai & Kim, 2018). The parallel trends assumption means that in the absence of the treatment, the difference between the groups (treatment and control) is constant over time (Callaway & Sant'Anna, 2018). The two groups do not have to be identical, as long as the fixed effects or other control variables capture the difference between them (Angrist & Pischke, 2008). Further, the treatment might cause a deviation from the common trends, making it possible to examine the effect of the treatment. This assumption must hold to get unbiased results. Therefore, the control group must be carefully chosen.

Further, the DiD estimator requires the absence of causal relationships between past outcomes and current treatment (Imai & Kim, 2018) and that the treatment is irreversible, i.e. that the treatment group cannot avoid treatment once it has occurred (Callaway & Sant'Anna, 2018).

The difference-in-difference estimator:

$$\beta = (\bar{y}^{Post, T} - \bar{y}^{Post, C}) - (\bar{y}^{Pre, T} - \bar{y}^{Pre, C}), \text{ in which } Post = \text{post-treatment, } Pre = \text{pre-treatment, } T = \text{treatment group, } C = \text{control group}$$

The difference between the average change in  $y$  between the two groups is presented by  $\beta$ . This transformation allows the two groups to be comparable since the groups have parallel trends. The difference-in-difference design therefore analyzes the change in  $y$  for the treatment group before and after the treatment, relative to the corresponding change of  $y$  for the control group.

## 3.2 Model Specification

The specified model in this study exploits the benefits of the panel data by using a difference-in-difference estimation with a fixed effects model. In this model, the treatment is the exclusion of tobacco companies, and the dependent variable is the cost of equity (COE). To estimate a causal relationship between the cost of equity and exclusion, we add comparable companies to the model. These comparable companies have not been affected by exclusion, i.e. they are used as a control group. This research design allows for a comparison of the difference between the actual change in COE of tobacco companies relative to what the change would have been without exclusion.

The measure of the exclusion is based on an interaction term between a dummy variable indicating whether the period is post-exclusion (i.e. post-treatment) and a dummy variable of whether a firm is tobacco or not (i.e. treatment or control group). In this design, the groups are nonequivalent, meaning that the firms are not randomly assigned and that there are important differences between the two groups of industries.

The following model assumes that the exclusion of tobacco companies occurs at the same time and that no comparable company is excluded. Further, the model assumes that no tobacco company can avoid exclusion once the exclusion has happened.

Equation 4: Main Model Specification

$$COE_{it} = \beta_0 + \beta_1 * (AfterExcl_t * Tobacco_i) + \beta_2 * X_{it} + \sum Firm\ fixed\ effects\ (a_i) + \sum Year\ fixed\ effects\ (\delta_t) + u_{it}$$

AfterExcl is a dummy variable scored 1 if the year is after the exclusion period, 0 otherwise. Tobacco is a dummy variable scored 1 if the firm-year observations belong to the industry Tobacco, 0 otherwise. AfterExcl \* Tobacco is the interaction term between the two dummies. COE is regressed on the interaction variable along with other control variables ( $X_{it}$ ) and firm ( $a_i$ ) and year ( $\delta_t$ ) fixed effects. These fixed effects capture those unobserved fixed factors that are constant over time for each firm and those that are constant across each firm but differs over time. The control variables,  $X_{it}$ , are explained further in Section 4.

The coefficient of interest in our model is  $\beta_1$  and is called the difference-in-difference estimator (often called the average treatment effect) (Wooldridge, 2016). This coefficient

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captures the average exclusion effect on COE, meaning the change in COE of tobacco firms after being excluded, relative to the change of comparable companies.

Equation 5: The difference-in-difference estimator

$$\beta_1 = (\overline{COE}^{Post, T} - \overline{COE}^{Post, C}) - (\overline{COE}^{Pre, T} - \overline{COE}^{Pre, C}), \text{ in which } Post = \text{post-exclusion, } pre = \text{pre-exclusion, } T = \text{tobacco companies, } C = \text{comparable companies}$$

As this model presents two dimensions, one across time and one across space, spatial correlation may occur (Pesaran & Tosetti, 2011). Spatial correlation is an extension of time serial correlation, also including cross-sectional dependence. This may be the case e.g. with regulations targeting one of the industries, firms, or countries in a specific time-period. With such spatial correlation occurring in the unobserved factors, the standard errors of the error term may be too small. Therefore, the variance of the sample should be estimated by a two-way clustering of standard errors ((e.g., Arellano (1987) and Cameron and Miller (2015)). Here the Newey and West 1987 corrected standard errors are used, which also correct for heteroscedasticity (Hail & Leuz, 2006). The clustering is done by firm and year to account for standard errors correlated across time but not within units (following Hail and Leuz (2009)).

## 4. Data

In the following section, we detail how we select and gather the data used to examine the direct effect of the exclusions of tobacco firms on the cost of equity. First, we describe the identification of tobacco firms and its chosen comparable companies. Second, we present the choice of countries and the selected exclusion period of tobacco firms. Further, we present the different data sources and the selected variables for our model. Lastly, we summarize the gathered data.

### 4.1 Sample Selection

#### 4.1.1 Identifying companies

When examining the hypothesis of this study, the value and validity of the results rely upon the task of selecting and classifying the right companies. Therefore, gathering the correct data is crucial for the results to be interpretable. Hong and Kacperczyk (2009) and El Ghouli et al. (2011) base their “sin stock” classifications on the 48 industry codes defined by Fama and French (1997). They use Standard Industry Classification (SIC) codes combined with the North American Industry Classification System (NAICS) codes to determine the classified “sin stocks”. Other studies such as Kim et al. (2015) have specific criteria for each firm and screen each firm, while P. J. Trinks and Scholtens (2017) use both SIC-codes and an industry list already defined; the list CU 200.

The main advantage of using SIC-codes and the NAICS classification is the reduced burden of screening each company to make the industry classification, i.e. it is less time demanding. However, some complex companies may be classified by only one part of their business. In such cases, SIC-codes and the NAICS classification may fail to capture the industry effect of the company.

We use industry SIC-codes and NBIM’s exclusion criteria as a starting point for selecting companies. Further, we screen the companies of interest according to the data requirements, described in Section 4.2.

### **4.1.2 Selection of tobacco firms**

The companies classified as tobacco companies in this study are involved in direct and/or indirect production (e.g. production of filters or papers) of tobacco. We include tobacco companies regardless of their percentage of business involved in tobacco production, following NBIM's exclusion of tobacco companies (Finance, 2010).

The tobacco industry has a unique SIC-code classification (21-). Thus, many of the tobacco companies in this sample are classified by this code. Also, our sample consists of tobacco companies with different SIC-codes. We include these companies due to their tobacco-related activities and revenues.

### **4.1.3 Selection of comparables**

Following Hong and Kacperczyk (2009), the research design of this study is based on identifying the exclusion effect on cost of equity of tobacco companies relative to carefully chosen industry comparable companies. By using comparables, we control for unobserved factors related to industry or market characteristics, such that the change in the cost of equity is coming from exclusion only.

One way to select comparable companies is to examine companies with similar SIC-codes as the companies of interest. However, the tobacco industry has a unique SIC-code. Therefore, this study follows Hong and Kacperczyk (2009) and selects food producers as the comparable companies. Food companies are applicable due to consumer preferences, i.e. that tobacco is often lumped together with food. Also, tobacco stocks are similar to value firms, such as food producers, in terms of their firm characteristics. This can be seen from the firms' steady cash flows, the low market to book ratios, and the low betas. Assuming food producers are not excluded, we can study the effect of exclusion by comparing the COE development of tobacco firms with the COE development of food producers.

The food producers all have SIC-codes of 20-, which classify manufacturing companies. The chosen food companies are selected based on Thompson Datastream's Food Producers index.

### **4.1.4 Choice of countries**

When studying the effects of SRI and the strategy of negative screening, previous research show that there are differences across countries, culture, time-periods, and investor

characteristics (Durand, Koh, & Tan, 2013; Kumar, Page, & Spalt, 2011; Scholtens & Sievänen, 2013). Therefore, this paper focuses on countries that have similar SRI trends across investors. In doing so, we can assume that the tobacco companies have similar exclusion trends. Thus, the companies chosen for this study are required to have origins from Europe, Canada, or the US since tobacco exclusion in these countries has been deeply rooted in investor and consumer preferences. Further, these countries are developed and thus have similar market trends. Choosing these geographical areas will mitigate differences across countries.

The left column of Table 1 presents an overview of the total number of global tobacco firms. These firms all have SIC codes of 21-. We screen all tobacco firms according to the requirements explained in Section 4.2. None of the companies from Canada fulfill all requirements. Therefore, we only include companies from the US and Europe. The right column presents the included companies.

Table 1: Selected tobacco firms

Country	Tobacco firms	Selected tobacco firms
Bulgaria	7	1
Canada	5	0
China	1	0
Croatia	1	1
Czech Republic	1	0
Denmark	1	1
Egypt	1	0
Greece	1	1
Hong Kong	1	0
India	9	0
Indonesia	5	0
Other	32	1
Pakistan	7	0
Philippines	1	0
Poland	1	0
Serbia	7	0
Sweden	1	1
United Kingdom	6	2
United States	27	8
Vietnam	5	0
Total	120	16

#### 4.1.5 The tobacco exclusion period

Socially responsible investors have avoided tobacco stocks for a long time (Hong & Kacperczyk, 2009). In 1994, the tobacco divestment campaign started, aiming to motivate

large-scale tobacco divestments (Angel & Rivoli, 1997; Ansar et al., 2013). The campaign started in the US and continued globally throughout the '90s. The cumulative amount of divested tobacco assets increased gradually until 2000, as seen in Figure 4.

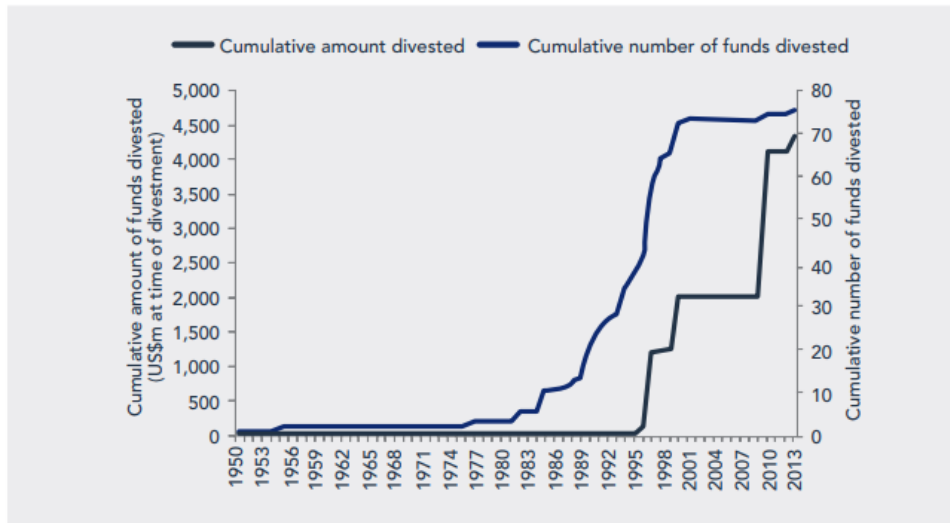


Figure 4: Tobacco divestments, retrieved from Ansar et al. (2013)

After 2000, the total cumulative amount of divested assets remained stable before increasing drastically in 2010 (Ansar et al., 2013). This was the year that NBIM liquidated all its tobacco stocks (Finance, 2010). As mentioned previously, the increase in the amount of total assets divested, i.e. assets excluded, can have an impact on the cost of equity capital. Therefore, we study whether the direct effect of exclusion on the cost of equity is significant in the years after 2010 compared to the years before.

## 4.2 Data Sources and Requirements

We obtain yearly financial data from Bloomberg, the World Bank, and Thompson Datastream in the period ranging from 2000 to 2018.

The selected companies are required to have the requisite financial data from Thompson Datastream, to be publicly listed as of 2008 and at least until 2011, to have positive revenues, and to be classified with an industry SIC-code. All items are measured as of fiscal year-end and are quoted in US dollars.

## 4.3 Selection of Variables

When examining the causal effect of exclusion, it is important to control for firm characteristics and other market factors that affect the cost of equity (COE). In this section, we present the variables accounting for these factors. We include traditional controls on the firm level (following e.g. Hail and Leuz (2009)) as well as proxies for country and industry effects.

### 4.3.1 Dependent variable: Cost of equity capital

There are different ways of calculating the cost of equity capital. Since there are no clear answers to which estimates provide the correct COE (Hail & Leuz, 2009), some studies use dividend yields or realized returns as proxies (Errunza & Miller, 2000; Foerster & Karolyi, 1999).

We use the Bloomberg terminal's calculated COE, which is estimated through the capital asset pricing model (CAPM):

$$r_e = r_f + \beta(r_m - r_f)$$

The model calculates a premium above the risk-free rate in the market, which depends on the stock's beta. Bloomberg calculates each stock's weekly beta by regressing the stock's daily return on the local market daily return. The risk-free rate ( $r_f$ ) for each stock is the local government 10-year bond. The market return is set to each country's historical market return.

### 4.3.2 Independent variable: Exclusion

The variable of interest determines the average difference in the cost of equity of tobacco firms after exclusion, relative to food firms after exclusion. The variable is expressed as an interaction term between two dummy variables; one indicating whether the firm-year observation is after the exclusion period, 2010, and one indicating whether the firm is in the tobacco industry or not (AfterExcl \* Tobacco). This variable is the Difference-In-Difference estimator and measures the average exclusion effect on the cost of equity.



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### 4.3.3 Control variables

To isolate the exclusion effect, control variables for firm and country characteristics known to affect the cost of equity must be included (Hail & Leuz, 2006). Cross-sectional variability can be presented by proxies for firm risk, e.g. volatility, size and book to market factors, as well as country factors measuring differences in macroeconomic variations and inflation (Hail & Leuz, 2006). Hail and Leuz (2006) further state that these factors can explain about 60% of the country-level variation in COE around the world and 35% of the firm-level variation.

