Corporate social responsibility and financial markets

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Chapter 1

Introduction

On September 13, 1970, the New York Times featured an article by Milton Friedman in which he wrote:

> *"There is one and only one social responsibility of business— to use its resources and engage in activities designed to increase its profits so long as it stays within the rules of the game, which is to say, engages in open and free competition without deception or fraud."*

This credence is well-established in neo-classical economics. It is argued that when competitive corporations maximize profits, production is achieved as efficiently as possible, yielding maximum welfare for society. In the process of profit maximization, business is bounded by consumer demand, production factor scarcity, technological limitations, and legal constraints. Friedman's argument is true, as long as society ensures that the legal constraints are set in a socially optimal fashion. Naturally, a firm should "stay within the rules of the game", but the question is: Does society play a *fair* game? Is society able to set the *optimal* rules?

In Friedman's perfect world, the game is fairly played. In reality, however, some people feel that on occasion society allows for cheating, i.e. legal constraints are sub-optimal. For instance, in 2003, Honduran factory workers were paid $0.15 to make one *Sean John*-brand T-shirt. The same shirt cost its U.S. bulk importer $3.65 and the retail price was $40.00. The question is whether business is "playing a fair game" when multinational enterprises are allowed to shift their production to *sweatshops* in developing countries, countries that often still allow for child labor. However, in defense of the multinational enterprises one can argue that their employees would be even worse off, if these companies were not present. To give another example: even though efforts are made to reduce greenhouse gas emissi-

ons, today many large corporations can costlessly emit carbon-dioxides, while the global society and future generations bear the risks of global warming. The question of what is fair and what is unfair is not easily answered in general. There is a thin line between efficiency and exploitation. It is a difficult task to let laws and regulations draw this line in such a way that the rules of the game are fair.

Why would society fail to set its laws optimally? To thoroughly discuss the literature on optimal regulation is beyond the scope of this thesis, but we give a few explanations. First of all, societal processes are dynamic and legislative bodies now and then take time to catch up with the pace (some call this bureaucracy). For instance, up until the 1980s, asbestos was a very popular material and was used in, but not limited to, plasters and stuccos, fireproofing, pipes, brake pads, shoes, and gaskets. The material is strong, durable, isolating, fire-proof, and cheap. However, in the late 1960s it became clear that asbestos fibers were potentially threatening human health and that the substance can cause a number of serious illnesses. Today, asbestos is banned in most countries, although the actual implementation of the ban was almost 25 years after the negative properties of asbestos were discovered. In the first half of the 20th century, child labor was not uncommon in western Europe— today it is illegal. Society is dynamic; technology progresses, human knowledge increases, welfare grows, and moral attitudes change. Laws change accordingly, but the implementation of regulations lags.[1] Failure to implement a specific law might be a temporary problem, but since in a dynamic society new problems continuously arise, failure of setting laws optimally *in general* is a structural problem.

A second reason for failure of achieving optimal regulation, is that strategic interactions potentially prevent governments from reaching or maintaining a socially optimal agreement (see, e.g. Mäler and de Zeeuw, 1998). For instance, it is internationally recognized that global warming is of major concern, but the global society has not yet reached agreements that will significantly reduce CO_2 emissions. The problem is that when an agreement is reached, the cost associated with CO_2 reductions gives one individual government incentives to break the agreement, without jeopardizing global CO_2 reductions seriously. Such public good issues can be related to the classic *tragedy of the commons* (Hardin, 1968). Provision of a public good suffers from free-rider effects, unless property rights are well defined (Coase,

[1] I appreciate that laws are not behind in general; take for instance the current discussions on human cloning. Policy makers have put this topic on their agendas, while the technique is not available yet.

1960).[2] There are numerous examples of how strategic interactions between firms, governments, and firms and governments might compromise optimal regulation (see Heijnen, 2007). If regulation is not optimal, it often leads to effects which economists label externalities; costs or benefits resulting from an economic transaction that parties "external" to the transaction receive. A typical example of an externality is pollution due to production. A third reason that explains failure of achieving optimal regulation is simply that developing and maintaining legislation is costly, see e.g. Dixit (2004).

"We live in a world where it is more serious to break trade rules than it is to violate human rights," said Warren Allmand, (President of International Center for Human Rights and Democratic Development).[3] Whether or not one agrees that in some instances society fails to implement optimal regulation, the fact is that increased globalization has fueled the public debate on the "fairness of society". Consequently, the debate has led a growing number of corporations to engage in self-regulation (Becchetti et al., 2005; Beltratti, 2005). We increasingly witness voluntary *overcompliance* in terms of environmental and social policies, and an improvement of corporate stakeholder relations in general. A popular label for this type of behavior is "corporate social responsibility". There are several alternative descriptions of corporate social responsibility, such as, corporate citizenship, voluntary overcompliance, self-regulation, internalization of externalities. McWilliams and Siegel (2001), regard corporate social responsibility as a set of actions on the part of a firm that advance the promotion of some social good beyond the immediate interests of the firm and/or shareholders. That is, socially responsible activities of firms are those that exceed compliance with social or environmental regulations. Morrison Paul and Siegel (2006) argue that these are employed to create the perception or reality that these corporations are advancing a social good or goal. There exist many definitions and labels, but the general idea is clear: to do more than just staying within legal boundaries, even if this possibly compromises corporate profits.

For many people it is an attractive idea that "being socially responsible" is the best thing a firm can do. However, there is little literature that thoroughly investigates this from an economic perspective. Attempts have been made to put corporate social responsibility in an economic framework. Baron (2001) links corporate social responsibility to modern political theory and the role of civil society. In this thesis, we try to make the connection between corporate social responsibility and basic

[2] To this extent, trade in CO_2 permits is a theoretically optimal implementation of international agreements, since it assigns property rights to environmental pollution.

[3] Ottawa, March 29, 2001. See http://www.dd-rd.ca.

resource allocation theory and adopt Geoffrey Heal's definition of corporate social responsibility:

> "Corporate social responsibility involves taking actions which reduce the extent of externalized costs or avoid distributional conflicts." (Heal, 2005, p. 393.)

This thesis tries to fill some gaps in the literature on the economics of corporate social responsibility. The focus of this thesis is not so much on why and how firms behave socially responsible. We take societal preferences and public debates as given. We are interested in the consequences of corporate social responsibility for corporate financial performance, the real implications and the relation to optimal allocation of production factors. We question whether Friedman's argument is insensitive to possible discrepancies between regulations and social preferences, such as externalities. We also try to answer whether socially responsible behavior is actually valued by economic agents. Furthermore, we are interested in how corporate social responsibility relates to increased globalization. Since shareholders play such an important role in corporate policy and corporate governance, the emphasis is on the relation of corporate social responsibility with financial markets.

1.1 Corporate social responsibility

Although firm behavior is taken as a given throughout the thesis, in this section we give a few explanations for why firms might engage in corporate social responsibility. This list is loosely based on Heal (2005).

Preempting future regulations

Regulations are not static and firms might have strategic reasons to preempt the introduction of new government regulation. In a model of voluntary pollution control, Maxwell et al. (2000) discuss how an increased threat of government regulation induces firms to voluntary reduce emissions before the new laws are actually passed. In their model, they show that without voluntary control, the new regulation laws will potentially be more strict. Firms therefore have an incentive to self-regulate. Analogue to staying ahead of the competition, firms might want to stay ahead of the government.

Liability management

Liability management is an important aspect of corporate governance. In this context, corporate social responsibility can be seen as a way to avoid environmental scandals, consumer boycotts, or law suits. In 1995, a media campaign by Greenpeace against the disposal of the oil storage tanker Brent Spar, caused a huge environmental scandal. Although Royal Dutch Shell had carried out an environmental impact assessment in full accordance with existing legislation, and firmly believed that their actions were in the best interests of the environment, they had severely underestimated the strength of public opinion. Since then, Shell has been one of the pioneering companies to engage in corporate social responsibility, adopting the popular slogan "People, Planet and Profit". Related to such scandals are consumer boycotts. Friedman (1985, 1999) reports that consumers start boycotts more and more frequently. One of the reasons for consumer boycotts is dissatisfaction with corporate policy after receiving information on how goods are produced. Finally, law suits such as those against the tobacco industry have shown that scandals do not only hurt brand equity, but can induce large costs in the form of penalties.

Vertical product differentiation

In marketing, product differentiation refers to the alteration of a product to make it more attractive to the target market. Vertical product differentiation is most often associated with producing similar goods with distinct qualities. Bjørner et al. (2004) show that a sufficiently large group of consumers is willing to pay a bit extra for a product, if it has been produced in an environmental friendly way. Also, the market for "fair trade" goods is expanding. Importers of these goods certify that producers, often from developing countries, are given a "fair" wage. This type of demand creates a niche market. To this extent, corporate social responsibility can be a form of vertical product differentiation.

Improving stakeholder relationships

Engaging in corporate social responsibility can also be motivated to create an improvement in human relations and employee productivity. For instance, the theory of compensating wage differentials (see e.g. Rosen, 1974) implies that improved labor conditions can reduce employee costs. This theory states that in equilibrium employees are willing to accept a lower wage in exchange for e.g. better safety conditions. Moreover, working for a "responsible" company can exhibit positive

externalities in the form of increased productivity, as employees might be better motivated to do their job. Furthermore, good stakeholder relationships can serve as "social credit" - thereby facilitating business operations.

Lowering the cost of capital

Related to social responsibility is socially responsible investment. In 2003, nearly one out of every eight dollars under professional management was subject to some form of social or environmental screening. Some shareholders do not merely care about cash flows, but also about how these cash-flows are generated. Rating agencies like Kinder Lyndenburg Domini (KLD) and Ethical Investment Research Service (EIRIS) have come up with large lists of issues they consider when assessing corporate social responsibility. For example, KLD analyzes charitable giving, relations with indigenous people, the compensation of top management, employment of women, minorities and disabled, the retirement benefit program, the firms liabilities for hazardous waste, use of recycled materials and alternative fuels, etc. (See Mattingly and Berman, 2006). How well a company scores on these issues is then taken into account when shareholders select their portfolio. By limiting the set of available investment opportunities, socially responsible investors are implicitly willing to accept a lower rate of return.

Intrinsic motivation

Finally, managers might have their own moral obligations against certain ways of doing business. A fairly well-known example of such a manager is Ray Anderson, chairman of Interface, a manufacturer of modular carpet for commercial and residential applications. He is known for his progressive stance on corporate social responsibility and sustainability. Since 1995, he has reduced Interface's waste by a third, and plans to make the company sustainable by 2020. Anderson radically changed his way of doing business in 1994 after reading "The Ecology of Commerce" by Paul Hawken.

1.2 The economics of corporate social responsibility

Engaging in corporate social responsibility implies that firms restrain their own conduct, i.e. they limit their set of production possibilities. This implies that the benefits of corporate social responsibility come at a cost. In an economic equilibrium,

the benefits should at least outweigh the costs. From the previous section we can deduce that the economic rationale of engaging in corporate social responsibility boils down to identifying who reaps the benefits of socially responsible behavior and who is willing to bear the associated cost. The costs are usually more easily identified and measured compared to the benefits, though.

For instance, if corporate social responsibility is motivated through vertical product differentiation, consumers bear the costs by paying a higher price. If corporate social responsibility is motived through socially responsible investment, than the investors are bearing the costs through reduced returns. Such indirect payments can be linked to *hedonic* price mechanisms, i.e. the price of a product can be split up in a sum of payments for various characteristics of the product. Note that because of altruism, it does not always have to be the case that the agent who receives the benefits also "pays" for corporate social responsibility. If corporate social responsibility is motivated in light of improving employee relationships, employees might bear the costs in terms of a lower wage, but it could also be the "fair trade" consumers or socially responsible investors that are bearing the costs.

In this thesis, we focus on the economics of corporate social responsibility. We try to answer questions such as whether investors bear the cost of corporate social responsibility, are hedonistic price mechanisms associated with corporate social responsibility able to optimally allocate resources, what are the consequences of socially responsible behavior for financial performance, how corporate social responsibility affects location decisions, etcetera. We are interested in the implications of corporate social responsibility for the real economy and the relation to optimal allocation. The remainder of this chapter presents an outline of the thesis.