#### *Firm risks*

##### **Size**

Based on previous studies (e.g. (Fama & French, 1992, 1993)), a firm's size is expected to be negatively associated with the cost of equity capital. To control for a firm's size, we use total assets instead of market capitalization because including a market value would absorb the hypothesized effect of exclusion if exclusion leads to lower valuation (following Hail and Leuz (2009)). Other studies (El Ghouli et al., 2011; Hong & Kacperczyk, 2009) use market capitalization at the end of year  $t$ .<sup>12</sup>

##### **Book to market ratio**

Fama and French (1992) argue that firms with higher book to market ratios tend to have higher returns, i.e. higher cost of equity capital. The ratio is also a proxy for the growth opportunities of a company, which may affect the cost of equity (e.g. (La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 2002)).

##### **Volatility**

To control for a stock's volatility, we use the volatility of daily stock return. According to previous studies (e.g. (Fama & French, 1992, 1993)), this is supposed to be positively associated with the cost of equity capital. An alternative to the daily stock return is a firm's beta. However, to determine beta, one must address which equity index to use. If the international markets are considered integrated, the world index should be used, whereas if

<sup>12</sup> By replacing market capitalization with total assets, the results of our study presented in Section 5 and 6 do not change.

the market is segmented, the local index should be used. Following Hail and Leuz (2006, 2009), this can be avoided when using the volatility of stock return.<sup>13</sup>

### **Leverage**

Financial leverage is added as liabilities to total assets, which is predicted to have a positive sign on the cost of equity capital (Modigliani & Miller, 1958).

### **Country and industry risks**

Finally, it is important to control for country and industry fixed effects known to affect the cost of equity. According to Fama and French (1997) there is variation in factor loadings across industries. We could control for these industry variations by including one-digit SIC-codes. However, since the fixed industry effects do not vary over time, the variable would be removed in the fixed effects model. Hence, we do not include any time-constant factors (country or industry factors) in our model because they would disappear. Therefore, we assume that the fixed differences within industries and countries will not explain a large part of COE.

Further, country, industry, and firm time-varying effects, such as individual-specific shocks, economic risks, and differences in macroeconomic variability are known to affect COE (Ferson & Harvey, 1997; Hail & Leuz, 2006). We control for these variations in two different ways. First, we include an interaction term between individual dummies (Country or Industry) and the Year-dummy. This interaction term accounts for country- or industry-year specific factors (Hail & Leuz, 2006) and allows these factors to have different trends (Angrist & Pischke, 2008). Second, we include the log of GDP per capita instead of the Country-Year interaction term, which controls for a country's economic development. We explain each specification when presenting the different regression models.

## **4.4 Descriptive Statistics**

This section presents descriptive statistics of the data used to analyze the exclusion of tobacco companies. We describe the data for tobacco companies and food companies in the periods before and after exclusion, along with a visualization of the parallel trends assumption.

<sup>13</sup> By replacing the volatility of daily stock return with beta, the results presented in Section 5 and 6 do not change.

#### 4.4.1 Summary statistics

Table 2 provides descriptive statistics of the cost of equity and all the control variables for food and tobacco companies.

As presented, tobacco companies have a higher cost of equity on average than food producers both before and after exclusion. Further, the sample consists of more food companies than tobacco companies. There is also a different number of firm-year observations in the years before exclusion compared to the years after exclusion, implying that the panel data is unbalanced.

Table 2: Descriptive statistics of tobacco and food firms

	Tobacco		Food		All	
	2000-2009	2010-2018	2000-2009	2010-2018	2000-2009	2010-2018
BtoM (Mean)	0.51	0.50	0.42	0.38	8.13	0.43
Total Assets 000s USD (Mean)	13 777	14 580	14 221	23 214	14 059	19 805
Volatility (Mean)	0.33	0.29	0.24	0.21	0.27	0.24
Leverage (Mean)	0.92	0.98	0.63	0.58	0.73	0.74
Number observations (Mean)	101	118	190	184	291	302
COE (Mean)	8.28	8.20	7.97	8.04	8.13	8.02
COE (Median)	8.04	8.08	7.72	7.86	7.88	7.92
COE (Min)	4.51	4.27	5.70	5.70	4.51	4.27
COE (Max)	12.78	12.67	12.17	12.17	12.78	12.67

We employ a Wilcoxon Rank Sum Test to test whether the difference between the tobacco COE and the food COE before exclusion is significantly different than the difference after exclusion. The result implies that there is not a significant difference.<sup>14</sup> However, when examining the hypothesis, we must control for other factors to isolate the exclusion effect. Therefore, in our multivariate model in Section 5, we control for the firm-specific variables as well as other macro factors.

#### Cost of equity over time

Figure 5 presents the yearly average cost of equity in the period ranging from 2000 until 2018 for tobacco and food producers using Bloomberg's COE estimates. The two industries follow similar patterns both before and after the exclusion period.

<sup>14</sup> The p-value of the Wilcoxon Rank Sum Test is above 5%, rejecting the null that the difference in COE between tobacco firms and food firms before exclusion is significantly different than the difference after exclusion.

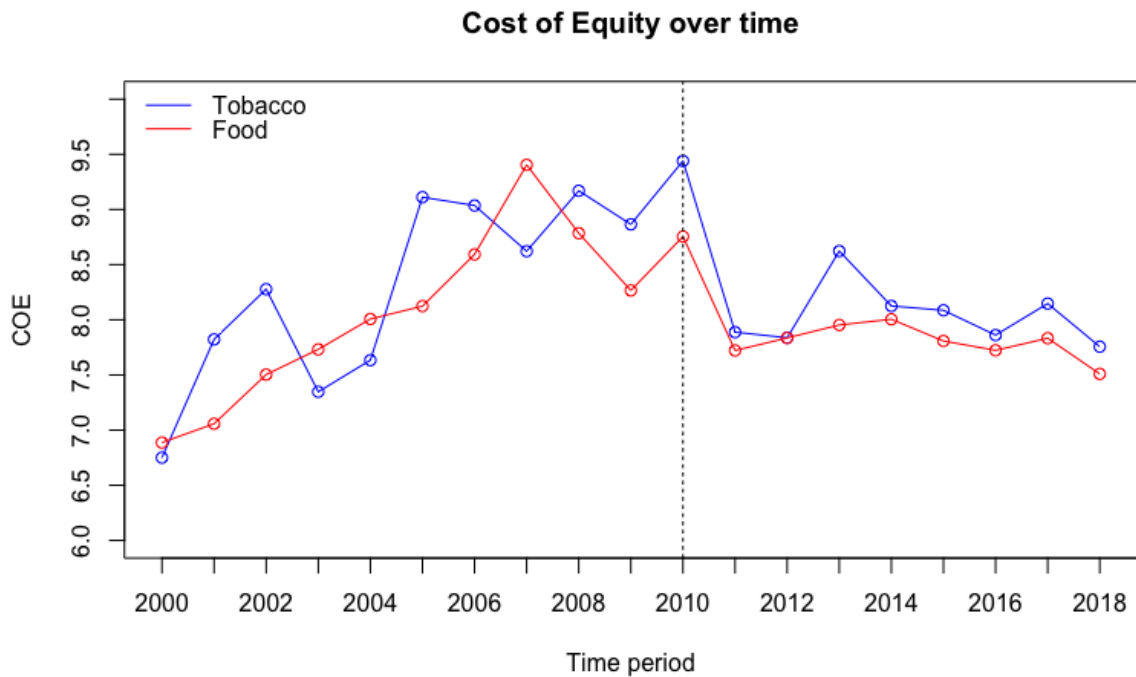


Figure 5: The average cost of equity over time for tobacco and food companies

#### 4.4.2 The assumption of parallel trends

The parallel trends assumption is essential to interpret the results of the difference-in-difference estimation causally, as mentioned in Section 3.1.2. The following graph (Figure 6) presents the observed average cost of equity estimates for all food and tobacco companies for the pre-exclusion period, as well as the corresponding trends. As seen, the industries exhibit similar trends in the pre-exclusion period, indicating that the assumption holds. Also, a t-test on the differences between the slopes finds no significant difference.<sup>15</sup>

<sup>15</sup> The t-test is presented in Appendix 10.7.

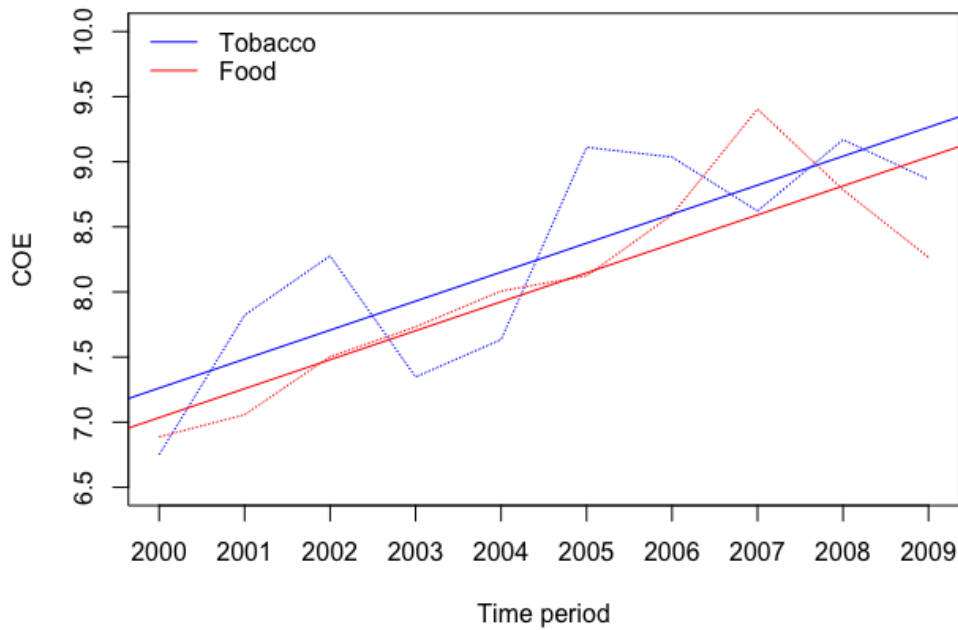


Figure 6: The parallel trends assumption for tobacco and food companies

## 4.5 Treating outliers

The sample of companies in this analysis is collected from a small population. Thus, the chances of potential outliers are high (Osborne & Overbay, 2004), which may increase error variance and reduce the power of the statistical tests. Also, when not randomly distributed outliers can decrease normality and bias the estimates of interest. With a small sample, it is important to carefully consider excluding outliers as they have a large impact on OLS estimates (Wooldridge, 2016). Osborne and Overbay (2004) state that outliers lie near three standard deviations from the mean and may have a disproportionately strong influence on the estimates. Following this, we remove the observations with these deviations when applying this on the cost of equity. We present this in Appendix 10.4.

## 5. Empirical Findings

This section presents the results of the regression estimations performed to test our hypothesis. First, we present the main model specification in which determines the direct exclusion effect of tobacco firms on the COE. Second, we exclude the treatment years (2009 and 2010) in the analysis to make sure that the results are not affected by any announcement effects. Lastly, we perform an estimation separating the countries.

### 5.1 Main Specification: Tobacco Exclusions

Table 3 provides the results of the specification model presented in Section 3.2. It contains four regressions with COE as the dependent variable. The independent variable of interest is the interaction term between the dummy *AfterExcl* and the dummy *Tobacco*, representing the exclusion effect. For each regression, new variables are included to isolate the effect of exclusion. All estimations employ the fixed effects model with a difference-in-difference estimator.

The DiD-estimator is the exclusion effect, i.e. the interaction between *AfterExcl* and *Tobacco*. Each model includes this interaction term as well as fixed effects for firm and year.<sup>16</sup> The standard errors are shown in parenthesis based on Newey-West robust standard errors.

The interaction term between *AfterExcl* and *Tobacco* is positive in all model specifications, however insignificant in model 1. The coefficient becomes significant at 5% in model 2, and the significance increases to 1% in model 3 and model 4. The interaction term is also economically meaningful and indicates that tobacco firms have approximately between 50 to 60 basis points higher COE after exclusion, relative to food firms. These findings support our hypothesis that the direct effect of exclusion has a significant impact on tobacco firms' cost of equity.

<sup>16</sup> The coefficients for the fixed effects and the intercept are not reported.

Table 3: Empirical findings of tobacco exclusions

Tobacco and Food Sample				
<i>Dependent variable:</i>				
	COE			
	1	2	3	4
Volatility		1.698 (1.205)	1.738 (1.221)	2.232 (1.904)
log(TotalAssets)		0.244 (0.206)	0.263 (0.206)	0.218 (0.237)
log(BtoM)		0.075 (0.109)	0.258** (0.121)	0.030 (0.136)
LiabilitiestoTotalAssets			2.367*** (0.701)	0.901 (0.879)
AfterExcl:Tobacco	0.084 (0.213)	0.577** (0.228)	0.581*** (0.224)	0.639*** (0.230)
Year and Firm fixed effects?	Yes	Yes	Yes	Yes
Country*Year Interaction?	No	No	No	Yes
Observations	628	553	553	553
R <sup>2</sup>	0.0003	0.023	0.039	0.503
Adjusted R <sup>2</sup>	-0.098	-0.090	-0.074	0.179
F Statistic	0.151 (df = 1; 571)	2.858** (df = 4; 495)	4.040*** (df = 5; 494)	2.052*** (df = 165; 334)

*Note:* \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

In model 1, the interaction term between AfterExcl and Tobacco, along with firm and year fixed effects, are the only variables. This model controls for unobserved factors that are constant over time within each firm (firm fixed effects) and factors that are constant across firms within a given year (year fixed effects). However, it does not control for other firm characteristics, leading to a low coefficient of determination. The model suggests that an excluded tobacco firm has higher COE on average, relative to food firms in the exclusion period (after 2010). The effect is not significant.

Models 2, 3, and 4 show that adding more controls for firm-varying characteristics changes the magnitude and significance of the interaction term of interest, as well as the model fit, presented by R-squared. The interaction term becomes significant when controlling for other

firm characteristics.<sup>17</sup> This indicates that tobacco companies have higher COE on average after the exclusion, relative to food companies and that this effect is significant.

The difference between model 3 and model 4 is that model 4 includes an interaction term between Country and Year to account for time-specific country effects that would otherwise be unobserved and captured by the error term (Hail & Leuz, 2009).<sup>18</sup> The interaction term allows for different trends between the countries, such as new regulations affecting one or both industries (Angrist & Pischke, 2008). When adding the interaction term, the variables BtoM and LiabilitiesToTotalAssets lose their significance. This might reflect that differences within each firm over time are not that important to determine the COE as the cross-sectional differences between each firm. It may also mean that the time-varying country effects capture some of the firm-varying effects.

Model 3 and model 4, which include all control variables, are the main model specifications of our analysis.

### **5.1.1 Sample size and statistical inference**

In the regression models of Table 3, the coefficient of determination is very low, leading to a negative adjusted R-squared. The adjusted R-squared introduces punishment for including more explanatory variables (Wooldridge, 2016). If the coefficient of determination does not increase after the punishment is introduced, the adjusted R-squared may be negative.

The low R-squared may arise due to too much variation in the data set. The data used consists of a small sample which may increase variation, also mentioned in Section 4.5. Therefore, increasing the sample size e.g. by adding more years, could improve the results.

<sup>17</sup> The effect of economic performance in year  $t$  may not affect COE until year  $t+1$ . Following Sharfman and Fernando (2008), we perform separate regressions lagging the variables for BtoM and TotalAssets one year. This does not affect our results.

<sup>18</sup> We also account for country time-specific effects by using the log of GDP per capita and the lagged log of GDP per capita instead of the Country\*Year interaction term. This does not change our results. In addition to country time-specific factors, we add tobacco time-specific factors by including Tobacco\*Year as an interaction term. This does not change the interpretation of the exclusion effect, i.e. the effect remains significant. Further, to control for possible regulations affecting COE, we add a variable for net income to total revenues. This does not change the sign or significance of the exclusion term.



## 5.2 Additional Analyses

### 5.2.1 Excluding the treatment period

Investors' decisions of excluding specific industries are often announced before the actual exclusion takes place (e.g. due to transparency and preparation objectives). Following the theory of market efficiency (Fama, Fisher, Jensen, & Roll, 1969), the market may price in and react to the exclusion in advance. Hence, the transition period going from 2009 to 2010 might not be so clear. Therefore, we exclude these two firm-years in the models of Table 4 presented below. The difference between models 1 and 2 is that model 2 includes an interaction term between Country and Year to account for country time-specific effects.

Table 4: Excluding transition period: 2009 and 2010

<b>Excluding 2009 and 2010</b>		
<i>Dependent variable:</i>		
	<b>COE</b>	
	1	2
log(BtoM)	0.328*** (0.119)	0.169 (0.138)
log(TotalAssets)	0.214 (0.212)	0.226 (0.237)
LiabilitiestoTotalAssets	2.940*** (0.703)	1.798** (0.837)
Volatility	0.996 (1.241)	0.933 (1.889)
AfterExcl:Tobacco	0.579** (0.234)	0.599** (0.241)
Year and Firm effects?	Yes	Yes
Country*Year Interaction?	No	Yes
Observations	496	496
R <sup>2</sup>	0.045	0.487
Adjusted R <sup>2</sup>	-0.076	0.148
F Statistic	4.178*** (df = 5; 439)	1.939*** (df = 146; 298)

*Note:* \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

The coefficient of exclusion (the interaction term between AfterExcl and Tobacco) is significant at a 5% level in both models and between 50 and 60 basis points. Thus, the COE of tobacco firms is higher on average relative to food firms after the exclusion period, even when accounting for possible announcement effects.

## 5.2.2 Separating countries

This section extends the analysis of the relationship between exclusion and cost of equity capital by examining whether the direct exclusion effect differs between continents and countries. As this sample includes companies from Europe and the US, it is interesting to examine whether the direct exclusion effect of firms originating from Europe is stronger than of US firms since they have a long history of excluding “sin” firms. This analysis is also of interest if there is more variation between the continents than assumed in our main model. As mentioned, the fixed effects model removes these constant variations.

To examine the cross-country differences, our sample is divided in two subsamples; firms originating from the US and firms originating from Europe. We run separate regressions for each subsample and account for firm and year fixed effects (shown in Table 5). Further, we add an interaction term between Country and Year in model 3 to control for time-specific country effects within Europe.

Table 5: Separating continents

Separating continents			
<i>Dependent variable:</i>			
COE			
	The US	Europe	Europe
	1	2	3
log(BtoM)	0.049 (0.169)	0.571*** (0.174)	-0.061 (0.222)
log(TotalAssets)	0.099 (0.310)	-0.087 (0.428)	0.499 (0.357)
LiabilitiestoTotalAssets	0.889 (1.067)	5.651*** (1.367)	0.896 (1.834)
Volatility	2.266 (2.079)	0.387 (1.664)	2.241 (2.117)
AfterExcl:Tobacco	0.538* (0.304)	0.606 (0.416)	0.789* (0.444)
Year and Firm fixed effects?	Yes	Yes	Yes
Country*Year Interaction?	No	No	Yes
Observations	288	265	265
R <sup>2</sup>	0.035	0.101	0.821
Adjusted R <sup>2</sup>	-0.125	-0.055	0.432
F Statistic	1.805 (df = 5; 246)	5.032*** (df = 5; 225)	2.594*** (df = 147; 83)

Note:

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01

The exclusion effect in the US is significant at a 10% level, and the coefficient implies that tobacco firms' COE is, on average, 0.538 higher than food firms' COE after the exclusion period. For Europe, the exclusion effect becomes significant at a 10% level after controlling for country-varying characteristics, and the magnitude increases. Further, the coefficients show that the exclusion effect on average is higher for European firms than for US firms.

Even though the significance of the exclusion term is reduced when examining each continent separately, the effect is still significant at a 10% level. These findings confirm our hypothesis and indicate that the direct exclusion effect of tobacco companies is positively associated with the cost of equity capital. The effect is significant. In the next section, we examine the direct effect of exclusion of coal firms on their cost of equity capital.

## 6. Exclusion of Coal Companies

The previous section supports our hypothesis that the direct effect of exclusion of tobacco firms has a significant impact on the COE. The findings provided an answer to our first research question. However, to answer our supplementary research question of whether an increasing trend of excluding fossil fuel stocks will lead to a significant change in the COE, we investigate the exclusion effect of coal companies.

As mentioned in the introduction, there is a trend of excluding fossil fuel firms and coal firms in particular. Coal firms have experienced a longer exclusion period compared to other fossil fuels and account for 44% of total humanmade CO<sub>2</sub>, which is the largest single source of global warming (Lewis, 2019). Thus, we choose to examine the exclusion effect of coal companies to discuss possible implications for the exclusion of fossil fuels.

An important difference between coal firms and tobacco firms is that coal firms have the ability to reform their businesses without changing their main industry specification. The tobacco industry imposes a high societal cost, which can only be lowered by reducing the demand for tobacco products. Fossil fuels also impose a high societal cost in terms of carbon emission and increasing climate change. However, producing more renewable energy can reduce the societal cost (Skancke et al., 2014). Hence, coal companies can transform their business and thus avoid exclusions from “green investors” (Heinkel et al., 2001). Transforming their businesses might lead to an indirect effect of the companies’ cost of equity capital e.g. due to involvements in projects with lower risk. Therefore, we control for the possible indirect effect by including additional variables.

In this analysis, we compare coal companies to carefully chosen comparable companies and use a fixed effects estimation with a difference-in-difference design. Thus, we use the same research design as the analysis for tobacco exclusions, described in Section 3. In the following section, we present the data for our sample, the exclusion period for coal firms, and additional variables needed to analyze the effect. Further, we summarize the data and present the results of the analysis.

## 6.1 Data

### 6.1.1 Data sources and requirements

We obtain yearly financial data from Bloomberg, the World Bank, and Thompson Datastream in the period ranging from 2004 to 2018. The selected companies are required to have the requisite financial data from Thompson Datastream, to be publicly listed as of 2013 and at least until 2016, to have positive revenues, and to be classified with an industry SIC-code. All items are measured as of fiscal year-end and are quoted in US dollars.

The selected companies are required to originate from the US, Europe, or Canada.

### 6.1.2 Selection of coal companies

A selection of coal firms is chosen based on NBIM's exclusion criteria. NBIM requires the coal companies to derive 30 percent or more of their revenues or operations from thermal coal (Norges Bank, 2016). The majority of the firms on their list have SIC-codes of 49-; "Electric, Gas, and Sanitary Services", while some have the SIC-code 1220; "Bituminous Coal & Lignite Mining". Further, the selected coal companies are required to follow the requirements listed in Section 6.1.1.

Table 6 presents an overview of the selected firms.

Table 6: Selected coal firms

Country	Coal (SIC 1220)	Possible coal (SIC 49-)	Selected coal firms
Canada	3	15	3
China	35	75	0
Greece	0	2	1
Hong Kong	5	21	0
Indonesia	21	5	0
Other	27	141	0
Philippines	3	11	0
Poland	3	12	2
Spain	0	9	1
United Kingdom	6	10	1
United States	16	182	25
<b>Total</b>	<b>119</b>	<b>483</b>	<b>33</b>

### 6.1.3 Selection of comparables

We select comparable companies based on the SIC-codes of the majority of coal companies (4911, 4931, 4991), meaning that the comparable firms also operate in the electric service and gas sector. We gather all companies with these SIC-codes and select those originating the US, Canada, and Europe. Further, we screen each firm to make sure that it meets the requirements mentioned in Section 6.1. Lastly, we select the companies with a market capitalization above the coal firms' average market capitalization.

### 6.1.4 The coal exclusion period

The Fossil Fuel Divestment Campaign emerged in the US in 2011 and was initiated at US universities (Arabella Advisors, 2018). The campaign urged investors to divest their assets in fossil fuel companies to reduce greenhouse gas emissions (Ansar et al., 2013). By September 2014, more than 50 billion USD was divested, and this number grew to 2.6 trillion USD in a year (Arabella Advisors, 2018). By September 2019, the total amount had increased to 11.48 trillion USD. Figure 7 presents this development.

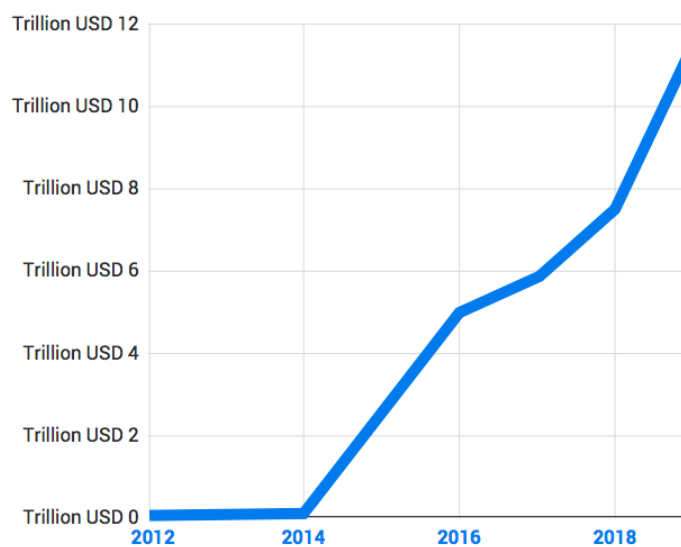


Figure 7: Cumulative coal exclusions, retrieved from Cadan (2019)

As mentioned, the total amount divested increased notably between the end of 2014 and the end of 2015. The period of exclusion is therefore chosen to the year-end of 2014. The year 2015 was also the period in which large funds started excluding coal firms (Buckley, 2019). Further, the “Clean Power Plan” was proposed by the Obama administration this year (EPA,

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2015). This plan might have changed social norms concerning coal, leading to increased exclusion.

We study whether the direct effect of exclusion of coal firms on the cost of equity is significant in the years of 2015 to 2018 compared to the years before, relative to the comparable companies.

### **6.1.5 Additional variables**

#### **The dependent variable: Cost of equity**

In this analysis, we use two different COE estimations. First, we use Bloomberg's calculated COE, which is estimated through the capital asset pricing model (CAPM). This estimation is the same as for the tobacco analysis. Second, we use two versions of the dividend discount model; Easton (2004) and Ohlson and Juettner-Nauroth (2005).

We use the additional COE estimations since previous research (e.g. (Fama & French, 1997)) show that CAPM may not hold in the real world. Therefore, we follow Hail and Leuz (2006) and apply the Easton (2004) model and the Ohlson and Juettner-Nauroth (2005) model, which both estimate the ex-ante cost of equity implied from the stock price and analysts' forecasts. These methods have the advantage of taking the degree of market segmentation as a given. However, the methods have limitations, such as the dependence on analysts' forecasts and measurement errors in these forecasts (Hail & Leuz, 2009). The assumptions behind long- and short-term growth, the use of analysts' forecast data, and the forecast period explain the differences between the methods. We average the results of the two methods and use this estimate as a proxy for COE.<sup>19</sup> We explain the methods further in Appendix 10.1.

#### **Control variables**

##### **Forecast dispersion (used for implied COE estimations)**

The implied COE estimation is dependent on analysts' forecasts, which may have large differences. The dispersion of analysts' forecasts reflects information uncertainty (Botosan &

<sup>19</sup> The implied cost of equity estimation is not used for the tobacco analysis. This is because of the low analyst coverage of tobacco firms, which might bias the results. Further, some tobacco firms have zero analyst coverage. Hence, many observations will be lost.

Plumlee, 2005; Chen, Jorgensen, & Yoo, 2004) and is predicted to have a positive sign on COE. Following Hail and Leuz (2006), we measure this variable as the variation of analysts' EPS forecast one year ahead.