1.3 Outline of this book

First, in chapter 2, we describe the mixed findings in the empirical literature on the relation between corporate social responsibility and financial performance. Economic theory suggests that corporate social responsibility comes at a cost. This means that, in theory, corporate social responsibility should negatively affect a firm's financial performance, certainly not positive. Even if consumers, employees or stakeholders other than investors fully bear the associated cost, socially responsible firms can only do at least as good as their "irresponsible" peers. Moreover, who would want to invest in a heavily polluting firm with low returns? So an economic equilibrium suggests a trade-off between corporate social responsibility and

financial performance. However, a huge strand of empirical work suggests that this is untrue, and in fact, many studies claim that corporate social responsibility is associated with superior financial performance (see Margolis and Walsh, 2001; Orlitzky et al., 2003). These survey articles show that the amount of empirical work on the relation between corporate social responsibility and financial performance is overwhelming, with a lot of conflicting conclusions. What can explain these mixed observations? Although the relation has been studied intensively and management literature provides some insights, a satisfactory economic theory lacks. Therefore, we analyze the relation between corporate social responsibility and financial performance using a Diamond (1967)-like general equilibrium stock market model. We find that the presumed conflicting results are in fact paradoxical. Gained with new insights we evaluate the existing empirical literature in light of our model and find that the empirical results on the relation between corporate social responsibility and financial performance are in fact very aligned. As such, chapter 2 can be viewed as a road map for interpreting the empirical literature.

In chapter 2 we also show that socially responsible investment can drive firms to self-regulation that leads to the socially optimal allocation. This is in line with the argument made by Jensen (2002) that firms should have one goal and that is to maximize its value and not simply maximize pure profits. However, if an investor disagrees with corporate policy, he can choose to sell his share (exit) or to try to change firm policy at shareholder meetings (voice). Unless there is some form of coordination, the small individual investor acknowledges that he cannot change firm behavior on its own and will prefer the "exit" strategy over "voice". Thus, a socially responsible investor will simply invest in companies that adopt policies in line with his preferences. Therefore, even if negative externalities are incorporated in the firm value, as long as the company does not go bankrupt and makes a positive profit, firm shares are priced accordingly, and nothing precludes a firm from behaving "irresponsible". In that sense, corporate governance of corporate social responsibility might be problematic - firms can always rely on internal funds to finance new projects and hence do not need approval of financiers. So it appears that the impact of the shareholders on corporate social responsibility is rather limited.

Scholtens (2006) discusses the potential impact of the credit channel on corporate social responsibility. Although equity financing can in principle drive socially responsible behavior, in practice, equity financing is only a small percentage of total new funding. Internal financing and bank loans are far more popular methods of raising funds. Bank loans are dominating external financing in the worlds

major economies (see e.g. Corbett and Jenkinson, 1994), so if banks have some form of social or environmental screening when financing projects, it is potentially a much more effective tool to ensure that projects are conducted in a socially responsible way. Chapter 3 goes into this issue by analyzing the performance of banks that adopted the Equator Principles. The Equator Principles are designed to assure sustainable development in project finance. We are interested whether the social, ethical, and environmental policies of the non-adopters significantly differ from the banks that did adopt the Equator Principles. We are also interested in differences in other bank characteristics between the adopters and non-adopters, such as financial performance, structure, and size. With an event study, we try to find out how shareholders value the adoption of the Equator Principles.

In chapter 4, we link corporate social responsibility to sustainable development and analyze the role for financial markets. As pointed out by John and Pecchenino (1994), if agents are shortlived and the environment is long-lived, this creates an intergenerational externality. Generally, when agents are short-lived, society acts myopic, i.e. they do not account for long-term effects of pollution. Future generations are then forced to bear the costs of the current generation. Intergenerational externalities associated with conservation of the environment are usually tackled by fiscal policy. Alternatively, socially responsible investment funds create a role for the stock market to deal with environmental externalities. We analyze the role of the stock market in a Diamond (1965) type overlapping generations model, in which agents choose between investing in "clean" bonds or "polluting" firms. We are interested the long-term prospects of the real economy.

In chapter 5 we try to find out whether developing countries have comparative advantages in terms of regulations and link this to corporate social responsibility of multinational enterprises. We use firm level data on large multinational enterprises to test whether firms with relatively low environmental standards are more often located in countries that are poor, corrupt or have weak environmental regulations. In a sense, we test the Pollution Haven Hypothesis, which states that Multinational Enterprises are transferring their dirty operations to countries with weak environmental regulation (see e.g. Mani and Wheeler, 1997). In this context, we specifically try to find out whether socially responsible multinational enterprises avoid locating their operations in countries with weak environmental regulation. Finally, in chapter 6, we conclude, give policy recommendations, and present directions for future research.

Chapter 2

Corporate Social Responsibility and Financial Performance

2.1 Introduction

The relationship between corporate social responsibility and corporate financial performance has been studied intensively with mixed results. In a survey of 95 empirical studies conducted between 1972-2001, Margolis and Walsh (2001, p.10), report that: "When treated as an independent variable, corporate social performance is found to have a positive relationship to financial performance in 42 studies (53%), no relationship in 19 studies (24%), a negative relationship in 4 studies (5%), and a mixed relationship in 15 studies (19%)." In general, when the empirical literature assesses the link between social responsibility and financial performance the conclusion is that the evidence is mixed. We show that this confusion is created by a paradox that is due to differences in the behavior of distinct financial performance measures.

There exist many definitions and views[1] of corporate social responsibility. However, far fewer attempts have been made to analyze corporate social responsibility in an economic framework. In this chapter, we link corporate social responsibility to basic resource allocation theory, and adopt the definition of Heal (2005, p.393): "corporate social responsibility involves taking actions which reduce the extent of externalized costs or avoid distributional conflicts". We formalize this concept in an

This chapter is an adapted version of Dam (2006a)

[1] See for definitions and views on corporate social responsibility, for example, McGuire et al. (1988); Caroll (1999); Baron (2001); McWilliams and Siegel (2001); Heal (2005); McWilliams et al. (2006); Morrison Paul and Siegel (2006).

economic model to analyze the relationship of social responsibility with financial performance.

When the relationship between social responsibility and financial performance is examined, it is often implicitly assumed that financial performance measures can be used interchangeably. Indeed, without externalities, most financial performance measures can be expected to generate similar conclusions. With externalities, however, changes in financial performance measures must be interpreted differently. For example, the internalization of externalized costs has a strictly negative effect on accounting profits. Lower profits have a negative effect on the stock market value of the firm. Yet, if the internalization of external effects is valued by (socially responsible) stockholders, there is also a positive effect on stock market value. Consequently, accounting profit and stock market prices cannot be expected to change in a similar way. Partial equilibrium analysis cannot reveal these opposing effects. In this type of analysis, the financial return process and the generation of external effects are exogenous.[2] Therefore, we formulate an economic model that links socially responsible investment and corporate social responsibility in a general equilibrium framework. Our model illustrates that when externalities are internalized, various financial performance measures capture different effects, which may then yield paradoxical findings.

We introduce a Diamond (1967)-like general equilibrium stock market model with both heterogeneous consumers and heterogeneous producers. We assume that besides production of market-traded goods, firms generate an externality, for example environmental damage. The traditional way of dealing with externalities is through some form of intervention, e.g. imposing a Pigouvian tax on the generator of the externality (Pigou, 1920; Baumol, 1972). In contrast, socially responsible firms internalize the externalities voluntarily. Such constrained business conduct implies a cost. However, there are also potential benefits to corporate social responsibility, since some stakeholders appreciate socially responsible behavior. Consumers might be willing to pay a higher price for "green" products, or employees might be willing to accept a lower wage in exchange for "safer" working conditions. These are examples of hedonic pricing mechanisms (see Rosen, 1974). When consumers and/or employees fully bear the costs of corporate social responsibility, there are no consequences for financial performance in a competitive equilibrium.

[2] The model by (Heinkel et al., 2001) with *green screening* in the portfolio selection process is worth mentioning here. This model is similar to the asymmetric information model by Merton (1987), where "screening" is due to the fact that some investors do not know about the existence of certain securities. However, these studies analyze a partial equilibrium model and therefore focus on (socially responsible) investing.

Hence, to study potential differences in financial performance, we only need to consider the shareholders' hedonic pricing mechanism associated with corporate social responsibility, namely socially responsible investment.

In 2005, about one out of every ten dollars under professional management in the United States was involved in socially responsible investing.[3] Socially responsible investors acknowledge that, as owners of the firm, they are also responsible for the generation of the externality. Effectively, such investors view the externality as their property, which affects their demand for shares. Consequently, corporate social responsibility has an effect on the market value of the firm. We find that a social planner's solution coincides with the competitive stock market allocation, given that firms maximize market value. This finding can be related to the argument made by Coase (1960), that externalities can be resolved when property rights are well-defined. The result is also in accordance with the basic argument made by Jensen (2002), that the single objective of a firm should be to maximize its market value. Maximizing value is not the same as maximizing profits and this result explains many of the various empirical findings of studies on the relationship between social responsibility and financial performance.

We re-evaluate the existing empirical literature of the last three decades. Three measures of financial performance are commonly used: 1. the Market-to-Book ratio; 2. accounting profit ratios, such as Return on Assets; 3. stock market returns. We observe which financial performance measure is used in 68 empirical studies. We group the studies accordingly and investigate the observed relationship between financial performance and corporate social responsibility. We find that the empirical results are in line with the predictions of our general equilibrium model. In addition, in light of our findings, the existing empirical evidence is no longer mixed.

The remainder of this chapter is organized as follows. In the next section we present the model. We derive the socially optimal allocation and introduce financial markets. We compare the market equilibrium with the socially optimal solution. In Section 2.3 we examine the consequences of socially responsible behavior for three different financial performance measures. In Section 2.4 we relate our results to the existing empirical literature. Finally, we summarize and conclude in Section 2.5.

[3] Social Investment Forum, 2005 Report on Socially Responsible Investing Trends in the United States.

2.2 The model

The basic set-up is the general equilibrium stock market model of Diamond (1967). We consider n firms and we assume that the production by firm i can be written as a decomposable function of capital intensity k_i and a random vector θ reflecting the state of nature, as in Diamond (1967). The output of firm i when state θ occurs is given by:

$$y_i(k_i, \theta) = g_i(\theta) f_i(k_i), \tag{2.1}$$

with $f_i'(k_i) > 0$, $f_i''(k_i) < 0$. We assume that $f_i(k_i)$ is homogeneous of degree α_i with respect to k_i. Modeled as a decomposable production function, output is scaled by the state of nature, but output patterns are not affected by different choices of inputs. The firm also generates an economic bad, labeled social damage D^i, which we may think of as environmental pollution. For simplicity, but without losing the general argument, we assume it is proportional to $f(\cdot)$:

$$D^i = D^i(f_i(k_i)) = D_i f_i(k_i). \tag{2.2}$$

Note that D^i is total social damage and D_i is damage proportional to expected production. Social damage D^i is produced with certainty, so it is state independent.[4] It is a quite natural assumption that capital intensity is related to environmental damage. One can also give an alternative interpretation to Eq. (2.2) in terms of *social* damage to employees. If a firm hires more employees, it can reduce the work load per employee and therefore work-related stress, so that more men on the job increases health and safety conditions.[5] A larger number of employees reduces capital intensity so that there is a correlation between total social damage and capital intensity. We assume that each firm produces the same good and the same bad. This perfect substitutability allows us to interpret goods as cash flows.

There are m consumers and consumer j has individual preferences for the good and the bad which are represented by a utility function $U^j(c_j, d_j)$, where c_j is consumption and d_j is damage due to production, $U^j_c = \frac{\partial U^j}{\partial c_j} > 0, U^j_{cc} = \frac{\partial^2 U^j}{\partial c_j^2} < 0, U^j_d =$

[4] Adding uncertainty to the amount of generated damage requires keeping account of several covariances and variances to calculate the aggregate risk associated with a certain investment, but does not alter the core of the analysis.

[5] In a market equilibrium, the dual equivalent of a reduced workload can be interpreted as a "fair wage"

$\frac{\partial U^j}{\partial d_j} < 0, U^j_{dd} = \frac{\partial^2 U^j}{\partial d_j^2} < 0$. A consumer wants to maximize expected utility:

$$V^j = E[U^j(c_j, d_j)]. \tag{2.3}$$

We make some restrictive assumptions on technology and preferences, which do not influence the results, but allow for explicit solutions and expositional convenience. We assume constant absolute risk aversion (CARA) preferences and a constant marginal rate of substitution between consumption and damage. We assume $g_i(\theta) \sim \mathcal{N}(1, \sigma_i^2)$ and we consider the simple case where covariances between the $g_i(\theta)$'s equal zero.[6]

There are some intriguing issues in modeling preferences over social damage which arise in this way. For example, the environment is a public good, which means that the relationship between private and public consumption is not one-to-one. In addition, the generated social damage need not be a physical product. In order to avoid blurring the analysis with free-rider effects, underprovision, or other secondary problems related to externalities, we treat the bad as a divisible, privately owned product. Alternatively, we can simply interpret the bad component as disutility that consumers get from consumption of a good that is produced in a damaging manner. This approach is similar to models of vertical differentiation, where goods have a quality dimension (see, for instance, Tirole, 1988, p.296-298).

In the next section, we first derive the socially optimal allocation which serves as a benchmark. Next, in section 2.2.2, we calculate the stock market equilibrium.

2.2.1 A centrally planned economy

We examine a centrally planned economy, in which a social planner tries to find a Pareto optimal allocation in terms of expected utility V_j. As in Diamond (1967) the planner has full control over the allocation of the production factors, but has limited control over the allocation of output. Hence, we consider a social planner with somewhat limited powers. The reason is that a planner with full control can in principle determine an allocation identical to that which is achieved by a competitive economy with a complete set of contingent commodity markets (see Arrow and Debreu, 1954). In contrast, we look at a limited set of markets; we do not allow for insurance markets, etc. We therefore assume that the cost elements that

[6] The effects of covariances on prices and portfolio selection are well known and do not affect our analysis qualitatively. Generally, covariances play an important role in asset pricing, but for our purpose we only require a risk premium. See, for example, Cochrane (2001).

restrict the set of markets also limit a social planner in the same way. Accordingly, we choose the planner's powers in such a way that the competitive economy with a stock market can *in principle* generate the same allocation as the social planner. More precisely, the planner has to come up with a distribution of production before the state of nature is known, so instructions are given to firms before production is completed. Firm i is instructed to deliver a fraction β_{ij} of its output to individual j, independent of the state of nature. This implies that the total consumption and damage of individual j is equal to:

$$c_j = \sum_{i=1}^{n} \beta_{ij} y_i(k_i, \theta), \tag{2.4}$$

$$d_j = \sum_{i=1}^{n} \beta_{ij} D_i f_i(k_i). \tag{2.5}$$

Total consumption should equal total output. This gives a restriction on the β_{ij}'s:

$$\sum_{j=1}^{m} \beta_{ij} = 1. \tag{2.6}$$

We impose a constraint on the available capital:

$$\sum_{i=1}^{n} k_i = \bar{k}. \tag{2.7}$$

A Pareto optimal allocation is then found by maximizing the utility of the first consumer $E[U^1(c_1, d_1)]$ subject to $m-1$ constraints on the expected utility of the other consumers $E[U^j(c_j, d_j)] = \bar{V}^j$, where the $\bar{V}_j$'s are reservation levels of expected utility of consumers $j = 2, .., m$. We derive a simple allocation rule:

$$\frac{f_1'(k_1)}{f_i'(k_i)} = \frac{E[U_c^1 g_i(\theta)] + D_i E[U_d^1]}{E[U_c^1 g_1(\theta)] + D_1 E[U_d^1]}, i = 2, 3, .., n. \tag{2.8}$$

(For the derivation see the Appendix.) This expression equates the marginal rate of transformation with the expected marginal rates of substitution. This result is similar to Diamond (1967). We see that the marginal rates of substitution are simply adjusted for social damage.

2.2.2 Stock market economy

We introduce stocks, bonds, and production factor markets. Firms hire production factors and reward these with payments independent of the state of nature, while stockholders are the residual claimants. The internalization of externalized costs does not necessarily require socially responsible investors. There might be other stakeholders that value socially responsible behavior. The subsequent analysis of corporate behavior will be similar to a setting with responsible investment if we consider consumers that are willing to pay more for "green" products or employees that are willing to receive a lower wage for better working conditions instead. Corporate social responsibility can induce vertical product differentiation in the consumer good market (see, e.g. Heal, 2003; Nyborg et al., 2006) and create compensating wage differentials in the labor market, which can be seen as hedonic pricing mechanisms (See Rosen, 1974). If the cost of corporate social responsibility is channeled through either the final goods market and/or the labor market, there are no consequences for financial performance in a competitive equilibrium. Since we are interested in potential differences in financial performance, the rest of this analysis considers a hedonic pricing mechanism in the stock market in the form of socially responsible investing.

We first describe the portfolio selection process of consumers. Then we introduce two types of corporate behavior and characterize the market equilibrium. In section 2.3 we argue that these corporate goals can be linked to social responsibility. We study the implications of the two types of corporate behavior for three widely used financial performance measures, namely the Market-to-Book ratio, Return on Assets, and stock market returns.

Portfolio selection

A consumer has initial wealth W_j, which consists of initial shareholdings and production factors. Assets are indexed by $i = 1, ..., n$ and generate payoffs R_i and damage D^i. The consumer receives these cash and pollution flows in proportion to his shareholdings in firm i. Asset i can be bought at price p_i. Consumers can also buy bonds and the price of a bond is the numeraire. One unit of a bond is a commitment to pay a fixed amount of r units of consumption. As such, this asset is risk-free and non-polluting. The consumer receives fixed payments both for his initial inputs and for the amount of bonds he holds. Let b_j be the total amount of bonds plus the real capital endowments of consumer j. An investor chooses a portfolio to maximize expected utility:

$$\max_{\omega_{ij}} E[U^j(c_j, d_j)]$$

subject to

$$\begin{aligned} c_j &= rb_j + \sum_{i=1}^{n} \omega_{ij} R_i, \\ d_j &= \sum_{i=1}^{n} \omega_{ij} D^i, \\ W_j &= b_j + \sum_{i=1}^{n} \omega_{ij} p_i, \end{aligned}$$

where ω_{ij} is the number of shares consumer j holds in firm i, and the last equation is the budget constraint. With normally distributed payoffs, the solution to this problem takes the form of a pricing equation:

$$p_i = \frac{E[R_i]}{r} - \frac{1}{r}\left(\delta \text{cov}[c_j, R_i] + \lambda_j D^i\right), \tag{2.9}$$

where $\delta = -\frac{E[U^j_{cc}]}{E[U^j_c]}$ is the coefficient of absolute risk aversion, and $\lambda_j = -\frac{E[U^j_d]}{E[U^j_c]}$ the implicit subjective conversion price, or the subjective marginal rate of substitution, of social damage to consumption of consumer j (for a derivation see the appendix). We can express Eq. (2.9) in returns and rearrange to find a familiar form:

$$\frac{E[R_i]}{p_i} = r + \frac{\lambda_j}{p_i} D^i + \delta \text{cov}[c_j, \frac{R_i}{p_i}]. \tag{2.10}$$

This equation is a modified Capital Asset Pricing Model (CAPM) equation, with a term added to the intercept which can be interpreted as a "social damage premium". We can also interpret the equation as a two-factor model. With social damage, an asset's return, and specifically Jensen's alpha, depends on other characteristics than financial risk. In the specific context of financial markets, we can give a general interpretation to these non-financial characteristics: D^i represents any liability or negatively valued characteristics of the firm, or any subjective ethical concerns of investors, that cannot be directly observed in financial statements. For instance, shareholders might want the firm to avoid potential environmental scandals or

consumer boycotts.[7]

Let $\mu_i = E[R_i]$ and $\sigma^2_{R_i} = \text{Var}[R_i]$. With CARA preferences and a constant marginal rate of substitution between consumption and damage the pricing equation for consumer j , Eq. (2.9),becomes:

$$p_i = \frac{1}{r}[\mu_i - \delta\omega_{ij}\sigma^2_{R_i} - \lambda_j D^i], \tag{2.11}$$

which can be inverted into a demand function for shares:

$$\omega_{ij} = [\mu_i - p_i r - \lambda_j D^i]\frac{1}{\sigma^2_{R_i}\delta}. \tag{2.12}$$

A consumer with a stronger preference for environmental quality (high λ_j) will hold less of the share if the firm pollutes more. Furthermore, greater risk lowers demand proportional to the risk aversion of investors.

Define $\bar{\lambda} = (1/m)\sum_{j=1}^{m}\lambda_j$ as the average rate of substitution between consumption and damage and normalize the number of shares and consumers to one. In equilibrium the stock market value M_i of firm i is:

$$M_i = p_i = \frac{1}{r}[\mu_i - \delta{\sigma_{R_i}}^2 - \bar{\lambda}D^i]. \tag{2.13}$$

This result is related to the partial equilibrium models by Heinkel et al. (2001) and Merton (1987) in the special case of no shortselling. If shortselling is not allowed, the demand for shares, Eq. (2.12), cannot become negative. Then, for very polluting firms (i.e. high D^i), Eq. (2.12) is a binding constraint for some j. In this case environmental screening takes place, since some stocks are omitted from the portfolio. If shortselling is not allowed and we have a dichotomous distribution of consumers' preferences (consumers with either a high λ_j or $\lambda_j = 0$), we get the model with environmental screening of Heinkel et al. (2001). Similarly, we have the Merton model of incomplete information if we interpret damage D^i as the "shadow cost of not knowing about security i" (Merton, 1987, p. 491). Both environmental screening and asymmetric information lower the market value of polluting and "unknown" firms.[8]

[7] An example of how consumer boycotts can drive firms to engage in corporate social responsibility in a symmetric information equilibrium is given by Innes (2006).

[8] In our model, we include shortselling since we want to obtain an explicit expression for p_i without specifying the functional form of λ_j. As in the case of no shortselling, higher environmental damage (weakly) lowers the market value of the firm when shortselling is allowed. Therefore, the choice of whether or not to allow for shortselling has no qualitative consequences for the comparative static effects.

Corporate behavior

The firm rewards production factors with r, irrespective of the state of nature. Hence, this payment is equivalent to a risk-free rate. Profits are given by:

$$R_i = g_i(\theta) f_i(k_i) - r k_i. \tag{2.14}$$

Define the market value of the firm as the stock market value plus the capital stock, $M_i + k_i$. Expected profits and the variance of profits are:

$$\mu_i = E[R_i] = f_i(k_i) - r k_i, \tag{2.15}$$

$$\sigma_{R_i}{}^2 = \text{Var}[R_i] = \sigma_i^2 f_i^2(k_i). \tag{2.16}$$

The firm can either maximize profits or maximize market value. [9]

Market Equilibrium

We now highlight the distinction between value maximization and profit maximization which our model generates. Using Eq. (2.2), Eq. (2.13), and Eq. (2.15)-(2.16) we find the value of the firm in equilibrium as:

$$\begin{aligned} M_i + k_i &= \tfrac{1}{r}[f_i(k_i) - r k_i - \delta \sigma_i^2 f_i^2(k_i) - \bar{\lambda} D_i f_i(k_i)] + k_i \\ &= \tfrac{1}{r}[f_i(k_i) - \delta \sigma_i^2 f_i^2(k_i) - \bar{\lambda} D_i f_i(k_i)]. \end{aligned} \tag{2.17}$$

Without agency problems, taxes, and transaction costs, the value of the firm only depends on output and not on the financing structure (as shown by Modigliani and Miller, 1958).

All proofs are in the Appendix.