#### **Forecast deviation (used for implied COE estimations)**

Noise in analysts' forecasts may affect the implied COE estimations (e.g. (Hail & Leuz, 2006)), due to analysts being overly optimistic causing COE to be upward biased (El Ghouli et al., 2011) and systematic differences of forecast error in between countries (Hail & Leuz, 2006). Therefore, we add forecast deviation when using the implied COE, defined as the difference between average consensus EPS one year forward and the actual EPS in a given year (Easton & Sommers, 2007). An increased difference indicates more uncertainty regarding future earnings (Guedhami & Mishra, 2009).

#### **Inflation (used for implied COE estimations)**

Hail and Leuz (2006) argue that inflation is an important variable when using the implied COE estimates because the inputs in these calculations are expressed in local currencies and nominal terms. Hence, the estimates reflect the countries' expected inflation rates. We use the actual inflation rate in year  $t+1$  as a proxy for the expected inflation rate in year  $t$  (Hail & Leuz, 2006). However, we predict the effect of this variable to be limited since the countries in our study have similar characteristics.

#### **Greenhouse gas emissions**

There is a positive association between greenhouse emissions and the cost of equity capital, e.g. due to different response to carbon threats (Kim et al., 2015). Also, Busch and Lewandowski (2018) find that companies with lower CO<sub>2</sub> emissions have superior financial performance. We control for this by adding greenhouse emissions (scaled by revenue) as a variable, when using both Bloomberg COE and implied COE.

Further, the greenhouse emissions variable might control for possible reformed coal companies. We have previously stated that coal firms have the ability to reform their business without changing their main industry specifications. Consequently, this can indirectly affect the COE, e.g. through involvements in projects with lower risk.

We note that the greenhouse emissions data from Thompson Datastream is limited for some firms.



## Net income scaled by revenue

There may be new regulations affecting the coal industry in the studied time-period, which could affect a firm's perceived risk. These regulations can be captured through the greenhouse emissions variable. However, due to data restrictions on the greenhouse emissions variable, we include net income divided by total revenues.

### 6.1.6 Descriptive statistics

We present summary statistics of the coal companies and the comparables in Table 7 by including all control variables as well as both estimation methods for COE. It is worth noticing that the specified coal companies have higher emissions (scaled by total revenues) than comparables both before and after exclusion. The mean of total emissions scaled by revenues is lower for both industries after exclusion.

Table 7: Descriptive statistics of coal and comparable companies

	Coal		Comparables		All	
	2004-2014	2015-2018	2004-2014	2015-2018	2004-2014	2015-2018
BtoM (Mean)	0.75	0.90	0.65	0.57	0.71	0.75
Total Assets 000s USD (Mean)	17 294	22 181	22 419	32 468	19 406	26 922
Volatility (Mean)	0.24	0.19	0.27	0.26	0.25	0.23
Leverage (Mean)	0.66	0.68	0.70	0.68	0.68	0.68
Forecast Dispersion (Mean)	0.36	0.33	0.09	0.09	0.25	0.22
Forecast Deviation (Mean)	0.23	0.23	0.41	0.50	0.30	0.35
Total Emissions To Revenue (Mean)	6.34	4.82	2.07	1.36	4.76	3.68
<b>Bloomberg COE</b>						
COE Bloomberg (Mean)	9.11	7.26	8.62	7.33	8.91	7.29
COE Bloomberg (Min)	4.24	3.68	3.73	4.16	3.73	3.68
COE Bloomberg (Max)	14.17	13.60	13.95	13.12	14.17	13.60
<b>Implied COE</b>						
COE Implied (Mean)	9.91	8.39	10.03	8.362	9.96	8.38
COE Implied (Min)	3.98	3.05	3.92	3.62	3.92	3.05
COE implied (Max)	17.79	17.60	18.03	17.56	18.03	17.60

### Cost of equity over time

Figure 8 provides an overview of the cost of equity capital for coal companies and their comparable companies over time. The left figure uses Bloomberg estimations for COE while the right figure our average implied COE estimations. The firms follow similar patterns across the time-period of 2004 to 2018.

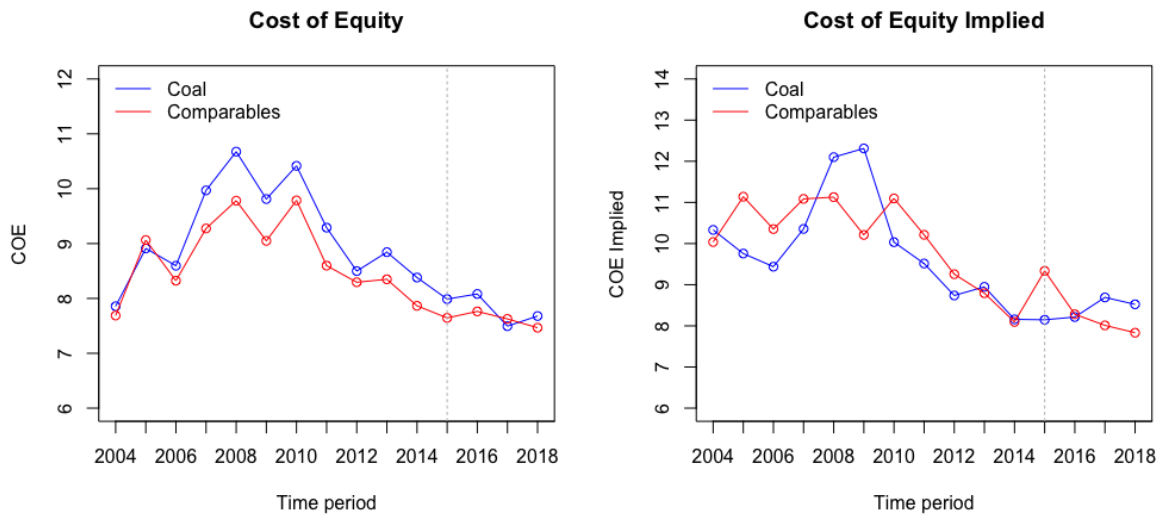


Figure 8: The average cost of equity over time for coal and comparable companies

### The parallel trends assumption

As stated in Section 3.1.2 the assumption of parallel trends must hold to use the difference-in-difference design. Figure 9 presents the average cost of equity capital for coal companies and its comparable companies, along with its corresponding trends. The left figure uses Bloomberg estimates while the right figure uses implied COE estimates.

The slopes show similar trends in the years leading up to the exclusion, indicating that the parallel trends assumption holds. We see some differences in the trends. However, we assume that those differences will be captured by the fixed effects. T-tests on the differences between the slopes find no significant difference.<sup>20</sup>

<sup>20</sup> The t-tests are presented in appendix 10.7.

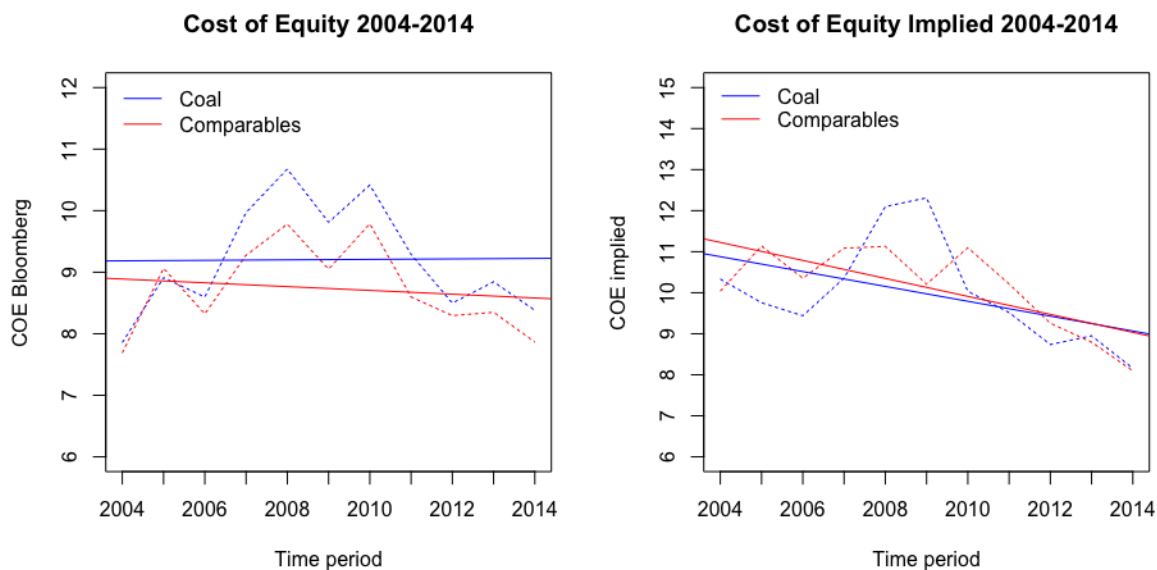


Figure 9: The parallel trends assumption for coal and comparable companies

## 6.2 Empirical Findings of Coal Exclusions

In this section, we present different models used to examine whether the direct effect of the exclusions of coal companies on the cost of equity is significant. The results presented in Table 8 show that the direct effect (represented by the interaction term between *AfterExcl* and *Coal*) is insignificant in all model specifications.

Each regression model includes firm and year fixed effects, along with several control variables for firm characteristics. Models 1, 2, and 3 use Bloomberg COE estimates, while models 4, 5, and 6 use our implied COE estimates following the models of Easton (2004) and Ohlson and Juettner-Nauroth (2005). Further, we include an interaction term between *Country* and *Year* in model 3 and model 6 to account for possible time-specific country effects. We add the *NetIncomeToRevenue* variable in all models to capture new regulations or legislations affecting each firm.<sup>21</sup>

The interaction term between *AfterExcl* and *Coal* is insignificant in all models and has different signs and magnitudes. When accounting for an interaction between *Country* and *Year*

<sup>21</sup> Instead of using *NetIncomeToTotalRevenues*, we also include an interaction between *Coal* and *Year*, which could capture year-specific industry effects such as new regulations. This does not change the sign or significance of the exclusion term.

in model 3 and model 6, the magnitude of the sign is small using both COE estimations, indicating a limited economic significance of exclusion.

Table 8: Empirical findings of coal exclusions

Coal and Comparables						
<i>Dependent variable: COE</i>						
	Bloomberg			Implied		
	1	2	3	4	5	6
log(BtoM)	0.801*** (0.249)	0.450 (0.297)	-0.522* (0.275)	0.911 (0.568)	1.304* (0.776)	0.185 (0.995)
log(TotalAssets)	0.187 (0.254)	-0.698* (0.377)	-0.321 (0.375)	0.549 (0.704)	1.760** (0.781)	1.596** (0.885)
LiabilitiestoTotalAssets	1.224 (1.410)	0.148 (2.159)	3.558* (2.038)	0.806 (3.222)	5.607 (5.150)	5.959 (5.314)
Volatility	5.127*** (0.911)	9.583*** (1.382)	5.254*** (1.246)	0.370 (1.673)	0.973 (3.299)	0.604 (3.258)
log(NetIncomeToRevenue)	-0.098 (0.125)	-0.128 (0.133)	0.046 (0.119)	-0.445* (0.246)	0.151 (0.347)	-0.135 (0.365)
TotalEmissionstoRevenues		0.032 (0.052)	0.017 (0.040)		-0.100 (0.077)	-0.039 (0.082)
log(1 + ForecastDeviation)				3.888*** (1.010)	-0.089 (1.688)	0.338 (2.479)
log(1 + ForecastDispersion)				-0.699 (2.653)	-4.060 (3.297)	0.050 (5.055)
Inflationexpected				-0.001 (0.007)	0.002 (0.007)	0.847* (0.500)
AfterExcl:Coal	-0.060 (0.189)	0.181 (0.253)	-0.272 (0.220)	0.457 (0.369)	0.611 (0.445)	0.182 (0.446)
Year and firm fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Country*Year Interaction?	No	No	Yes	No	No	Yes
COE estimate:	Bloomberg	Bloomberg	Bloomberg	Implied	Implied	Implied
Observations	671	369	369	564	313	313
R <sup>2</sup>	0.166	0.252	0.632	0.088	0.089	0.287
Adjusted R <sup>2</sup>	0.056	0.092	0.291	-0.050	-0.150	0.002
F Statistic	19.620*** (df f = 6; 592)	14.601*** (df f = 7; 303)	8.136*** (df = 54; 256)	5.222*** (df = 9; 489)	2.421*** (df = 10; 247)	2.636*** (df = 34; 223)

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

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We include emissions data in four of the models.<sup>22</sup> The emissions data does not seem to impact the significance of the interaction term between AfterExcl and Coal. However, the sign of the coefficient changes when using the Bloomberg estimate.

The insignificance of the interaction terms, AfterExcl\*Coal, indicates that there is not a significant direct exclusion effect of coal companies on the COE (Table 8). However, we note that the results must be interpreted with caution due to data restrictions, such as limited emissions data and a short time-period after exclusion.

### **Excluding the treatment period**

As mentioned, investors' decisions of excluding specific industries are often announced before the actual exclusion takes place (e.g. due to transparency and preparation objectives). Hence, the transition period going from 2014 to 2015 might not be so clear. Therefore, we exclude these two firm-years in the models of Table 9 presented below. Models 1 and 2 use the Bloomberg estimates for COE, while models 3 and 4 use the Implied COE estimates. We include an interaction term between Country and Year in models 2 and 4, but do not include TotalEmissionstoRevenue due to its insignificance in Table 8 and the loss of observations.

The coefficient of exclusion (the interaction term between AfterExcl and Tobacco) is insignificant all models and has different signs and small magnitudes. These findings further support the previous results of no significant direct exclusion effect of coal companies on the COE.