Lemma 2.1. *Maximizing the market value of the firm is different from maximizing profits. More specifically, if a firm maximizes its market value, it chooses k_i such that in equilibrium:*

$$f_i'(k_i) = \frac{r}{1 - \delta \sigma_i^2 f_i(k_i) - \bar{\lambda} D_i}. \tag{2.18}$$

In contrast, if a firm maximizes pure profits subject to the socially preferred fixed risk level, then it chooses k_i such that in equilibrium:

$$f_i'(k_i) = \frac{r}{1 - \delta \sigma_i^2 f_i(k_i)}. \tag{2.19}$$

[9] These derivations are in the appendix and we turn directly to the market equilibrium.

Lemma 2.2. *The socially optimal allocation, characterized by Eq. (2.8), is attained in a competitive economy by maximizing the value of the firm.*

These results also hold for a general utility function U, production function f and distribution function $g(\theta)$.

The socially optimal solution is attained by maximizing firm value, not by maximizing profits, which corresponds to the argument made by Michael Jensen: "value is created when a firm produces an output or set of outputs that are valued by its customers at more than the value of the inputs it consumes (as valued by their suppliers) in such production" (Jensen, 2002, p.239). Consequently, Jensen argues, firms should have one objective, namely to maximize the value of the firm. The argument is often interpreted as "firms should maximize profits", the statement put forward by Milton Friedman (1970), who claimed that "The social responsibility of business is to increase its profits".[10] However, if a firm creates several outputs, of which some are negatively valued, maximizing the long-term value of the firm is no longer the same as maximizing profits. Even if the negatively valued output is, in principle, marketable, by free disposal it will have a price equal to zero, which favors pure profits. Hence, there is a difference between pure profit maximization and firm value maximization.

Friedman argues that firms are taxing consumers through reduced profits by engaging in corporate social responsibility and that consumers can spend on social responsibility programs themselves if they want to. However, pollution due to production can also be considered as a form of taxation. From an efficiency point of view it might be better to prevent environmental damage, rather than cleaning it up later.

2.3 Implications

We now explore the implications of a firm's choice to operate in a socially responsible way on financial performance. The bulk of empirical studies basically adopt the

[10] Several arguments can be made to support this claim. If social damage is incorporated through consumption behavior on the consumption goods market, Friedman is right. However, this mechanism assumes that consumers have perfect information about all production processes in the supply chain of intermediate goods, on top of information about the production process of the resulting final good. In practice, this is almost impossible to keep track of (for an interesting story of a scholar who tried to do this for a T-shirt, see Rivoli, 2005). This makes it less likely that all the social damage generated by each firm in the supply chain is incorporated in the price of the final good. Therefore, we argue, that information asymmetries and resulting externalities are more likely to be present in the consumer goods market compared to the stock market, since shareholders as owners of the firm are more directly involved in the production process. Consequently, maximizing profits is no longer the same as maximizing firm value.

intuition of the partial equilibrium result of Eq. (2.13), namely that in equilibrium there is a trade-off between stock-market returns and corporate social responsibility. Next, the financial performance of socially responsible firms is compared to the financial performance of irresponsible firms, using some financial performance measure. It is implicitly assumed that any choice of financial performance measure will reveal the trade-off.

We present three general equilibrium results that show that for comparison purposes between socially responsible and irresponsible firms, it matters what kind of financial performance measure is used. We choose to discuss the properties of three measures that are widely used in the empirical literature. These three are Market-to-Book (or Tobin's Q), Return on Assets (i.e. accounting profit ratios), and stock market returns.

To keep the analysis simple, we focus on extreme cases and consider two types of corporate behavior. The first type of corporate behavior is market value maximization. Since maximizing market value yields the social optimum, we label it as socially responsible behavior. The second type of corporate behavior is pure profit maximization without internalization of external effects. We call this irresponsible behavior. This is in line with the definition of corporate social responsibility proposed by Heal (2005).

According to (2.18) a socially responsible firm (SR) sets its capital intensity k^{SR} such that:

$$f'^{SR}(k^{SR}) = \frac{r}{1 - \delta\sigma^2_{R_{SR}} - \bar{\lambda}D^{SR}} \tag{2.20}$$

An irresponsible firm (IR) sets its capital intensity k^{IR} such that:

$$f'^{IR}(k^{IR}) = \frac{r}{1 - \delta\sigma^2_{R_{IR}}} \tag{2.21}$$

Where $\sigma^2_{R_{SR}} := \sigma^2_{SR} f^{SR}(k^{SR})$ and $\sigma^2_{R_{IR}} := \sigma^2_{IR} f^{IR}(k^{IR})$. The difference between the two expressions is that the irresponsible firm does not consider the social damage $\bar{\lambda}D^{IR}$. The irresponsible firm uses a cost of capital that is too low from a social viewpoint, i.e. it takes into account the risk-free rate plus a risk premium, but not the pollution premium. Note that the choice of being socially responsible or socially irresponsible is exogenous in our model. There is no economic mechanism that forces firms to be socially responsible.[11]

[11] If shareholders disagree with the policy of a firm, they can either sell the stocks (Exit) or try to influ-

Proposition 2.1. *Define the Market-to-Book ratio as total market value divided by installed capital,* $(M + k)/k$*. Then:*

1. *the Market-to-Book ratio of a socially responsible firm is always larger than the Market-to-Book ratio of an irresponsible firm with the same degree of homogeneity, irrespective of the level of damage per output;*

2. *the Market-to-Book ratio of socially responsible firms is constant with respect to damage per output'.*

Note that the result even holds if firm risk levels differ, since the market value is determined by the appropriate discount rate. A responsible firm is maximizing market value, so it will install capital until the unique optimal Market-to-Book value is obtained.

Proposition 2.2. *Define the Return on Assets (ROA) ratio as profits divided by installed capital,* π/k*. To adjust for risk levels we assume that* $\sigma^2_{R_{SR}} = \sigma^2_{R_{IR}} = \sigma^2$*. Then:*

1. *the ROA of a socially responsible firm is always larger than the ROA of an irresponsible firm with the same degree of homogeneity;*

2. *the ROA of irresponsible firms is constant with respect to damage per output* D_i*, but for socially responsible firms it is increasing in damage per output* D_i*.*

If each firm is assumed to have the same corporate goal, namely to maximize profits, then observing a higher ROA would indeed imply superior financial performance. However, socially responsible firms do not maximize profits and based on a simple comparison of ROA we would label irresponsible firms as inefficient. According to conventional microeconomic theory, relatively higher *average* profits should induce additional investments, since maximum profits have not yet been attained. With social damage, however, socially responsible investors appreciate the internalization of externalities. This alternative corporate goal compromises profit maximization. A better way to measure inefficiency is by applying stochastic frontier analysis as proposed by Hughes et al. (1996). This type of analysis can take into account distinct corporate goals and, as such, measure "true" inefficiency.

Proposition 2.3. *Define stock market returns as* π/M*. To adjust for risk levels we assume that* $\sigma^2_{R_{SR}} = \sigma^2_{R_{IR}} = \sigma^2$*. Then:*

ence firm policy at shareholder meetings (Voice). As we assume that the individual investor is small, the latter is not an option.

1. *whether the risk-adjusted stock market returns are higher for socially responsible firms or irresponsible firms is ambiguous;*

2. *socially responsible firms have lower stock market returns compared to irresponsible firms with the same damage per output D_i technology .*

This result is not driven by differences in α_i since it holds when all firms have the same degree of homogeneity; $\alpha_i = \alpha$. A set of firms that have the same damage per output can be interpreted as an industry. So we find that socially responsible firms have lower stock market returns compared to irresponsible firms that are in the same industry. If we compare socially responsible firms to irresponsible firms at an aggregate level, i.e. we do not correct for industry type, then it is ambiguous whether stock market returns are higher or lower for socially responsible firms. The intuition is that corporate social responsibility relates to the internalization of external effects, not just the extent to which it creates external effects. A more polluting industry has to compensate more for its pollution if it wants to be labeled socially responsible. Unless we identify what drives firms to engage in corporate social responsibility - e.g. polluting industries are relatively more involved in pursuing social responsibility- we are unable to make precise statements concerning the stock market returns of socially responsible firms.

Note that all of the results hold without imposing assumptions on the operational relationship between productivity and social damage. Whether or not more damaging technologies are more productive is irrelevant to our analysis.

2.4 Empirical evidence

The empirical findings on the relation between corporate social responsibility and corporate financial performance appear to be contradicting. However, using our model we show that in fact this is not the case. We relate our propositions to the findings in the empirical literature, paying attention to what type of performance measure is used. For this purpose, we consulted two widely cited surveys on the link between corporate social responsibility and corporate financial performance, namely Margolis and Walsh (2001) and Orlitzky et al. (2003). We classify the studies according to the financial performance measure used and relate the empirical findings to our propositions. Therefore, we only look at studies that use Market-to-Book, Return on Assets[12] or stock market returns. This results in a survey of 68

[12] We also included in this category measures that are equivalent accounting profit measures, e.g. Return on Equity (ROE), Return on Investment (ROI) and Return on Sales (ROS).

Table 2.1. Studies using Market-to-Book

Authors	Relationship	Strength of result
B. Brown and Perry (1994)	positive	strong
Dowell et al. (2000)	positive	strong
Fombrun and Shanley (1990)	positive	strong
King and Lenox (2001)	positive	strong
Hamilton (1995)	positive	strong

Studies using Market-to-Book (Tobin's Q) find a positive relation between corporate social responsibility and corporate financial performance.

studies.

2.4.1 Studies using Market-to-Book

Table 2.1 shows that all five studies that have used the Market-to-Book index find a strong and positive relationship between corporate social responsibility and Market-to-Book. This is in line with Proposition 2.1. We quote King and Lenox (2001, p.106):

> We find evidence of a real association between lower pollution and higher financial performance. We also show that a firm's environmental performance relative to its industry is associated with higher financial performance. We cannot show conclusively, however, that a firm's choice to operate in cleaner industries is associated with better financial performance (..).

This is precisely what Proposition 2.1 predicts, namely that Market-to-Book is constant across industries for socially responsible firms and relatively lower for irresponsible firms, independent of the environmental performance of the industry. Heal also comes to this conclusion and mentions: "One robust result seems to be that superior environmental performance is correlated with high values for Tobin's Q" (Heal, 2005, p. 402).

2.4.2 Studies using Return on Assets

In Table 2.2 we present 36 studies that use Return on Assets or a comparable accounting profit measure. First note that not one study finds a strictly negative relationship. Furthermore, 17 out of 18 studies, that are classified as presenting either strong or moderate evidence, find a positive relationship which is in line with

Table 2.2. Studies using Return on Assets or equivalent measure

Authors	Relationship	Strength of result
Berman et al. (1999)	Positive	Strong
B. Brown and Perry (1994)	Positive	Strong
Dooley and Lerner (1994)	Positive	Strong
Judge Jr. and Douglas (1998)	Positive	Strong
Preston and OBannon (1997)	Positive	Strong
Simerly (1995)	Positive	Strong
Waddock and Graves (1997)	Positive	Strong
Graves and Waddock (1994)	Positive	Moderate
Graves and Waddock (2000)	Positive	Moderate
Hart and Ahuja (1996)	Positive	Moderate
Heinze (1976)	Positive	Moderate
Herremans et al. (1993)	Positive	Moderate
McGuire et al. (1988)	Positive	Moderate
Russo and Fouts (1997)	Positive	Moderate
Spencer and Taylor (1987)	Positive	Moderate
Turban and Greening (1997)	Positive	Moderate
Abbott and Monsen (1979)	Positive	Weak
Anderson and Frankle (1980)	Positive	Weak
Bowman (1978)	Positive	Weak
Bragdon Jr. and Marlin (1972)	Positive	Weak
Griffin and Mahon (1997)	Positive	Weak
Marcus and Goodman (1986)	Positive	Weak
Parket and Eilbirt (1975)	Positive	Weak
Pava and Krausz (1995)	Positive	Weak
Wokutch and Spencer (1987)	Positive	Weak
Preston (1978)	Positive	N/A
Greening (1995)	Positive	N/A
Johnson and Greening (1999)	No Effect/Positive	Moderate
Cochran and Wood (1984)	No Effect/Mixed	Weak
Patten (1991)	No Effect	Strong
Aupperle et al. (1985)	No Effect	Weak
Chen and Metcalf (1980)	No Effect	Weak
Freedman and Jaggi (1982)	No Effect	Weak
Ingram and Frazier (1980)	No Effect	Weak
O'Neill et al. (1989)	No Effect	Weak
Rockness et al. (1986)	No Effect	Weak

Studies using accounting profit ratios (ROA/ROE/ROI/ROS) find merely positive relations between corporate social responsibility and corporate financial performance.

Proposition 2.2. Overall, 27 out of 36 studies find a positive relationship and the studies that are classified as presenting weak evidence find no relationship. Note that most of these studies date back to the 1970s and 1980s when data availability was probably a problem.

There is additional evidence that supports Proposition 2.2. Spencer and Taylor (1987) note that the relationship is valid at the industry level. This indicates that differences in ROA are not solely due to differences in damaging technologies. This evidence is supported by Griffin and Mahon (1997), who look at a single industry and find a positive relationship between ROA and corporate social responsibility, and also by Dooley and Lerner (1994), who use as an indicator a firm's ROA relative to the industry average ROA and find the predicted positive relationship.

2.4.3 Studies using stock market returns

Table 2.3 gives an overview of studies that have used stock market returns as a financial performance measure. We grouped these studies into comparative and event studies.

For the comparative studies (top half of Table 2.3) the findings differ considerably and the majority of the studies finds mixed effects or no effect, which is in line with Proposition 2.3. Moreover, according to Proposition 2.3, we should observe a negative relationship if we look at differences in stock market returns within one industry. Newgren et al. (1985) look at financial performance relative to average industry performance and indeed find a negative relationship.[13]

Event studies (bottom half of Table 2.3) present a less conflicting picture as they compare the returns of a firm to the firm itself. However, the problem with event studies is that it may be unclear whether or not the "event" is actually providing new information to investors. If this is not the case, then this action will not significantly affect the stock price.

In line with Proposition 2.3, most event studies find the expected negative relationship, however, three studies find a positive relationship, of which two are on the withdrawal of international firms from South-Africa in the 1980s.

2.4.4 Summary of empirical findings

Table 2.4 shows that the alleged paradoxical empirical findings are in line with our propositions and that these findings should in fact be interpreted as showing strong evidence on the relation between social responsibility and financial performance. If

[13] In fact Newgren et al. (1985) look at the Price/Earnings index relative to the industry Price/Earnings index and find a positive relationship between this indicator and corporate social responsibility. Note however, that the Price/Earnings index is inversely related to stock market return, which in a steady state is equal to the Earnings/Price index. Therefore we label this result as negative to make it comparable to the other studies.

Table 2.3. Studies using stock market returns

a) Average Return Studies

Authors	Relationship	Strength of result
Freedman and Stagliano (1991)	Positive	Strong/Moderate
McGuire et al. (1988)	Positive	Moderate
Ingram (1978)	Positive	Moderate
B. Brown (1998)	Positive	Moderate
Vance (1975)	Negative	Strong
Newgren et al. (1985)	Negative	Moderate
Guerard Jr. (1997b)	Mixed	Moderate
Davidson III and Worrell (1992)	Mixed	Weak
B. Brown (1997)	No effect/Positive	Weak
Hamilton et al. (1993)	No effect	Moderate
Alexander and Buchholz (1978)	No effect	Weak
Guerard Jr. (1997a)	No effect	N/A
Chen and Metcalf (1980)	No effect	Weak

b) Event Studies

Authors	Relationship*	Strength of result
Blacconiere and Northcut (1997)	Negative	Moderate
Blacconiere and Patten (1994)	Negative	Moderate
Klassen and McLaughlin (1996)	Negative	Moderate
Shane and Spicer (1983)	Negative	Moderate
Stevens (1984)	Negative	Moderate
Posnikoff (1997)	Negative**	Moderate
Belkaoui (1976)	Negative	Weak
Meznar et al. (1994)	Positive**	Strong
P. Wright and Ferris (1997)	Positive**	Moderate
Boyle et al. (1997)	Positive	Moderate
Diltz (1995)	Mixed	Weak
Freedman and Jaggi (1986)	No effect	Moderate
Patten (1990)	No effect	Weak
Pava and Krausz (1995)	No effect	Weak

Studies using stock market returns find an ambiguous relation between corporate social responsibility and corporate financial performance.
*Other than the usage of the researchers, the results are given the interpretation "negative", if news on increased social responsibility increases the stock price significantly in the event window. In the context of our model, a correction of the stock price results in lower stock market returns for these firms, given that operating profits are not affected by the news. This way, our interpretation makes it possible to compare event studies with studies that use average stock market returns.
**These are studies on the effect of announcing withdrawal from South-Africa, with conflicting results.

we distinguish between the different performance indicators we find that there are clear associations between financial indicators and corporate social responsibility.

Table 2.4. Overview of empirical findings

Financial performance indicator	Number of studies	Positive relation	Negative relation	Mixed relation	No relation
Market-to-Book	5	5 (100%)	0 (0%)	0 (0 %)	0 (0 %)
Return on Assets	36	27 (75%)	0 (0%)	0 (0%)	9 (25%)
stock market returns*	27	7 (26%)	9 (33%)	3 (11%)	8 (30%)
Total	68	39 (57%)	9 (13%)	3 (5%)	17 (25%)

Overview of the results of the studies on the relation between corporate social responsibility and corporate financial performance, classified by financial performance measure.
*We give an interpretation to the results of event studies that is in line with our model.

2.5 Conclusion

In this chapter, we introduce a general equilibrium stock market model to study the effects of corporate social responsibility on financial performance. We assume that a significant part of investor behavior is affected by the non-financial characteristics of the firm. We show that one cannot use financial performance measures interchangeably to develop an understanding of the relationship between corporate social responsibility and corporate financial performance. With externalities, different financial performance measures capture different effects. As such, one should be cautious when interpreting empirical results.

We analyze the impact of socially responsible behavior on three widely used financial indicators, namely the Market-to-Book ratio, Return on Assets and stock market returns. We show that for the Market-to-Book ratio as well as for Return on Assets we expect a positive relationship with social responsibility. In contrast, for stock market returns the relationship is ambiguous at the aggregate level and negative at the industry level.

We review the existing empirical literature of the past three decades on the relationship between corporate social responsibility and corporate financial performance in the light of our findings. In general, when the empirical literature assesses the link between corporate social responsibility and financial performance the conclusion is that the relationship is not very clear. Our analysis shows that there are in fact strong linkages between corporate social responsibility and financial performance. The linkages are intuitive: engaging in corporate social responsibility compromises pure profits, but it potentially leads to maximum firm value.

Our model is simple yet general. There are many specific issues that can be studied in the area of corporate social responsibility. For example, it is often suggested

that only the firms that *"do well"* also *"do good"*, and not vice versa. Alongside causal issues, strategic motivations are sometimes given to explain the reasons for socially responsible behavior. These types of analysis are valid and valuable in and of themselves. However, incorporating these issues will not change our general equilibrium results. Recall that the choice of being socially responsible is exogenous in the model, the model is static, and we only require market clearing. Our findings must hold in equilibrium, irrespective of whether there are direct or indirect operational benefits to behave in a socially responsible way, such as product differentiation, eco-efficiency, preempting future regulations, improved brand equity, or improved customer relationships.

Our analysis opens up various areas for further research. First, our model provides more specific and theoretically supported testable hypotheses for empirical work. Second, the model can be extended to allow for strategic motivations. Our model cannot provide an understanding of why some firms choose to behave socially responsible and others do not, as this choice is exogenous in the model. Finally, we can consider a dynamic version of the model. In a static model it is not possible to analyze the long term considerations that are often associated with corporate social responsibility. We leave this for future research.

2.A Appendix

Derivation of the social planner's solution

We rewrite the constraint given by Eq. (2.6) so that $\beta_{i1} = 1 - \sum_{j=2}^{m} \beta_{ij}$. Then using Eq. (2.4) and Eq. (2.5), substitute for consumption and damage, and for β_{i1}, and form the Lagrangean:

$$E\left[U^1\left(\sum_{i=1}^{n}(1-\sum_{j=2}^{m}\beta_{ij})y_i(k_i,\theta), \sum_{i=1}^{n}(1-\sum_{j=2}^{m}\beta_{ij})D_i f_i(k_i)\right)\right] + \sum_{j=2}^{m}\nu_j\left(E\left[U^j\left(\sum_{i=1}^{n}\beta_{ij}y_i(k_i,\theta), \sum_{i=1}^{n}\beta_{ij}D_i f_i(k_i)\right)\right] - \bar{V}_j\right) + \mu\left(\bar{k} - \sum_{i=1}^{n}k_i\right) \tag{2.A.1}$$

where μ is the Lagrange multiplier. Maximizing with respect to the β_{ij}'s and k_i's gives the following first-order necessary conditions:

$$-\left(E[U_c^1 y_i(k_i,\theta)] + D_i E[U_d^1 f_i(k_i)]\right) + \nu_j\left(E[U_c^j y_i(k_i,\theta)] + D_i E[U_d^j f_i(k_i)]\right) = 0 \qquad i = 1,2,..,n; j = 2,3,..,m \tag{2.A.2}$$

$$(1-\sum_{j=2}^{m}\beta_{ij})\left(E[U_c^1 y_i'(k_i,\theta)] + D_i E[U_d^1 f_i'(k_i)]\right) + \sum_{j=2}^{m}\nu_j\beta_{ij}\left(E[U_c^j y_i'(k_i,\theta)] + D_i E[U_d^j f_i'(k_i)]\right) = \mu \qquad i = 1,2,..,n \tag{2.A.3}$$

Since production is decomposable we have

$$\begin{aligned} E[U_c^j y_i(k_i,\theta)] &= f_i(k_i)E[U_c^j g_i(\theta)] \\ E[U_c^j y_i'(k_i,\theta)] &= f_i'(k_i)E[U_c^j g_i(\theta)] \end{aligned}$$

Substitute these two equations in Eq. (2.A.2) and Eq. (2.A.3) and combine these two first-order conditions by substituting for the Lagrange multiplier ν_j. If Eq. (2.A.2)

holds, the summation terms in Eq. (2.A.3) drop out and we get

$$f_i'(k_i)\left(E[U_c^1 g_i(\theta)] + D_i E[U_d^1]\right) = \mu$$

Substituting for μ we get Eq. (2.8):

$$\frac{f_1'(k_1)}{f_i'(k_i)} = \frac{E[U_c^1 g_i(\theta)] + D_i E[U_d^1]}{E[U_c^1 g_1(\theta)] + D_1 E[U_d^1]}, i = 2, 3, .., m$$

Derivation of the pricing equation

Set up the Lagrangean:

$$E[U^j(rb_j + \sum_{i=1}^{n} \omega_{ij} R_i, \sum_{i=1}^{n} \omega_{ij} D^i)] + \kappa(W_j - b_j - \sum_{i=1}^{n} \omega_{ij} p_i)$$

where κ is the Lagrange multiplier. Taking the derivative yields the first-order condition for a maximum:

$$E[U_c^j R_i] + E[U_d^j] D^i - p_i \kappa = 0 \tag{2.A.4}$$

Taking the derivative with respect to b_j yields an expression for the Lagrange multiplier κ:

$$\kappa = E[U_c^j r] = E[U_c^j] r \tag{2.A.5}$$

since bonds pay with certainty. Consequently, we get the pricing equation:

$$p_i = \frac{1}{E[U_c^j] r}\left(E[U_c^j R_i] + E[U_d^j] D^i\right) \tag{2.A.6}$$

Use $E[xy] = E[x]E[y] + \text{cov}[x, y]$ to get:

$$p_i = \frac{1}{E[U_c^j] r}\left(E[U_c^j] E[R_i] + \text{cov}[U_c^j, R_i] + E[U_d^j] D^i\right) \tag{2.A.7}$$

$$= \frac{E[R_i]}{r} + \frac{E[U_{cc}^j]}{E[U_c^j]} \frac{\text{cov}[c_j, R_i]}{r} + \frac{E[U_d^j]}{E[U_c^j]} \frac{D^i}{r} \tag{2.A.8}$$

where the last result is obtained by noting that if two random variables x and z are jointly normally distributed, then $\text{cov}[g(x), z] = E[g'(x)]\text{cov}[x, z]$ due to a Lemma by Cochrane (2001, p. 164). Consequently, we obtain the pricing equation (2.9).