<sup>22</sup> Due to data restrictions, we lose many observations when including TotalEmissionstoRevenues

Table 9: Excluding the treatment period: 2014 and 2015

Excluding 2014 and 2015				
<i>Dependent variable: COE</i>				
	Bloomberg		Implied	
	1	2	3	4
log(BtoM)	1.440*** (0.383)	0.770** (0.370)	1.360*** (0.427)	0.747** (0.381)
log(TotalAssets)	0.143 (0.307)	0.057 (0.396)	0.263 (0.323)	-0.139 (0.349)
LiabilitiestoTotalAssets	2.777 (1.830)	1.805 (2.080)	1.998 (1.669)	0.134 (1.595)
Volatility	5.459*** (1.376)	3.645** (1.458)	6.491*** (1.442)	4.718*** (1.606)
log(NetIncomeToRevenue)	0.205 (0.143)	0.369** (0.151)	0.254* (0.143)	0.254* (0.144)
log(1 + ForecastDispersion)			-2.935** (1.289)	-0.201 (0.860)
log(1 + ForecastDeviation)			0.892 (0.744)	0.503 (0.661)
Inflationexpected			0.001 (0.003)	0.009* (0.005)
Afterexcl:Coal	0.190 (0.240)	-0.150 (0.181)	0.231 (0.242)	-0.165 (0.172)
Year and Firm fixed effects?	Yes	Yes	Yes	Yes
Country*Year interaction?	No	Yes	No	Yes
Observations	576	576	521	521
R <sup>2</sup>	0.169	0.437	0.230	0.516
Adjusted R <sup>2</sup>	0.043	0.293	0.101	0.384
F Statistic	16.969*** (df = 6; 499)	7.563*** (df = 47; 458)	14.795*** (df = 9; 445)	9.673*** (df = 45; 409)

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

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## 7. Limitations

The previous analyses state that the direct effect of exclusion is significant for tobacco firms but insignificant for coal firms. We discuss the implications of these results in Section 8. In this section, we consider potential limitations that could bias the inference of the results. Further, we present several robustness issues.

### 7.1 Overestimation of the Exclusion Effect

#### **Hedging against diversification loss (spillover effects)**

The exclusion effect could be overestimated due to several reasons. First, the effect could be overestimated if the cost of equity of comparable companies decreases in the post-exclusion period as a result of the direct exclusion effect of excluded companies. Following Luo and Balvers (2017), this can happen if “green” investors want to diversify their portfolio by buying more non-excluded stocks that correlate with the stocks they have excluded. Thus, the exclusion effect can be overestimated if a significant number of “green” investors that exclude tobacco firms instead want to invest in food firms to increase their portfolio diversification. As a consequence, the demand for food stocks will increase, leading to an increased price. Due to the diversification benefits of investing in food stocks, “green” investors will not require a higher return (COE). Therefore, the difference between the COE of tobacco stocks and the COE of food stocks post-exclusion might increase (Luo & Balvers, 2017).

Second, when “neutral” investors give up food stocks (because “green” investors want to diversify their portfolios), they may want to hedge this loss of diversification by investing in stocks correlating with food (e.g. tobacco) (following Luo and Balvers (2017)). In order for the “neutral” investors to hold more of the excluded stocks, causing an unbalanced portfolio, they would require an even higher return. This hedge against diversification loss increases the direct effect of exclusion.

#### **Other policy implementations**

Further, the effect might be overestimated if it captures the effect of other policy implementations or other exogenous factors. The tobacco and coal industry are exposed to several industry regulations. We control for this by including both industry and country time-specific factors (dummies for industry and country interacted with year, as well as GDP per capita each year) in addition to emissions data for coal firms, depending on the model

specification. However, these variables might fail to capture the full extent of regulations, which could bias the exclusion effects.

### **Other factors affecting COE**

Tobacco firms and coal firms might have experienced increased returns in the studied time-periods due to increased litigation risks known to affect the COE (Hong & Kacperczyk, 2009). Negative social norms can heighten litigation risks. Hence, the exclusion effects could capture the effects of increased litigation risks if the negative social norms started at the same time as exclusion.

Further, Hong and Kacperczyk (2009) find that norm-constrained institutions hold less “sin stocks” than comparable stocks. These findings can be explained by the institutions’ exposure to social norms and their attempt to stay away from carbon risk and CSR risk. According to previous literature, there is a positive correlation between firm value and institutional ownership (e.g. McConnell and Servaes (1990)), and it is often stated that firms with higher a fraction of institutional owners have a lower cost of capital (Sharfman & Fernando, 2008). Therefore, since the chosen exclusion periods in our analyses are selected based on exclusions by large funds, the exclusion effects could capture the relationship between the share of institutional owners and the cost of equity. However, Sharfman and Fernando (2008) find no significant relationship between the percentage of institutional holders and the cost of equity. Therefore, it is likely that the exclusion effect is not notably impacted by the relationship between institutional owners and the COE.

## **7.2 Robustness Issues**

In this section, we discuss our model choice and possible spatial correlation issues. We present additional robustness issues and tests in the Appendix.

### **7.2.1 Model choice**

We use the fixed effects (FE) model in our analyses. Alternative models are the random effects (RE) model, the pooled OLS (POLS) model, and the first difference (FD) model.



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When comparing FE to RE and FE to POLS using the Hausman and F-test, respectively, both results indicate that FE is the most efficient model.<sup>23</sup> These results implies that there are fixed factors not observed in the data which affect COE. The fixed effects model, which includes year and firm fixed effects, captures these unobserved effects.

Further, FE is used instead of the FD model. With a two-period sample, the two methods would obtain the same results (Wooldridge, 2016), but with three or more periods, the two methods are different. Both methods are unbiased under the first four OLS assumptions (listed in appendix 10.2), but require the strict exogeneity assumption to hold (that the unobserved varying errors are uncorrelated with the independent variables) and variation in variables across time.

The fixed effects estimation has an advantage when the data has many missing values, which is the case in our sample (Wooldridge, 2016). The FD estimation will then lose two observations when one period is missing. However, the FD estimation might be more efficient with serially correlated errors. Since the tobacco analysis and coal analysis exhibit serially correlated errors, we also estimate the model using the FD estimation. The results and interpretation of the exclusion of tobacco and coal remain unchanged.

## 7.2.2 Accounting for spatial correlation

In panel data, there is dependence across the time dimension (serial correlation) and within each cross-section (within firm, country, or industry). Therefore, our model follows a two-way clustering of standard errors.<sup>24</sup> We report this using Newey-West corrected standard errors, which also allows for heteroscedasticity.

### Serial correlation in Difference-in-Difference estimation

Another way to assess serial correlation issues is by averaging the pre- and post-exclusion data and then repeat the difference-in-difference estimation (following e.g. (Bertrand, Duflo, & Mullainathan, 2004; Li, 2010)). We present this in Table 10.

<sup>23</sup> The p-values are below 0.05, indicating that FE is the most efficient model.

<sup>24</sup> Tests for cross-sectional dependence and serial correlation in the errors are presented in the Appendix.

The exclusion term is positive for the tobacco and coal sample. The effect remains significant for the exclusion of tobacco firms, which supports our hypothesis that the exclusion can have a direct effect on the COE. The effect is insignificant for the coal sample when using both the Bloomberg COE estimate and the Implied COE estimate. Hence, these results are in line with our previous findings.

Table 10: Regression results using aggregated data

<b>Aggregated Data</b>			
<i>Dependent variable: COE</i>			
	<b>COE Bloomberg</b>		<b>COE Implied</b>
	Tobacco sample	Coal Sample	Coal Sample
	1	2	3
Afterexcl	-0.976 (1.002)	-2.104*** (0.363)	-0.018 (0.012)
log(BtoM)	1.043 (0.712)	0.851 (0.897)	0.051* (0.026)
log(TotalAssets)	1.136** (0.499)	0.967 (0.615)	0.006 (0.017)
LiabilitiestoTotalAssets	6.404*** (2.155)	-6.565 (6.221)	0.129 (0.081)
Volatility	-6.494* (3.607)	2.963 (3.351)	-0.053 (0.075)
log(NetIncomeToRevenue)		-0.894* (0.462)	0.014* (0.007)
log(1 + ForecastDispersion)			0.014 (0.111)
log(1+ForecastDeviation)			0.092*** (0.033)
Afterexcl:tobacco	0.893** (0.432)		
Afterexcl:Coal		0.250 (0.340)	0.003 (0.005)
Firm fixed effects?	Yes	Yes	Yes
Country*Year Dummy?	Yes	No	No
Observations	66	100	87
R <sup>2</sup>	0.959	0.826	0.722
Adjusted R <sup>2</sup>	0.811	0.546	0.113
F Statistic	20.667*** (df = 16; 14)	25.721*** (df = 7; 38)	7.776*** (df = 9; 27)

Note:

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01

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## 8. Discussion of Empirical Findings

In this section, we discuss the impact of exclusionary investing and its effect on the cost of equity capital. In theory, there may be two effects of exclusion on the cost of equity capital; the direct and indirect effect. We study only the direct effect. Our results in Section 5 suggest that the direct effect of exclusion of tobacco firms can raise the COE. The results are in line with previous literature stating that with the same number of investors and companies in the economy, the cost of equity will rise for the excluded companies due to diversification limitations and limited risk-sharing (Heinkel et al., 2001; Merton, 1987). Further, our results in Section 6 suggest that the direct effect of excluding coal companies is not significant on the COE.

In this section, we discuss the direct effect of excluding tobacco firms in light of the theories presented in Section 2 and implications for the tobacco firms. Further, we use the findings of the tobacco analysis in addition to the study of coal exclusions to discuss potential implications for exclusions of fossil fuels. Lastly, we introduce the importance of the indirect effect of exclusion and discuss implications for the investors.

### 8.1 The Direct Effect of Tobacco Exclusions

Studying the direct effect of exclusionary investing, we find that tobacco stocks are associated with an increased cost of equity after exclusion. This effect is significant at 1% and indicates that tobacco stocks have 50 to 60 basis points higher COE after exclusion, relative to food firms. Our results are consistent with our hypothesis that exclusionary investing has a significant impact on the tobacco stocks' cost of equity. In general, we explain the significant effect on COE by reduced demand for tobacco stocks, causing limited risk-sharing, which in turn increases the COE. To explain the mechanisms behind this increase, we apply the theories introduced in Section 2.

Following Merton (1987) segmentation theory, the equilibrium model of Heinkel et al. (2001) can explain why tobacco stocks experience higher COE after exclusion. The reduced investor base limits diversification opportunities for tobacco stockholders and causes idiosyncratic risk to be shared among fewer investors (Merton, 1987). This effect can be significant if a sufficient

number of investors exclude tobacco stocks (Heinkel et al., 2001).<sup>25</sup> Hence, our results imply that a sufficient number of investors have excluded tobacco stocks after 2010 compared to before 2010. According to Heinkel et al. (2001), a 10% share of “green” investors (not investing in tobacco) is enough to raise COE notably. Empirical findings have found that about 10-15% of investors exclude “sin stocks” (Hong & Kacperczyk, 2009). According to Luo and Balvers (2017), 96% of global SRI funds screen tobacco stocks, and the number is increasing. Following Heinkel et al. (2001) and previous research, our results imply that at least 10% of investors exclude tobacco stocks and that the COE is raised notably.

The more recent model of Luo and Balvers (2017), building on the intuition of Merton (1987) and Fama and French (2007), can also be used to explain why tobacco stocks experience increased COE after exclusion. The model assumes that some investors have nonpecuniary preferences for holding assets, implying that the CAPM is no longer valid. Thus, a systematic risk factor emerges (the “boycott” factor) in addition to the market factor. Consequently, all stocks in the market are affected by their return covariance with the “boycott” factor. After exclusion, non-excluding investors require a premium for being exposed to the “boycott” factor. Further, other stocks positively correlated with tobacco stocks will also have a premium (potential further study).

### **Implications for tobacco companies**

Our findings imply that tobacco companies have higher COE due to exclusionary effects, relative to food firms. Tobacco companies can likely expect this increase to continue in the future, as the amount of socially responsible investors is increasing.

Higher capital costs might reduce the economic profit of firms’ activities (Angel & Rivoli, 1997). Increased equity capital costs for tobacco firms might induce a shift towards more debt capital. However, since socially responsible factors might also influence the debt market, such a shift is not necessarily beneficial (Ansar et al., 2013).

Applying the Heinkel et al. (2001) model, tobacco firms will benefit from reforming its businesses when the difference in returns between tobacco stocks and other comparable stocks

<sup>25</sup>Heinkel et al. (2001) find that acceptable firms have lower expected return than unacceptable firms when there is a sufficient number of “green” investors in the market and that this difference increases with the number of “green” investors (given the same systematic risk for each firm).

is significant. According to the model, 25% of the investor base must be “green” (i.e. not investing in tobacco stocks) to induce the tobacco firms to reform. However, tobacco firms have limited opportunities to reform their businesses (Skancke et al., 2014). Hence, this might not apply to tobacco firms.

## 8.2 The Implications of Fossil Fuel Exclusions

The analysis of the exclusion of tobacco companies can provide implications for fossil fuels, which currently experience an increasing trend of exclusionary investing. To apply the results of the tobacco analysis, we must address important differences between tobacco stocks and fossil fuel stocks. We consider these differences in Section 8.2.1. Further, we discuss the results of the analysis of coal exclusions. Lastly, we use both analyses to provide implications regarding oil and gas exclusions.

### 8.2.1 Differences between tobacco and fossil fuels

There are several differences between the tobacco industry and the fossil fuel industry in which affect the extent of the direct exclusion effect. First, the tobacco industry imposes a high societal cost that can only be reduced by lowering the demand for tobacco products. The use of fossil fuels also imposes a high societal cost in terms of carbon emissions. However, the cost can be reduced by producing more renewable energy (Skancke et al., 2014). Hence, fossil fuel companies can reform their businesses and thus avoid exclusion by “green” investors in the future (Heinkel et al., 2001).

Second, the tobacco industry has been subject to negative social norms for several decades (Hong & Kacperczyk, 2009). In contrast, the fossil fuels industry has not experienced this extent of negative social norms, implying limited fossil fuel exclusions (Ansar et al., 2013).

Third, the industries have different exposure to the market. The tobacco stocks have a beta around 0.5, whereas the fossil fuel stocks often have a beta around 1 (A. Trinks et al., 2018). Further, the fossil fuels industry accounts for a larger share of the equity market compared to the tobacco industry.