Proof of Lemma 2.1

Derivation of market value maximization

We assumed a decomposable production function, so the effect of the state of nature is multiplicative. As a price taker, the firm recognizes that its value will change in proportion to output. In general, when the input level and market value equal $\hat{k}_i$ and $\hat{M}_i$, the firm calculates the market value given an alternative input level k_i as:

$$M_i = \frac{f_i(k_i)}{f_i(\hat{k}_i)}(\hat{M}_i + \hat{k}_i) - k_i.$$

The firm chooses its input level such that the derivative of the market value with respect to k_i equals zero, which at the equilibrium input level where $\hat{k}_i = k_i$ yields:

$$\frac{f_i'(k_i)}{f_i(k_i)}(M_i + k_i) = 1. \tag{2.A.9}$$

Substituting the expression for the market value of the firm Eq. (2.17) in Eq. (2.A.9) we see that in general equilibrium:

$$\frac{f_i'(k_i)}{f_i(k_i)}\frac{1}{r}[f_i(k_i) - \delta\sigma_i^2 f_i^2(k_i) - \bar{\lambda}D_i f_i(k_i)] = 1$$

which simplifies to

$$f_i'(k_i)[1 - \delta\sigma_i^2 f_i(k_i) - \bar{\lambda}D_i] = r. \tag{2.A.10}$$

Derivation of pure profit maximization

A pure profit maximizing firm faces the following problem:

$$\max_{k_i} E[\pi_i] \text{ subject to } \operatorname{cov}(\pi_i, R^m) = \bar{\rho}$$

where R^m is the market return and $\bar{\rho}$ a fixed risk level. The restriction is on the covariance of profits with respect to market return, since the firm acknowledges that only systematic risk is priced. Rewrite, substitute, and set up the Lagrangean:

$$f_i(k_i) - rk_i - \xi(f(k_i)\operatorname{cov}(g_i(\theta), R^m) - \bar{\rho})$$

Here, ξ is the Lagrange multiplier. Maximizing with respect to k_i yields the following first-order condition:

$$f'(k_i)(1 - \xi \text{cov}(g_i(\theta), R^m)) = r$$

Covariances between the $g_i(\theta)$'s are assumed equal to zero, so that in equilibrium we have $\text{cov}(g_i(\theta), R^m)) = \sigma_i^2 f_i(k_i)$. To find the equilibrium solution we directly substitute consumers' risk attitude δ for the shadow cost of risk ξ:

$$f_i'(k_i)[1 - \delta\sigma_i^2 f(k_i)] = r$$

Rewrite and we obtain Eq. (2.19).

Proof of Lemma 2.2

Note that (2.8) must also hold for a risk free, non-polluting technology. Then we can substitute $f_1' = r$ in the numerator of the left hand side of Eq. (2.8). Rewrite $E[U_c^1 g_i(\theta)] + D_i E[U_d^1] = E[U_c^1](1 - \beta_{i1}\delta\sigma_i^2 f_i(k_i) - \lambda_1 D_i)$. For the risk free technology ($i = 1$) the numerator of the right hand side of Eq. (2.8) is equal to $E[U_c^1]$. Substituting these expressions in Eq. (2.8) and averaging over all consumers, noting that $\sum_{j=1}^m \beta_{ij} = 1$, we see that Eq. (2.18) is equal to the social planner's solution Eq. (2.8). ■

Proof of Proposition 2.1

First note that if $f_i(k_i)$ is homogeneous of degree α then $\frac{f_i'(k_i)k_i}{f_i(k_i)} = \alpha$. Substituting Eq. (2.20) in Eq. (2.17) we find that the total market value of a socially responsible firm is equal to $M^{SR} + k^{SR} = k^{SR}\alpha^{-1}$, so the Market-to-Book ratio is equal to $(M^{SR} + k^{SR})/k^{SR} = \alpha^{-1}$ which does not depend on the level of social damage. Substituting Eq. (2.21) in Eq. (2.17) we find that the total market value of the irresponsible firm is equal to $(M^{IR} + k^{IR})/k^{IR} = \alpha^{-1}\left(1 - \frac{\bar{\lambda}}{r} f'(k) D_{IR}\right) < \alpha^{-1} = (M^{SR} + k^{SR})/k^{SR}$. ■

Proof of Proposition 2.2

Again, note that if $f_i(k_i)$ is homogeneous of degree alpha then $\frac{f_i'(k_i)k_i}{f_i(k_i)} = \alpha$. Using the definition of profits we have ROA $= \pi_i/k_i = f_i(k_i)/k_i - rk_i/k_i = f_i'(k_i)/\alpha - r$.

Substituting for $f_i'(k_i)$ using Eq. (2.21) we see that for the irresponsible firm

$$\text{ROA}^{IR} = \frac{r}{\alpha(1-\delta\sigma^2_{R_{IR}})} - r$$

which does not depend on damage per output D_i. For socially responsible firms we substitute for $f_i'(k_i)$ using Eq. (2.20) and find that

$$\text{ROA}^{SR} = \frac{r}{\alpha(1-\delta\sigma^2_{R_{SR}} - \bar{\lambda}D^{SR})} - r$$

which is increasing in damage per output D_i. Looking at the difference we see that

$$\text{ROA}^{SR} - \text{ROA}^{IR} = \frac{r}{\alpha(1-\delta\sigma^2_{R_{SR}} - \bar{\lambda}D^{SR})} - \frac{r}{\alpha(1-\delta\sigma^2_{R_{IR}})} > 0$$

given that risk is identical $\sigma^2_{R_{SR}} = \sigma^2_{R_{IR}} = \sigma^2$. ■

Proof of Proposition 2.3

First we observe that $\pi/M = \frac{\pi/k}{M/k} = \frac{\text{ROA}}{\text{Market-to-Book}-1}$. We assume that the risk levels are identical $\sigma^2_{R_{SR}} = \sigma^2_{R_{IR}} = \sigma^2$. Using the expression for ROA and Market-to-Book, we can express the stock market returns of the socially responsible firm as

$$\frac{\pi^{SR}}{M^{SR}} = \frac{A + r\alpha\bar{\lambda}D_{SR}}{B - (1-\alpha)\bar{\lambda}D_{SR}},$$

and the stock market returns of the irresponsible firm as

$$\frac{\pi^{IR}}{M^{IR}} = \frac{A}{B - \bar{\lambda}D_{IR}},$$

with $A = r\left(1-\alpha(1-\delta\sigma^2)\right)$ and $B = (1-\alpha)(1-\delta\sigma^2)$. Note that both are increasing in damage per unit of output. The sign of the difference of these two equations depends on the combination of D_{SR} and D_{IR}. Stock market returns of the irresponsible (IR) and responsible (SR) firm are identical if:

$$D_{SR} = D_{IR}\frac{1-\alpha(1-\delta\sigma^2)}{1-\alpha(1+\bar{\lambda}D_{IR})}.$$

If D_{SR} exceeds the right-hand side of this equation, the socially responsible firm has a higher stock market return, otherwise lower. We see that if $D_{SR} = D_{IR}$, that is,

if we compare within a single industry, stock market returns are lower for socially responsible firms. ■

Chapter 3

Banking on the Equator

3.1 Introduction

On June 4, 2003, ten multinational banks announced that they adopted the Equator Principles. These Principles are the banks' policy framework to guide large project finance lending decisions. In adopting these principles, the banks *"...seek to ensure that the projects we finance are developed in a manner that is socially responsible and reflect sound environmental management practices"*.[1] The banks assess a project's impact on the natural environment and on society. As of summer 2006, about another thirty financial institutions have adopted the Equator Principles. Together, the 40 institutions (see Appendix I) account for about 85% of the market for *project finance* (see Esty et al., 2005). The Equator Principles were criticized, among others by Watchman (2005), for not going far enough in the direction of achieving sustainable development. The banks were also accused, for example by BankTrack (2004, 2005), of using the Principles to 'greenwash' their operations in developing countries.

In this chapter, we investigate whether the adopters of the Equator Principles behave in a significantly different manner with respect to their social, ethical, and environmental policies, than non-adopters. This is of importance as the governance of the Principles is rather weak. It is not clear whether banks that adopted the Principles really have different environmental and social policies in place and whether they actually behave accordingly. As such, we investigate corporate social responsibility (CSR) in the international financial industry. Heal (2005, p.393) defines CSR as (...) taking actions which reduce the extent of externalized costs or avoid distri-

This chapter is based on Scholtens and Dam (2007)

[1] From the Preamble of the Equator Principles, www.equator-principles.com

butional conflicts.

In addition, we want to explore whether the financial markets assess these banks differently. This is of importance as the adopters assume that financial institutions that adopt the Principles ought to be able to better assess, mitigate, document and monitor credit risk and reputation risk associated with financing development projects. However, in order to do so, they have to invest in screening and monitoring mechanisms and they may forego some potentially profitable projects.

To find out whether the adopters of the Equator Principles stand out from the non-adopters, this chapter will look into the different attributes of the banks' social, ethical and environmental policies, their balance sheet and income state, their financial return and risk, and investigate whether and how these attributes differ between banks that adopted the Equator Principles and those that did not. At this stage we lack a formal model and hence, the study is rather explorative in nature. The financial data are derived from DataStream and BankScope. The data about social, environmental and ethical policies are provided by the Ethical Investment Research Service (EIRIS). We find that the social, ethical, and environmental policies of banks that adopted the Equator Principles significantly differ from those of non-adopters and especially their large size is a distinctive feature of the adopters. Most other financial and firm characteristics do not show significant differences. As such, it appears that there are scale effects involved in the adoption decision and the more responsible institutions signal their responsibility by adopting the Equator Principles. We infer that for larger banks, reputation appears to be more important. Furthermore, an event study shows that that shareholders do not respond to the adoption announcement of financial institutions; implying that shareholders seem to expect that adhering to the Equator Principles does not affect shareholder value. This can be related to the relative small size of the project finance portfolio in relation to the banks'overall activities. We do not find support for the view that adoption of the Equator Principles is merely window dressing as there are at least some costs involved and there are many project finance banks that do not adopt the Principles. We conclude that it appears that banks adopt the Equator Principles to signal their responsible conduct.

The structure of this chapter is as follows. Section 3.2 presents the background of the Equator Principles. Section 3.3 introduces the data and methods employed to assess the characteristics of the banks in the sample. The results are in section 3.4. Section 3.5 concludes.

3.2 Equator Principles

We present the key characteristics of the Equator Principles (EP) and briefly sketch its history and main features of project finance. We also give a brief overview of the costs and benefits of adoption. To illustrate the background of the EP we also link the EP to the literature on codes of conduct and industry self-regulation.

3.2.1 Background of the Equator Principles

The EP are a voluntary set of guidelines for promoting social and environmental responsibility in financing projects, especially in emerging markets. The EP specifically address the negative external effects of project finance. They apply to projects with a total cost of US$ 10 million or more. The EP are based in large part on the policies and guidelines of the International Finance Corporation (IFC), a member of the World Bank Group. They require adopting institutions to categorize projects as high (A), medium (B), or low (C) in environmental or social risk as a precondition of consideration of financing. Borrowers have to conduct an Environmental Impact Assessment (EIA) and must prepare an Environmental Management Plan (EMP) for category A and B projects. Category C projects do not require an EIA. With Category A projects, the borrower or a third-party expert must also put an EMP in place to address project compliance, mitigation, action plans, and monitoring procedures. The compliance with the EMP is written into a project's loan covenant. As such, the bank can withdraw funding if a borrower breaches its obligations. In applying the EP, the lead arrangers, among other things, will have to reach a consensus on the categorization of the project (A, B, or C) and on the nature of the appropriate environmental assessment and covenant package. The approach used under the EP includes the categorization of a project according to its environmental and social impact using IFC's screening procedures.[2] The EIA will take into account

[2] IFC uses a set of environmental and social policies, which are based on the set used by the World Bank. Some policies have been adapted to better reflect their applicability to IFC's private sector client base. Some however remain in their World Bank format and as such require careful interpretation for private sector projects. The safeguard policies provide guidance on matters relevant to IFC's operations, including environmental assessment, natural habitats, involuntary resettlement and indigenous peoples. The environmental assessment policy is a key umbrella policy for IFC, and various requirements, environmental and social, follow from it. In addition, to reflect the fact that IFC works with employers, IFC has adopted the Policy Statement on Harmful Child and Forced Labor. The World Bank's safeguard policies are geared to its public sector activities. Full text of the IFC safeguard policies is available at www.ifc.org/enviro. IFC uses two sets of guidelines for its projects. The Pollution Prevention and Abatement Handbook (PPAH, also referred to as "the World Bank Guidelines") was adopted in 1998 and compiled by environmental staff from the World Bank and IFC. IFC also uses a series of environmental, health and safety guidelines ("the IFC Guidelines") that cover industries not included in the PPAH. It is anticipated that these guidelines will be added to from time to time covering new and emerging

the IFC's environmental, health and safety guidelines for all countries. However, for projects in low-, lower-middle, and upper-middle income countries (as defined by the World Bank), it will also take into account the IFC's safeguard policies. In high-impact projects, borrowers undertake appropriate consultation with affected local stakeholders and develop an environmental management plan that addresses mitigation and monitoring of environmental and social risk. The EP also apply to project finance advisory activities. Adopters are required to report on the progress and performance with respect to implementation on an annual basis.

The history of the EP is described by Esty et al. (2005). It dates back to the late 1990s when bankers at ABN·Amro first approached the IFC with concerns that there were no established principles to guide lending decisions when it came to social and environmental risks. ABN·Amro came across this problem when financing a mining project in Papua New Guinea that severely contaminated local water. In a meeting in London in October 2002, ABN·Amro and the IFC brought together three other players in project finance (Barclays, Citigroup and WestLB) to discuss their experiences. Following this meeting, the banks met to draft principles, which were sent out for comments by other banks, the IFC, non-governmental organizations, and clients. On June 4, 2003, ten banks announced that they were adopting the EP. In the next two and a half years, about another 30 financial institutions banks announced that they adopted the EP. The 40 institutions account for around 85% of the market for project finance in developing countries (see Esty et al., 2005).

The EP followed the IFC safeguard policies and the World Bank's Pollution Prevention and Abatement Guidelines. The former requires all project sponsors to assess a project's impact on the natural environment and on society. The IFC safeguard policies generally represent an approach to critical issues that cut across industry sectors, such as the protection of natural habitats or the physical or economic displacement of people (resettlement). The World Bank guidelines address levels of pollution discharge by industry and establish minimum standards. They are sector-specific environmental standards that are applicable to the processes, technologies, and issues that prevail in specific industries, and represent good practice within that sector. From the banks' perspective, the IFC's and World Bank's guidelines offer a benchmark for the EP. Therefore, they can be regarded as a set of instructions on how to implement the standards from the IFC and World Bank.

With project finance, lenders base their credit appraisals on the projected revenues/ cash-flows from the operation of the facility - rather than on the general

industry sectors. New guidelines are subject to an open period of consultation.

assets or the credit of the sponsor of the facility. They rely on the assets of the facility, including any revenue producing contracts and other cash-flow generated by the facility, as collateral for debt. In project financing, the debt terms are not primarily based on the sponsor's credit support or on the value of the physical assets of the project. Project performance, both technical and economic, is the core of project finance. At the heart of the project finance transaction usually is a Special Purpose Vehicle (SPV) that consists of the consortium shareholders who may be investors or have other interests in the project (such as the originator or contractor). Esty and Sesia (2005) find that private sector firms have used project finance for industrial projects such as mines, pipelines, and oil fields. During the 1990s, infrastructure projects (water, electricity, natural gas, transportation, and telecommunication) were increasingly privately financed as well. Especially the privatization of state-owned enterprises, the deregulation of traditional state monopolies and key industries (electricity, telecommunication), and the internationalization and integration of markets boosted the use of project finance. Project finance constitutes only a small part of the overall activities of the banks. For example, in the US in 2004, project finance was about 1% of total corporate financing (see Esty and Sesia, 2005, p. 1)

3.2.2 Costs and benefits of adopting the Equator Principles

From a microeconomic perspective, financial institutions are likely to engage in the EP if the perceived benefits exceed the associated costs.[3] Benefits might include a better reputation, better market access, the potential to charge a premium price for its product or enhanced possibilities to recruit and/or retain high quality employees. Many academic studies have focused on the differences and similarities between the financial performance of "responsible" firms and comparable firms that do not meet the same CSR criteria (see review studies like those of Margolis and Walsh (2001) and Orlitzky et al. (2003)) as well as the previous chapter). The reason why CSR behavior can coexist with profit maximizing behavior in equilibrium is that CSR activities create non-market value for certain stakeholders, who are willing to bear the associated costs in the form of foregone profits, wages or whatever payment applies to the stakeholder. If these stakeholders are consumers, who are willing to pay a higher price for the product if it is produced socially responsi-

[3] Recent theories of CSR (P. Bansal and Roth, 2000; Baron, 2001; McWilliams and Siegel, 2001; Bagnoli and Watts, 2003; Heal, 2005) conjecture that firms engage in profit-maximizing CSR, based on the anticipated benefits from their activities.

ble, CSR can in fact turn out to be profitable, but sooner or later the entire industry will follow, and such CSR actions will become business as usual. The benefits of CSR can be in terms of non-market value which certain stakeholders (employees, shareholders, host countries) are willing to bear, but also in terms of reduced risk for the stakeholders of the firm. If a firm or bank does not engage in CSR, the non-market costs in the form of negative externalities for society as a whole will potentially be charged back to the firm. This back-firing of non-CSR behavior can take many forms, for example consumer boycotts, environmental scandals, employee actions, pressure from NGO's, negative publicity, or law-suits. The effects on the stock market value of companies or banks that experience such events can be economically significant. This potential back-firing links CSR to risk management. In this context, displaying CSR behavior might be of greater importance to banks that demonstrate considerable exposure, i.e. banks that are in the spotlight. In this case, investors - although it also holds for other stakeholders - are not ethical investors, but they view non-CSR behavior as a financial liability, or even a liability for the mere continuation of existence of the bank, which naturally affects all stakeholders.

Esty et al. (2005) argue that adopting the EP will lead to greater learning among project finance institutions on environmental and social issues, and that having larger expertise in these areas will better enable them to advise clients and control risks. Taking social and environmental issues into account would improve the banks' understanding of the interaction of the project with stakeholders and can improve credit risk management. Unfortunately, so far, there is no evidence of how the adopters implemented the EP. Another specification is that *reputational* risk is reduced when having the EP in place. Sethi (2002) and Florini (2003) stress that the impact on reputation is an important factor in adopting a codes of conduct.

According to C. Wright and Rwabizambuga (2006), the screening and monitoring of the social and environmental issues is a difficult and costly task. They argue that not many bankers are used to it and it is not part of most standard banking procedures. However, in our opinion, although there undeniably is a cost involved in accounting for non-financial aspects of the projects, the size of such costs has to be put in perspective. In general, many projects are quite large; say more than $1 billion. Now, let us assume (as suggested by one of the referees of *World Development*) that the project financier trains 50 people to undertake the analysis. This training might take 3 days at $2,000 per day per person. If the financier additionally has 2 full-time CSR experts on the payroll to monitor the deal and the project for $150,000 per person, the cost of screening and monitoring are $600,000. This can

be put against the expected 1% advisory fee on the project, which is $10 million. In this perspective, the cost of CSR screening and monitoring is limited. Another cost is in the missed opportunities or lost business to finance projects in case the country or firm who initiates the project is not in favor of scrutinizing social and environmental aspects of the project. As such, the adopters of the EP in fact reduce their potential market for project finance, implying opportunity costs. Relatedly, it is very likely that projects that meet the requirements of the Equator Principles have larger operational costs that need to be financed too and, as such, may increase the benefits. Not just the screening and monitoring is a costly activity, but also operating environmental friendly or socially responsible can imply higher operating costs for the project itself compared to the non-CSR alternatives. Again this is obvious by merely considering the "over-compliance" aspect of CSR. If operating socially responsible is less costly, it will become business as usual.

3.2.3 Governance issues

The EP can be regarded as self-regulation of the international banking community in the form of a code of conduct. Sethi (2002) and Florini (2003) provide a general discussion of the issues regarding corporate codes of conduct. This type of self-regulation is soft-law and contrasts with traditional command-and-control regulation. According to Shelton (2000), it fills a gap left by traditional law. Soft-law can evolve into industry standards and this can be the basis of binding law. As such, self-regulation may lead to stricter norms, rules and policies than usual. Carraro and Siniscalco (1998) argue that by developing and adopting codes of conduct corporations have set themselves stricter rules and policies, though not legally binding. Jenkins (2001) argues that as external parties cannot enforce firms to act upon codes of conduct, one may wonder whether codes of conduct are a realistic alternative to the traditional mechanisms of regulation. Adopting codes of conduct may positively impact upon the firm's reputation. Management can adopt policies largely for symbolic purposes without necessarily applying them in practice. This is discussed, among others by Westphal and Zajac (1994, 2001) and Zajac and Westphal (1995).

In general, with any form of 'voluntary collaboration' we can expect free-rider problems. Gunningham and Sinclair (2002) argue there are two types of free-riding involved with codes of conduct and self-regulation. In the first, all parties agree to the terms and conditions of self-regulation, but some do not comply whereas others are maintaining the higher standards. By doing this, firms that do not comply with

the codes are able to reap the reputation benefits of being an adopter to the code without incurring the compliance costs. Here, monitoring and transparency are crucial to deal with free-riders. The second type of free-riding occurs when part of the firms in the industry refuses to adopt the self-regulation. This may lead to competitive disadvantages for the adopters and will jeopardize the effectiveness of the initiative. Since there is no formal control on actual performance, adoption of the EP introduces the free-rider problems. As a result, both types of free-riding might occur: some adopters may not put the EP to practice, and some project finance institutions do not adopt the EP.

P. Bansal and Hunter (2003) is an example of a study that investigates the determinants or the strategic explanations for the early adoption of a code of conduct. For their analysis of the ISO 14001 certification, they find that firms were reinforcing their commitment to the natural environment and internationalization. They did not find support for the view that firms were using the certification to reorient their strategies. C. Wright and Rwabizambuga (2006) argue that adopters are largely concentrated in institutional environments shaped by targeted advocacy campaigns organized by civil society groups and strong regulatory systems, i.e. in Europe and North-America. The adopters typically operate transnational and are more likely to have a visible role in high-risk project finance deals, which increases the likelihood that environmental malpractice may be exposed by stakeholders and causes damage to corporate reputation. C. Wright and Rwabizambuga (2006) also suggest that firm-specific characteristics might play a role as a few large-project finance institutions have opted against the EP. In particular, BNP Paribas and Société Générale, continue to opt out of the EP. EIRIS (2006) assesses the way in which EP banks apply the Principles. They find that from the nine banks they investigate, only two company's management response are classified as 'good', i.e. sufficient to mitigate social and environmental risks to an acceptable level. Six out of nine fail to report in detail on their compliance, monitoring, and auditing systems. And only three of the nine banks show evidence of client diagnostic tools or audits to evaluate social and environmental risks (see EIRIS, 2006)

Another problem appears to be that local laws and regulations may hamper the power of banks to intervene and to enforce the contract. This can result in conflicts of interest. Perspectives of authorities and NGOs about employment, pollution and rights of various parties may conflict with the policies and claims of the banks. The outcome of any arbitrage of such a conflict may be difficult to predict. Furthermore, there is no international standard to report about the CSR performance of

firms. (Watchman, 2005) points out that the current approach is rather top-down. It usually is the heads of the banks that have drawn up the CSR program and it is not very clear whether it is fully internalized by all employees. Furthermore, there is uncertainty about whether the IFC and World Bank raise their standards, which would imply that the EP have to become stricter too.