### **8.2.2 The direct effect of coal exclusions**

Contrary to our analysis of tobacco exclusions, there is no significant direct exclusion effect on the cost of equity for coal companies. According to Heinkel et al. (2001), this implies that the current magnitude of investors who exclude coal companies is not sufficient to have an effect on the firms' cost of equity. Hence, the reduced investor base does not limit investors' diversification opportunities and risk-sharing in a way that increases the idiosyncratic risk significantly. Further, the results imply that the "boycott" factor that arises with a restricted investment universe is not significant, i.e. that there is no significant systematic "boycott" premium for coal firms (Luo & Balvers, 2017).

The low share of total AuM excluding coal stocks supports our results (A. Trinks et al., 2018). Thus, the magnitude of coal exclusions must increase to have a significant effect on the cost of equity (Heinkel et al., 2001). Also, A. Trinks et al. (2018) find a significant underperformance of coal stocks on portfolio performance in the period between 2011 and 2016 (during The Fossil Fuel Divestment Campaign period (Arabella Advisors, 2018)).

### **8.2.3 Implications for oil and gas companies**

Following the theory of Heinkel et al. (2001), negative screening of fossil fuel companies needs to be conducted by a sufficient number of investors to have a direct effect on the firm's price and the firm's cost of equity. An increasing exclusion trend of fossil fuel companies might induce such effect in the coming years.

Coal is the most polluting fossil fuel and has thus been the primary focus among many exclusionary investors. However, many investors exclude all fossil fuels, including oil and gas stocks. The exclusion of all fossil fuels is also the aim of the fossil fuel campaign that started in 2011. Therefore, we also discuss possible implications of excluding oil and gas firms.

The magnitude of oil and gas exclusions is low, and the share of "green" investors in these markets is smaller than for coal firms (Ansar et al., 2013; A. Trinks et al., 2018). Ansar et al. (2013) state that the maximum possible capital of fossil fuels to be excluded by large public pension funds or university endowments represent a small pool of funds, relative to the total market capitalization of all fossil fuel companies. Hence, the direct impact on the firms' cost of equity might be limited.

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The limited magnitude of excluded oil and gas stocks might be a consequence of these stocks accounting for a large share of the market (Luo & Balvers, 2017), implying a great loss of diversification for investors when excluding these companies. Also, the relatively new trend of negative social norms towards the industry and the many consumers and businesses who rely on oil and gas firms might limit the exclusion of these firms.

Exclusions of oil and gas companies could potentially have huge implications on the market. Many companies use these energy sources as input and thus rely on the services of the oil and gas firms.<sup>26</sup> With a significant exclusion effect of oil and gas firms, the cost of equity of companies that rely on and correlate with oil and gas firms would also be affected (Luo & Balvers, 2017). Further, due to the oil and gas firms' large share of the market, the market composition would change with a sufficient number of exclusionary investors (Luo & Balvers, 2017). Hence, the effect on the market can potentially be huge and more extensive compared to coal firms' effect on the market.

However, we recognize that these impacts on the market will not happen unless the amount of excluded assets increases notably. This is further supported by the oil and gas companies' ability to transform their business, indicating that the companies can respond to exclusions e.g. by shifting production towards more renewable energy (Heinkel et al., 2001). A transformed business is beneficial if the fixed cost of incorporating the new operations and the return of the new business combined has a smaller cost than the cost of a restricted investor base. Due to the ability to transform, we believe that the oil and gas firms would be proactive and choose this option before the direct effect of exclusion becomes significant.

#### **8.2.4 Sensitivity of the direct exclusion effect on COE**

As stated, the current amount of excluded oil and gas stocks will not have a significant impact on COE unless the amount of excluded assets increases notably. To estimate the theoretical change in a firm's COE due to exclusion, we can apply the model presented by Angel and Rivoli (1997). The model indicates that a firm's cost of equity increases as the share of "green" investors increases. Further, the cost of equity will increase the larger the weight of the firm in the market portfolio, when the investors' risk aversion is high and when the variance of the

<sup>26</sup> Fossil fuels are the primary source of electricity in North America (EIA, 2018).

firm's return due to firm-specific factors increase. We note that the model has limitations, and thus, we apply it only for illustration purposes.

We apply the model to estimate the theoretical exclusion effect on a company by using a fictive US oil company. We use Merton's risk aversion of 2 and a firm-specific risk of 40%. First, we assume a closed economy with only US investors and US firms. In this economy, the market share of the oil company is approximately 0.97%. Second, we assume an open, global economy, including all investors and firms. In such economy, the company's market share is only 0.43%.

Holding all variables constant, we can examine the effect on the cost of equity at different levels of "green" investors. As shown in Figure 10, the cost of equity increases when the share of "green" investors increases. Further, the closed economy has a larger impact on the cost of equity, compared to an open economy. Therefore, this model implies that firms with larger market shares are more affected by exclusionary investing than firms with smaller market shares.

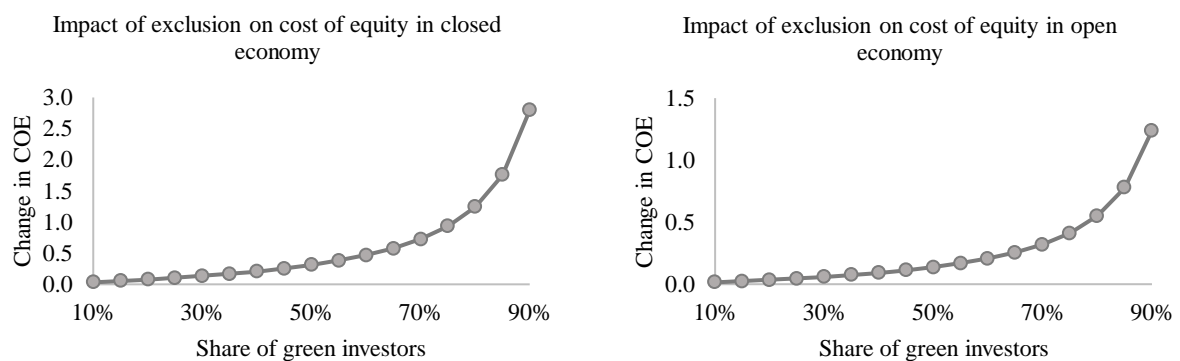


Figure 10: Adoption of the Angel and Rivoli (1997) model

Further, we perform a sensitivity analysis of the oil firm in a closed economy, varying the volatility and the proportion of "green" investors. At a given level of "green" investors, the change in the cost of equity is greater for firms with higher firm-specific risk, implying that riskier companies should expect a more substantial increase in their cost of equity capital.



Table 11: Sensitivity analysis on the change in COE, applying the Angel and Rivoli (1997) model

		Change in cost of equity capital						
		Volatility						
		0.1	0.2	0.3	0.4	0.5	0.6	0.7
Green investors	5 %	0.001	0.004	0.009	0.016	0.026	0.037	0.050
	15 %	0.003	0.014	0.031	0.055	0.086	0.123	0.168
	30 %	0.008	0.033	0.075	0.133	0.208	0.299	0.407
	50 %	0.019	0.078	0.175	0.310	0.485	0.698	0.951
	60 %	0.029	0.116	0.262	0.466	0.728	1.048	1.426
	70 %	0.045	0.181	0.407	0.724	1.132	1.630	2.218

As Table 11 shows, the effect on COE will remain limited unless the share of “green” investors is large. However, this model has limitations and should thus be interpreted with caution.

## 8.2.5 The indirect effect of fossil fuels exclusions

Even though it is possible that the COE of fossil fuel companies can change due to the direct effect of exclusion, we recognize that the probability of a significant direct effect is low. However, even with limited excluded outflows, exclusion might have an indirect effect on COE (Ansar et al., 2013).

Exclusion strategies and divestment campaigns might lead to changes in social norms, which could cause pressure on the firms (e.g. through new regulations) (Ansar et al., 2013). Hence, exclusion strategies can create uncertainty regarding the business or the environment, i.e. increased perceived firm risk. The increased risk for oil and gas companies could, for example, be legal, environmental, political-economic, or regulatory (such as new taxes on carbon use) (Ansar et al., 2013).<sup>27</sup>

Further, exclusion might induce a change in the excluded firms’ operations and investments. As mentioned, the global market capitalization of fossil fuel companies is large (A. Trinks et al., 2018). Hence, the exclusion of fossil fuels could potentially have a large impact on an investor’s financial return and the society if the firms’ cost of equity increase significantly.

<sup>27</sup> In example, the “Clean Power Plan” proposed by the Obama administration in 2014 pressured fossil fuel companies towards the production of greener energy. The plan aimed to reduce carbon emissions by 32% by 2030 and focused on reducing emissions from coal-burning power plants (EPA, 2015).

The possible effect on the cost of equity can motivate the firms to change their operations to become more attractive for investors. These changes in business operations could imply a different cost of equity. Oil and gas companies have already started responding to the increased pressure towards more environmental friendly energy sources. For example, Equinor is expanding its investments in renewable energy projects and BP has rebranded its business into more “green” energy sources to meet “green” investors’ preferences (Ansar et al., 2013).

The current magnitude of exclusion has a negligible direct effect on fossil fuel companies’ cost of equity. Going forward, it is likely that the indirect effect will have the most impact through changes in social norms and pressure on companies towards more “green” operations.

## 8.3 Implications of Exclusions for the Investors

As mentioned, a majority of previous studies have found limited effect of exclusions on portfolio performance (e.g. Diltz (1995) and Skancke (2016)), i.e. that the performance of exclusionary portfolios are not significantly different from other portfolios.

### 8.3.1 Tobacco exclusions

If the goal of exclusionary investing is to increase the cost of equity of tobacco stocks, we find evidence that this is achievable. However, we do not test the effect of excluding tobacco stocks on investors’ portfolio performance, but our analysis provides implications for the investors worth mentioning. P. J. Trinks and Scholtens (2017) find that the effect depends on the value of the excluded stocks’ market capitalization. The tobacco industry represents a small share of the market, implying limited diversification costs for investors when excluding tobacco firms. Thus, exclusionary investing of tobacco stocks might not have a significant effect on investors’ portfolio performance. However, the diversification costs for investors might be high due to tobacco stocks’ low correlation to the market. Whether or not the investors’ portfolio performance will be affected by exclusions depends on these effects. Hence, investors could impose a direct effect on tobacco firms’ COE without affecting the return of their portfolios significantly.

### 8.3.2 Oil and gas exclusions

Exclusion of oil and gas companies could have a different impact on investors’ portfolio performances compared to the exclusion of tobacco companies (Angel and Rivoli (1997)).

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Oil and gas companies represent a larger share of the market portfolio (Ansar et al., 2013). Thus, the diversification constraints could be larger for the investor when excluding the oil and gas companies from the portfolio. Consequently, “neutral” investors would require a higher COE for holding additional oil and gas stocks. Further, A. Trinks et al. (2018) state that the beta of tobacco stocks is close to 0.5, whereas the beta of fossil fuel stocks is about 0.5, implying that the diversification benefits of investing in oil and gas stocks are limited (Luo & Balvers, 2017). Hence, “neutral” investors would require a higher COE. However, these effects might be mitigated if a sufficient number of investors exclude oil and gas companies, changing the composition of the market. Whether the impact on portfolio performance will be larger for oil and gas exclusions compared to tobacco exclusions depends on the extent of these effects.

### **8.3.3 Concluding remarks on exclusionary investing**

#### **A potential diminishing effect of exclusion**

A potential weakness of exclusionary investing might be wealth shifting back to “neutral” investors, diminishing the impact of exclusionary investing. “Neutral” investors will continue to require a higher average return as the share of “green” investors continue to increase. Hence, the difference between the expected returns of “neutral” and “green” investors continues to grow (Heinkel et al., 2001). Also, assuming that “neutral” investors are less concerned about the responsibility of the excluded firms, the effect of exclusionary investing could be further diminished.

#### **Exclusion vs. active ownership**

Investors who are concerned with the ethical and social issues of a company face a choice between different strategies of SRI. An ongoing debate is whether investors should perform exclusionary investing or engage in the company through active ownership.

The exclusion of companies that cannot reform might be an appropriate strategy if the magnitude of investors that exclude is sufficient. However, if one believes that the excluded firms will continue their operations regardless of exclusions, engagement might be more appropriate due to ethical issues.

We assume that tobacco companies cannot reform. Hence, exclusionary investing might be an appropriate strategy, supported by our findings, which imply that exclusions increase the cost

of equity of tobacco firms. In contrast, oil and gas companies have the ability to reform and will likely continue their operations. Additionally, the amount of total excluded assets needs to be substantial to have a direct effect on the firm. Therefore, engagement through active ownership might be a more appropriate strategy.

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## 9. Conclusion

There is a debate regarding the value and the implications of exclusionary investing. We contribute to the literature on exclusionary investing by examining the direct effect on excluded stocks' cost of equity, meaning the financial effect of investors selling the stock. We analyze this by examining tobacco firms, testing our hypothesis: *The direct effect of exclusion has a significant impact on a tobacco firm's cost of equity capital.*

We employ the fixed effects model with a difference-in-difference estimation, in which we examine tobacco firms compared to food firms with similar characteristics. Hence, our approach captures the direct effect of exclusion by testing whether tobacco firms have a higher cost of equity, relative to food firms after exclusion.

Our findings suggest that the exclusion of tobacco firms has a significant impact on the companies' cost of equity. Therefore, exclusionary investing can be an appropriate strategy if the aim is to increase the companies' cost of equity. We explain the significance of the effect through two theoretical frameworks; a market segmentation model (Heinkel et al., 2001; Merton, 1987) and a model for the "boycott" premium (Luo & Balvers, 2017). By excluding tobacco firms, the market becomes segmented, and the stocks' idiosyncratic risks increase due to limited risk-sharing and restricted diversification opportunities. Further, exclusionary investing separates investors into two groups due to unequal preferences. Thus, the CAPM no longer holds, and a systematic risk factor arises, known as the "boycott" factor (Luo & Balvers, 2017). Additionally, the demand for tobacco stocks will be lowered due to exclusion. Hence, "neutral" investors will require an additional premium, i.e. a higher COE, for holding tobacco stocks.

Additionally, we examine the exclusion of fossil fuel firms, which currently experience an increasing trend of exclusionary investors. The coal industry has been the primary focus for exclusions within the fossil fuel industry. We study the exclusion of coal companies relative to carefully chosen comparable companies not excluded by investors. The results indicate that the exclusion of coal firms has no significant direct effect on the companies' cost of equity, suggesting that the amount of excluded assets is not sufficient (Heinkel et al., 2001). Hence, the direct effect of excluding oil and gas companies might be limited. This is further supported by the oil and gas firms' large shares of the market, the many businesses and consumers who rely on oil and gas services, and the low amount of assets currently excluded. However, we

note that if a sufficient number of investors exclude the oil and gas firms in the future, the firms might benefit from reforming their businesses. Thus, exclusionary investing can induce changes in oil and gas firms' operations by increasing the firms' cost of equity.

## 9.1 Possible further research

A further extension of our study could be to examine the exclusion effect on the cost of debt. Ansar et al. (2013) state that if a bank restricts its debt financing of a company, other banks might offer debt if they perceive the expected cash flows of the company as the same. However, with a sufficient number of banks restricting its finances, the firm's perceived risk might increase. Hence, if the largest banks restrict debt financing, the cost of debt could be impacted (Ansar et al., 2013). Further, the cost of debt will have a greater impact when the company is financed by banks in emerging countries, due to a restricted pool of debt in these countries.

Further, a topic of future research could be to investigate the effect of exclusion on the stocks that correlate with the excluded stocks. According to the Luo and Balvers (2017) adoption of Merton (1987) and Fama and French (2007), the COE of the correlated stocks will also change. Hence, it could be of interest to examine whether the COE changes significantly.

Additionally, exclusion of stocks in other markets, such as in Asia, could be examined using a similar research design as presented in our study.

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## 10. Appendix

### 10.1 Implied Cost of Equity Capital

We follow prior research (e.g. Hail and Leuz (2006)) and use two implied cost of equity measures developed by Easton (2004) and Ohlson and Juettner-Nauroth (2005). Each model presents different versions of the dividend discount model. We average these methods to reduce potential forecast bias and measurement error (following e.g. Hail and Leuz (2006)).

The method developed by Easton (2004) is a modified price-earnings growth (PEG) ratio. Equation 6 presents this method.

Equation 6: The Easton (2004) model

$$P_t = \frac{\hat{x}_{t+2} + r * \hat{d}_{t+1} - \hat{x}_{t+1}}{r^2}$$

This model uses the expected dividend per share (DPS) in period t+1 as well as the one-year- and two-year-ahead earnings per share (EPS) forecasts to find the abnormal earnings growth (Hail & Leuz, 2006)<sup>28</sup>.

Further, Equation 7 shows the Ohlson and Juettner-Nauroth (2005) method.

Equation 7: The Ohlson and Juettner-Nauroth (2005) model

$$P_t = \frac{\hat{x}_{t+1}}{r} * \frac{g_{st} + r * \frac{\hat{d}_{t+1}}{\hat{x}_{t+1}} - g_{LT}}{r - g_{LT}}$$

This model also uses the expected DPS in period t+1, along with one-year ahead EPS forecasts (Hail & Leuz, 2006). Also, the model is dependent on short-term and long-term earnings growth. The long-term earnings growth is the expected inflation rate, which equals the one-year ahead realized monthly country-specific inflation rates. The short-term growth rate is the average between the 5-year growth forecasts predicted by analysts and the percentage change in earnings from year t+1 and t+2.

<sup>28</sup> To get a numerical solution, the model is required to have only positive changes in forecasted EPS.

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$P_t$  = the firm's market price at date  $t$

$\hat{x}_{t+1}, \hat{x}_{t+2}$  = expected future EPS for period  $t+1$  and expected future EPS for period  $t+2$

$\hat{d}_{t+1}$  = expected dividend per share for period  $t+1$

$g_{ST}, g_{LT}$  = expected future short-term and long-term growth

$r$  = implied cost of equity capital

As presented, these estimates are highly dependent on analysts' forecasts of future earnings. Since many of the tobacco companies in our sample have few or no analyst coverages, our results would be biased, and we would lose many observations.<sup>29</sup>

## 10.2 OLS Assumptions

The regression models presented in our analyses use the ordinary least squares (OLS) estimation. Therefore, the assumptions for OLS must be taken into consideration to determine a causal relationship between exclusion and the cost of equity capital. Under assumptions one to five (Section 10.2.1 to 10.2.5), the OLS estimator will be the best linear unbiased estimator (BLUE) and will satisfy the Gauss-Markov Theorem, which justifies the use of OLS rather than other estimators (Wooldridge, 2016). However, to interpret the  $t$ -statistics and  $F$  statistics, we present a sixth assumption that must hold (Section 10.2.6).

The six assumptions presented in this section are called the classical linear model (CLM) assumptions for time series (Wooldridge, 2016).

### 10.2.1 Linearity

The linearity assumption defines the multiple linear regression model (Wooldridge, 2016). This assumption states that the regression model is linear in the parameters, i.e. that there is a linear relationship between the control variables and the dependent variable. When the

<sup>29</sup> The median analyst coverage for the tobacco firms in this sample is seven before the exclusion period and two after the exclusion period. In contrast, the median analyst coverage for the coal firms is nine before exclusion and nine after exclusion.

linearity assumption is satisfied, a one-unit change in the independent variable will have the same effect on the dependent variable, regardless of the independent variable's starting value.

This assumption is tested by plotting the model residuals against the fitted values for each variable. A difference between the blue line and the dotted line signals a non-linear relationship between the explanatory variables and the dependent variable (Paruchuri, 2012). As seen, taking the log of BtoM, TotalAssets, and NetIncomeToRevenue improves the relationship the tobacco analysis. We applied the same on the coal analysis (not shown) by taking the log of BtoM, TotalAssets, NetIncomeToRevenue, and the forecast variables.

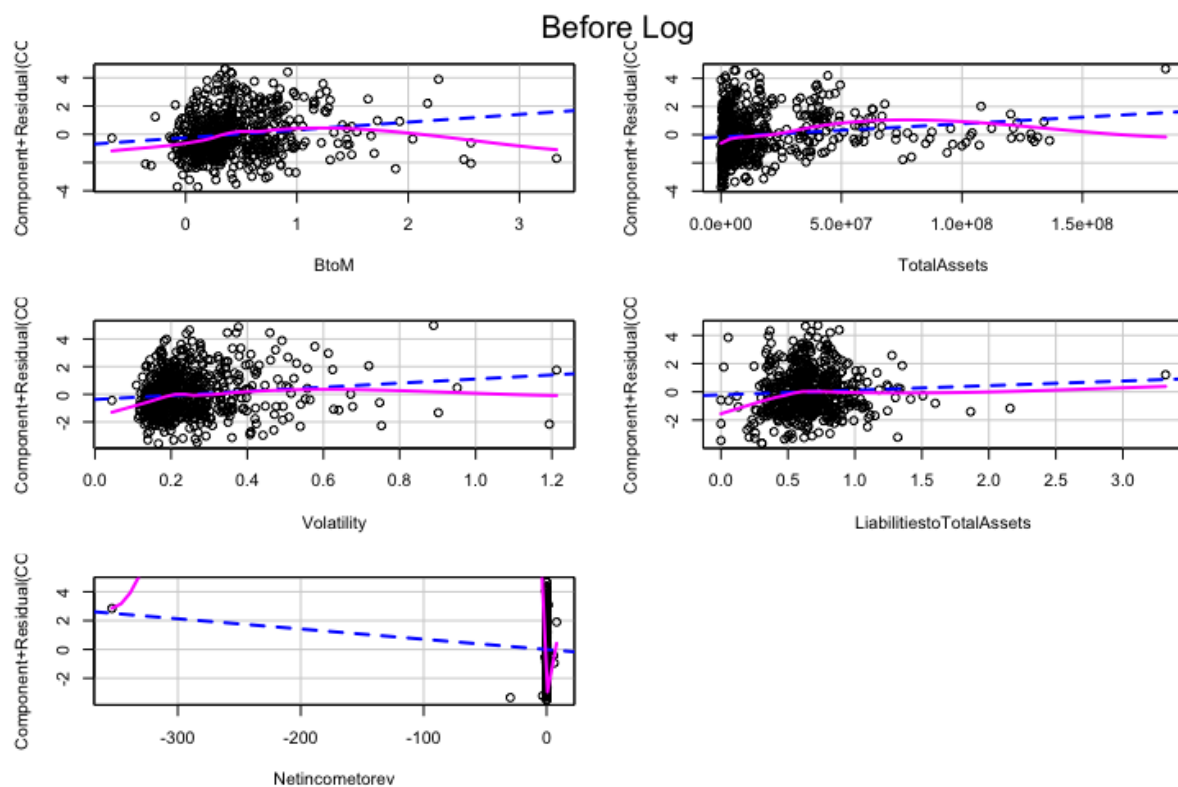


Figure 11: Tobacco firms without log

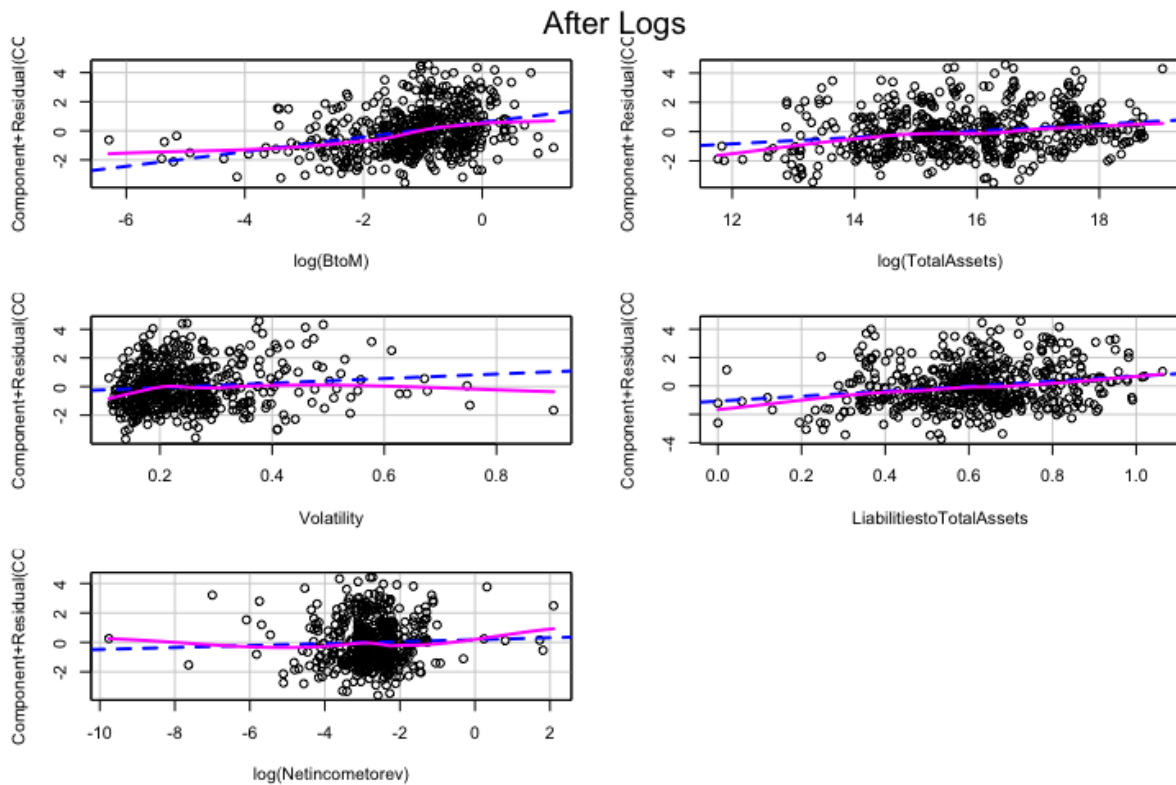


Figure 12: Tobacco firms with the use of log

## 10.2.2 No perfect collinearity

The OLS estimation must assume no perfect correlation between the independent variables (Wooldridge, 2016). Further, no independent variable can be constant. This assumption must hold for the whole sample, i.e. the underlying data. We test the multicollinearity assumption for the tobacco and the coal sample. Neither results show sign that multicollinearity is a problem.

### Multicollinearity: Tobacco analysis

In Table 12, the Pearson correlation coefficients between the variables (COE included) determines if any multicollinearity is present. This table shows that most variables are correlated, however, not to such extent that multicollinearity is a problem. The highest correlation is between the BtoM variable and the LiabilitiesToTotalAssets variable (-49%).<sup>30</sup>

<sup>30</sup> Excluding one of the variables; BtoM or LiabilitiestoTotalAssets, does not change our results presented in Section 5.

Table 12: Pearson correlation coefficients for the tobacco and food sample

Pearson Correlation Coefficients						
	COE	BtoM	TotalAssets	LiabilitiestoTotalAssets	Volatility	Netincometorev
COE	1	0.13	0.10	0.01	0.15	-0.11
BtoM	0.13	1	-0.11	-0.49	0.32	0.11
TotalAssets	0.10	-0.11	1	-0.05	-0.25	0.03
LiabilitiestoTotalAssets	0.01	-0.49	-0.05	1	0.09	-0.43
Volatility	0.15	0.32	-0.25	0.09	1	-0.33
Netincometorev	-0.11	0.11	0.03	-0.43	-0.33	1

Further, Equation 8 presents the VIF function, which examines whether multicollinearity is present.

Equation 8: The VIF function

$$VIF = \frac{1}{1 + R_i^2}$$

As seen in Equation 8, the VIF function for an independent variable is obtained using the R-squared of the regression of all the other independent variables on that exact variable.

Table 13: The VIF function for the tobacco and food sample

VIF Function	
Volatility	1.546
LiabilitiestoTotalAssets	2.335
log(TotalAssets)	1.359
log(BtoM)	2.831
log(Netincometorev)	1.500

The higher the value presented by the VIF function, the higher the collinearity in between the independent variables. As seen in Table 13, the VIF statistics of each independent variable are close to 1, which signals no multicollinearity present (Neter, Wasserman, & Kutner, 1985).<sup>31</sup>

### Multicollinearity: Coal Analysis

In the analysis of coal exclusions, ForecastDeviation, ForecastDispersion, ExpectedInflation, and TotalEmissionstoTotalRevenues are included in some of the model specifications. Table 14 provides Pearson correlation coefficients between the independent variables, along with

<sup>31</sup> High values of the VIF function often range from 5 to 10 (Neter et al., 1985). A value of 1 indicates zero correlation with other variables.



the two COE estimates. Multicollinearity does not seem to be a problem. The VIF function presented in Table 15 confirms these findings.

Table 14: Pearson correlation coefficients for the coal and comparables sample

Correlation Matrix											
	COE	COEImpliedaverage	BtoM	TotalAssets	LiabilitiestoTotalAssets	Volatility	Inflationexpected	ForecastDeviation	ForecastDispersion	TotalEmissionstoRevenues	tIncomeToReven
COE	1	0.39	0.19	-0.29	-0.13	0.56	0.02	0.28	0.20	0.14	-0.16
COEImpliedaverage	0.39	1	0.57	-0.22	-0.20	0.50	0.01	0.66	0.15	0.21	-0.23
BtoM	0.19	0.57	1	-0.06	-0.23	0.40	-0.09	0.50	0.002	0.07	-0.19
TotalAssets	-0.29	-0.22	-0.06	1	0.19	-0.21	-0.03	-0.18	-0.12	-0.21	0.15
LiabilitiestoTotalAssets	-0.13	-0.20	-0.23	0.19	1	-0.08	0.02	-0.20	-0.32	-0.23	-0.13
Volatility	0.56	0.50	0.40	-0.21	-0.08	1	0.14	0.44	0.29	0.03	-0.24
Inflationexpected	0.02	0.01	-0.09	-0.03	0.02	0.14	1	0.01	0.01	0.06	0.04
ForecastDeviation	0.28	0.66	0.50	-0.18	-0.20	0.44	0.01	1	0.11	0.14	-0.37
ForecastDispersion	0.20	0.15	0.002	-0.12	-0.32	0.29	0.01	0.11	1	0.03	0.18
TotalEmissionstoRevenues	0.14	0.21	0.07	-0.21	-0.23	0.03	0.06	0.14	0.03	1	-0.10
NetIncomeToRevenue	-0.16	-0.23	-0.19	0.15	-0.13	-0.24	0.04	-0.37	0.18	-0.10	1

Table 15: The VIF function for the coal and comparables sample

#### VIF Function

log(BtoM)	1.87
log(TotalAssets)	1.33
LiabilitiestoTotalAssets	1.74
Volatility	1.51
log(1 + ForecastDispersion)	1.50
ForecastDeviation	1.42
log(NetIncomeToRevenue)	1.35
TotalEmissionstoRevenues	1.14

### 10.2.3 Zero conditional mean

The error term  $u_{it}$  must have an expected value of zero and must be uncorrelated with any of the explanatory variables (Wooldridge, 2016). For time series, this means that the explanatory variables are contemporaneously exogenous. A violation of this assumption would lead to endogenous explanatory variables and cause biased estimates. This might be the case when omitting important factors that correlate with any of the  $X_{it}$  variables and the dependent variable (Wooldridge, 2016).

The zero conditional mean assumption cannot be tested through a formal test. However, we have addressed several endogeneity issues during our analyses by including different variables that could have an impact on the COE, and that could be correlated with the explanatory

variables (such as new regulations through a variable for net income scaled by revenues and different macro factors through a variable for GDP per capita).

### 10.2.4 Homoskedasticity

The error term  $uit$  is assumed to be homoscedastic, meaning that the errors have the same variance given any value of the independent variables (Wooldridge, 2016). When this is violated, the model exhibits heteroscedasticity. When analyzing panel data, the variation of each unit will likely vary, which may produce heteroskedastic error (Wooldridge, 2016).

#### Test for homoskedasticity

We use the Breusch-Pagan test on each sample to test the homoskedasticity assumption (Torres-Reyna, 2010). The corresponding p-values, as seen in Table 16, are below 0.05 for all samples, meaning that heteroskedasticity is present. We control for this by using Newey-West robust standard errors.

Table 16: Breusch-Pagan test for homoskedasticity

	Breusch-Pagan test		
	Tobacco Analysis Bloomberg COE	Coal Analysis Bloomberg COE	Coal Analysis Implied COE
BP	47.566	54.488	165.95
p-value	4.328e-08	5.551e-09	2.2e-16

### 10.2.5 No serial correlation

Serial correlation occurs when the errors in different periods correlate with each other (Wooldridge, 2016). Such correlation often occurs in the case of panel data as the same units are observed over several years and are not independent of each other.

The Wooldridge/Breusch-Godfrey test for serial correlation in FE-panels is conducted on each data sample, to test whether the data exhibits serial correlation. Table 17 presents the results. The tests provide p-values below 0.05 for all samples, meaning that there are problems with autocorrelation. This problem is accounted for by robust standard errors as well as the analysis on aggregated data presented in Section 7.2.2.

Table 17: Breusch-Godfrey/Wooldridge test for serial correlation

Breusch-Godfrey/Wooldridge test for serial correlation in panel models			
	Tobacco Analysis	Coal Analysis	Coal Analysis
	Bloomberg COE	Bloomberg COE	Implied COE
chisq	94.794	61.96	44.106
p-value	2.2e-16	3.506e-15	3.111e-11

### 10.2.6 Normality

This assumption states that the errors are independent of X and normally distributed (Wooldridge, 2016) and must be satisfied to perform statistical inference about the variance of the OLS estimator. This assumption can be studied through a Q-Q plot.

The Q-Q plots of the residuals presented in Figure 13 show that the distributions seem to follow normality. Some deviation is expected with such small sample and high variation.

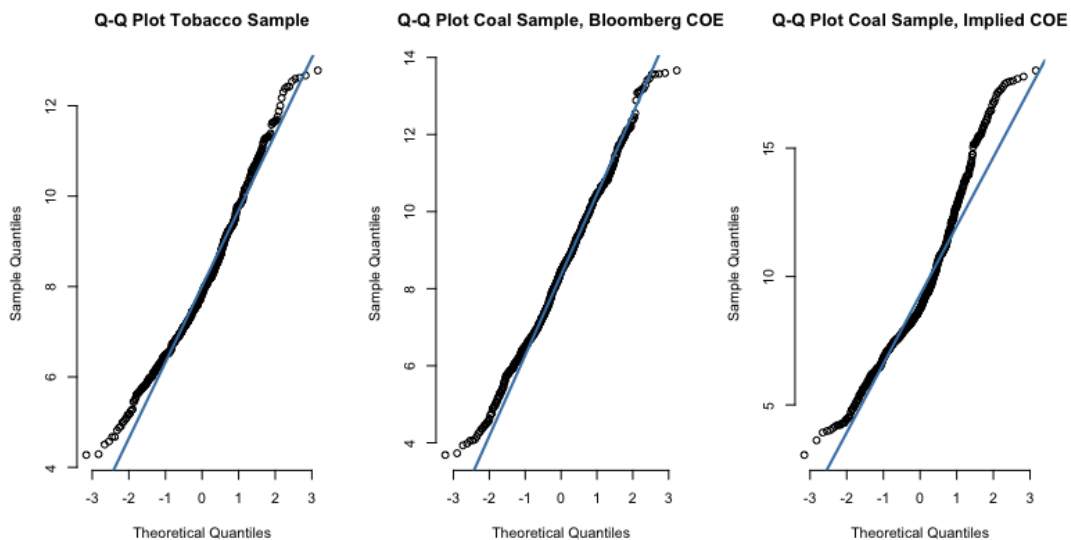


Figure 13: Q-Q plots

## 10.3 Testing for Cross-Sectional Dependence

The Pesaran CD and the Breusch-Pagan LM tests for cross-sectional dependence across errors are conducted for each sample (Torres-Reyna, 2010). Table 18 and Table 19 provide the results. The tests reject the null hypothesis of no cross-sectional dependence. Therefore, it is essential to cluster the standard errors at the cross-sectional level (firm).

Table 18: Breusch-Pagan LM test for cross-sectional dependence

<b>Breusch-Pagan LM test for cross-sectional dependence in panels</b>			
	Tobacco Analysis	Coal Analysis	Coal Analysis
	Bloomberg COE	Bloomberg COE	Implied COE
chisq	1119.4	2409.1	2035.8
p-value	2.2e-16	2.2e-16	2.2e-16

Table 19: Pesaran CD test for cross-sectional dependence

<b>Pesaran CD test for cross-sectional dependence in panels</b>			
	Tobacco Analysis	Coal Analysis	Coal Analysis
	Bloomberg COE	Bloomberg COE	Implied COE
z	-3.6447	-1.6144	-0.77058
p-value	0.0002677	0.106532	0.44133

## 10.4 Correcting for Outliers

Figure 14 presents potential outliers in the cost of equity estimations. The left figure of the coal and comparables sample shows the outliers using the Bloomberg estimates of COE, whereas the right figure shows the outliers using the implied COE estimates. Those observations outside the fences of the boxplots are defined as outliers and are removed.

<sup>32</sup> Even though this p-value is above 5%, the corresponding p-value of the Breusch-Pagan test suggests cross-sectional dependence in the data.

<sup>33</sup> Even though this p-value is above 5%, the corresponding p-value of the Breusch-Pagan test suggests cross-sectional dependence in the data.

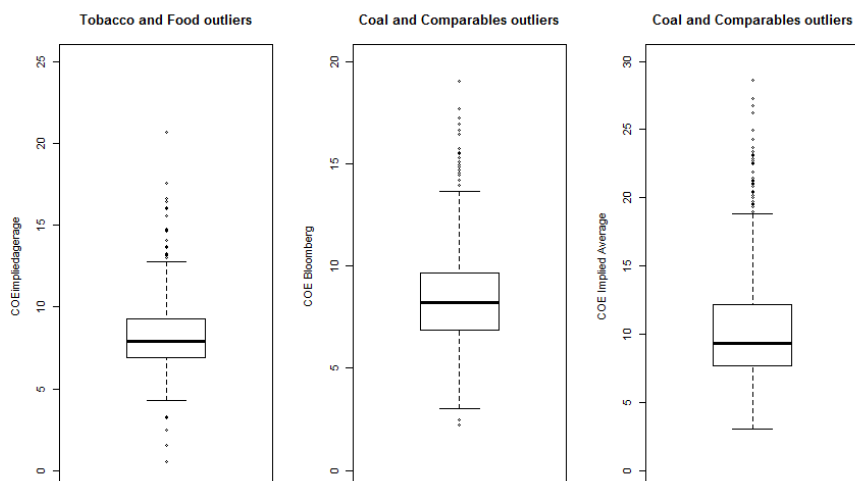


Figure 14: Potential outliers

## 10.5 Comparing Pooled OLS, Random effects and Fixed effects

To choose the best model, we perform several tests on the data.

### FE vs. POLS

We use the F-test to determine whether the FE model or the POLS model is the most efficient (Torres-Reyna, 2010). The tests shown in Table 20 provide p-values below 0.05 for all samples, indicating that FE is the most efficient model.

Table 20: F-test: FE vs. POLS

F-test for twoways effects			
	Tobacco Analysis	Coal Analysis	Coal Analysis
	Bloomberg COE	Bloomberg COE	Implied COE
F	7.2263	11.063	8.5416
p-value	2.2e-16	2.2e-16	2.2e-16

### FE vs. RE

The Hausman test for panel models tests whether the Random Effects (RE) model or the FE model is preferred (Torres-Reyna, 2010). Table 21 provides the results. The p-values are smaller than 0.05 for all samples, indicating that the FE model is the preferred model.

Table 21: Hausman test: FE vs. RE

<b>Hausman Test</b>			
	Tobacco Analysis	Coal Analysis	Coal Analysis
	Bloomberg COE	Bloomberg COE	Implied COE
chisq	16.032	13.773	22.788
p-value	0.006755	0.01712	0.003648

## 10.6 Testing for Two-Ways Effect

We use the build-in PLM-test in R for two-ways effects to test whether or not to control for year fixed effects (Torres-Reyna, 2010). Table 22 provides the results. With p-values below 0.05 for all samples, we can reject the null hypothesis of no significant effects by including yearly fixed effects. Thus, our models should include year fixed effects.

Table 22: PLM-test: Two-ways fixed effects

<b>Lagrange Multiplier Test - time effects (Breusch-Pagan) for unbalanced panels</b>			
	Tobacco Analysis	Coal Analysis	Coal Analysis
	Bloomberg COE	Bloomberg COE	Implied COE
chisq	150.59	1034.3	647.39
p-value	2.2e-16	2.2e-16	2.2e-16

When using the aggregated data in Section 7.1.2, we get a p-value above 0.05, meaning that there is no need to include year fixed effects.

## 10.7 T-test of Parallel Trends Assumption

Table 23: T-test of differences between slopes

<b>T-test of differences in slopes</b>			
	Tobacco Analysis	Coal Analysis	Coal Analysis
	Bloomberg COE	Bloomberg COE	Implied COE
T	0.0134	0.3032	0.2863
p-value	0.9897	0.7686	0.7811

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## 10.8 Other “Sin” Industries not Analyzed

We choose the tobacco industry for this study, mainly due to the tobacco companies’ long history of being classified as “sin”, their overall health concerns, and their inability to reform their businesses without changing their industry specification. However, alcohol, gaming, and weaponry are also popular stocks to exclude (Luo & Balvers, 2017).

We do not introduce weapon stocks because of the classification process. It is challenging to classify defense stocks since most companies in the industry also build commercial passenger airplanes (e.g. (Fabozzi, Ma, & Oliphant, 2008; Hong & Kacperczyk, 2009)). Further, it is not clear how investors define defense. Additionally, we do not introduce gaming and alcohol stocks because of their ability to reform, and because exclusions of these companies are not as common. According to Luo and Balvers (2017), gaming has become more acceptable in the US in recent years, explained by a wave of legalization of casino gaming in the US and a significant reduction of gaming screens made by socially responsible investors.