3.3 Hypotheses and data

This section presents the hypotheses, data on the financial performance and the social, ethical and environmental policies of internationally operating banks, as well as the methods employed. We introduce the variables and give descriptive statistics.

We assume that it is interesting for financial institutions, for financial authorities like the World Bank and IFC, as well as for NGOs to explore whether or not adopting the EP actually "makes a difference", that is, does anything indicate that adopting the EP is more than just window-dressing. To this extent, we first find out whether or not the adopters are different from the non-adopters. We take three perspectives. First is the corporate social responsibility (CSR) perspective. Here, we compare the social, ethical and environmental policies of signatory and non-signatory banks. Second is the economic or firm perspective. Here, we investigate firm attributes like size, balance sheet composition, and performance. Third is the financial market perspective. Here, we look into the companies' stock risk and return. Furthermore, we will perform an event study to investigate whether the announcement of adopting the EP has had a significant impact on stock market returns. This analysis is directed at an assessment of the impact of the adoption announcement on the stock market's valuation of the bank.

As to the question whether adopters and non-adopters differ, three possibilities may hold. First is that the adopters in all respects are similar to the non-adopters. This may relate to their social responsibility, profitability, solvency, stock market returns, risks, etc. This suggests that adopting appears not to be associated with any other characteristic of the firm or to its performance. For example, in case of financial market characteristics, this is consistent with a world where the social responsibility feature of the firm is not priced (see Hamilton et al., 1993; Statman, 2000). The second hypothesis is that the performance of the EP adopters is 'worse' than that of non-adopters. For example, they have poorer CSR policies, are smaller, weaker, less profitable, more risky, etc. This would suggest that adoption and complying

with the EP is undertaken by the 'weaker' institutions. The third hypothesis is that Equator companies are those that - in some way or another - perform significantly better than non-signatories. This would suggest that the 'stronger' institutions are inclined to adopt the EP.

From a financial market perspective (see Hamilton et al., 1993) the last two hypotheses would suggest that investors that might take account of firms that do and those that do not adopt the EP might have an impact on stock prices. Investors may either increase the valuation of EP banks relative to the valuation of conventional firms by driving down the cost of capital of and the expected returns of their stock (see also Heinkel et al., 2001). Or investors consistently underestimate the probability that negative information can be released about firms that are not acting according to the EP. Key in assessing the financial value of the firm is the relation between (expected) cash flows of the firm and the appropriate discount rate, e.g. th accounting cost of capital. The discount rate is unlikely to be directly affected when adopting the EP. The main factors that affect the cash flow are the higher costs associated with operating socially responsible, which reduce market value and the additional income from activities that the bank has gained through its better reputation. The main factor that might affect - albeit indirectly- the discount rate by operating socially responsible is the reduced risk from the improved reputation. However, adoption also might impact on the cash flows as it is accompanied by some additional costs for staff, screening, monitoring, (re)negotiation as well as by the probability of more (or less) deals to be closed with the result of more (or less) income via fees and interest income, also improved reputation may positively impact on the financial institution's cash flow. This all boils down to identifying who is willing to bear the costs of operating socially responsible and if the benefits of this bearing outweigh the costs. To conclude, the second and third hypothesis both assume that EP adopters significantly differ from non-adopters, whereas the first hypothesis assumes that the two can not be distinguished on the basis of key attributes. We expect that the results of a cost-benefit analysis associated with CSR is potentially more positive for banks that are in the spotlight. Since larger banks experience more exposure, we expect the reduction in risk to be larger for these banks. Thus, basically, the reasoning might be that by adopting the Equator Principles, banks signal their CSR conduct which improves their reputation which, in turn, reduces their risk.

As to the event study about the announcement effects of adopting the EP, we also have that three possibilities can occur. First is that there are significant and

positive abnormal returns. This suggests that investors assume that the benefits of adoption in terms of pecuniary benefits and reputation outweigh the costs. We specifically expect to observe this type of investor behavior in markets where the share of socially responsible investors is large or markets where investors view EP adoption as a means of risk reduction. Second is that there are significant and negative abnormal returns. This suggests that investors assume that the operational costs of adoption are higher than the benefits. Third is that there are no significant abnormal returns. This suggests that investors assume that the net effect of costs and benefits is small and does not affect the value of the firm in a significant manner or that any cost or benefit of adopting is small on an a priori basis as the relative size of project finance is limited from the perspective of the adopting institution's balance sheet and income statement.

To test the first three hypotheses, we will perform a simple test of equality of means on the key attributes of the adopters and compare their 'scores' with those of non-adopters. In order to find out whether adoption does make a difference from the perspective of financial market participants - i.e. the second bunch of hypotheses - we conduct an event study after the impact of the adoption announcement on the stock price of the firm.

Social, ethical and environmental policy data are derived from EIRIS. EIRIS is a not-for-profit organization set up in the UK in 1983 with the help of a group of churches and charities. EIRIS researches almost 2700 companies from the UK, continental Europe, North America (US and Canada) and the Asia-Pacific region (Australia, New Zealand, Japan, Singapore and Hong Kong). EIRIS gathers the data on the basis of a questionnaire and a survey of the firms in six different areas: Environment, governance, human rights, positive products and services, stakeholder issues, and other ethical concerns. EIRIS investigates the policies that are in place within the firm. Performance is not the focal point as reporting systems in this respect are still very weak and inconsistent between countries and industries and in time. With environment, policy, management, reporting, and performance are the main topics. Other topics analyzed by EIRIS are whether or not and if so to what extent, a firm is involved in various specific activities, such as water pollution, the use of tropical hardwood, nuclear power etc. Second is governance. Here, it is the relation with various stakeholders that is investigated as well as the position vis-à-vis various codes of conduct. Human rights also relates to policy, management, reporting, and performance. Positive products and services go into the share of turnover that comes from particular economic activities such as health care, waste disposal, energy

efficiency. Stakeholder issues relate to stakeholder engagement and management and to employee issues, to customer and supplier relationships, and to community involvement. Other ethical concerns relate to the involvement of the firm with issues as animal testing, gambling, pornography, or tobacco. To assess the firms' policies, EIRIS has a scoring table which consists of six scales or grades. We give a score of 3 to the high positive grade, 2 to med positive, 1 to low positive, -1 to low negative, -2 to med negative, and -3 to high negative. Firm characteristics are derived from BankScope. This is a database about banks and financial institutions and used a lot in the economics literature (see, for example, Claessens et al., 2001). Financial market information is derived from DataStream.

We took the financial institutions in EIRIS as the starting point for our sample.[4] EIRIS has information about social, ethical, and environmental policies for 412 financial institutions. In BankScope, we were able to derive information about 239 of these institutions. DataStream provided information about 236 institutions that also were in the EIRIS and in the BankScope databases. From these 236 institutions we picked the 56 largest ones that were involved in project finance on the basis of the league tables in Project Finance Magazine composed by Dealogic, and checked for project finance on their websites. We had all information regarding CSR policies, firm characteristics and risk and return of 27 of the EP adopters. The key characteristics of our dataset are presented in table 3.1. It gives, among others, the average score or value and standard deviation for indicators of CSR (in fact, we used factor analysis, see section 3.4 below) as well as for firm characteristics and financial market indicators for the two subgroups (i.e. EP banks and banks involved in project finance but not adopters of the EP).

3.4 Results

In this section, we first analyze whether the adopting banks differ from those that did not adopt the EP. We try to find out whether there are significant differences in firm characteristics, performance and in social, ethical and environmental policies of the two groups. To this extent we first perform tests for the equality of means. The issue here is whether the performance of the two groups of banks does significantly differ (or not).

[4] As EIRIS tries to gather as much information on quoted companies as possible , we do not particularly expect a sample bias

Table 3.1. Descriptive Statistics and test for equality of means

		number of banks	mean	standard deviation	min.	max	t-stat.[a]	t-stat.[b]
Size								
Number of Employees[c]	N	41	36,195	26,107	1,472	126,488	4.12***	4.21***
	E	19	95,925	79,792	12,487	315,434		
Total Assets (million US$)[c]	N	56	304,839	321,806	12,781	1,533,036	3.05***	2.89***
	E	31	666,586	482,386	3,292	1,484,101		
Equity (million US$)[c]	N	56	15,950	11,917	1,099	55,741	2.1**	1.78*
	E	31	33,422	31,372	123	111,155		
Deposits & Short term funding	N	56	192,179	202,786	1,505	905,893	3.43***	3.49***
(million US$)[c]	E	31	458,314	333,023	3,113	1,009,238		
Net Income (million US$)[c]	N	56	2,160	1,815	−128	7,546	1.79*	1.53
	E	30	3,764	4,769	−4,960	17,273		
Total Deposits (million US$)[c]	N	55	153,121	168,179	0	810,862	3.59***	3.7***
	E	31	381,875	271,654	3,113	813,301		
Loans (million US$)[c]	N	56	116,730	115,222	0	561,378	3.79***	3.66***
	E	31	287,890	204,188	2,705	733,527		

Table 3.1. Descriptive Statistics and Test for Equality of Means (continued)

		number of banks	mean	standard deviation	min.	max.	t-stat.[a]	t-stat.[b]
Structure								
Tier 1 Ratio (%)	N	36	8.8	2.4	5.3	17	−1.33	−1.41
	E	22	8.1	1.8	5.3	12.3		
Net Loans / Total Assets (%)	N	56	50.3	23.4	0	94	−0.13	−0.14
	E	31	49.8	14.9	16.9	82.2		
Equity / Total assets (%)	N	56	8.7	8.1	2.3	46.7	−2.94***	−3.32***
	E	31	5.2	2	2.2	9.2		
Total Capital Ratio (%)	N	38	12.7	2.8	9.5	21.2	−1.08	−1.23
	E	22	11.9	1.7	9.7	16.6		
Operating Profit								
Return on Average Equity	N	56	13.8	5.8	−2	29.3	−0.7	−0.6
(ROAE; %)	E	30	12.6	9.8	−20.6	24.3		
Net Interest Margin (%)	N	56	2.9	3.9	−1.2	19.9	−1.48	−1.95*
	E	30	1.8	1.1	0.4	4.9		
Return on Average Assets	N	56	1.1	0.7	−0.1	3.7	−2.71***	−2.99***
(ROAA; %)	E	30	0.7	0.5	−0.7	1.7		

Table 3.1. Descriptive Statistics and Test for Equality of Means (continued)

		number of banks	mean	standard deviation	min.	max.	t-stat.[a]	t-stat.[b]
Pre-tax operating income	N	50	1.5	1.3	−0.2	2.5	−1.99**	−2.45**
/ Average assets (%)	E	25	0.9	0.6	−0.3	2.7		
Cost to income ratio (%)	N	56	58.7	14.5	26.1	87.4	0.49	0.56
	E	30	60.2	9.3	41	79.7		
Stock Market Performance								
Average Stock Market Returns	N	52	0.10	0.05	−0.03	0.29	1.87*	1.63
(% per day jan03-jun06)	E	30	0.12	0.08	0.02	0.35		
Beta	N	54	1	0.42	0.26	1.85	1.96*	1.95*
(correlation with market index)	E	30	1.19	0.43	0.29	2.03		
Volatility (Standard Deviation	N	52	1.40	0.40	0.80	3.00	1.95*	1.66
of Stock Market Returns;%)	E	30	1.70	0.80	0.40	3.40		
CSR Performance								
Stakeholders[d]	N	56	0.33	0.99	−1.27	1.93	1.97*	2.05**
	E	31	0.74	0.85	−1.04	2.07		
Governance[d]	N	56	0.34	0.78	−1.89	1.33	0.88	0.89
	E	31	0.5	0.74	−1.96	1.27		

Table 3.1. Descriptive Statistics and Test for Equality of Means (continued)

		number of banks	mean	standard deviation	min.	max.	t-stat.[a]	t-stat.[b]
Environment[d]	N	56	0.15	1.04	−0.79	2.31	2.46**	2.43**
	E	31	0.73	1.08	−0.73	2.39		

Sources: Bankscope, Datastream, Ethical Investment Research Services (EIRIS)

E =Banks that adopted the Equator Principles, N=Banks that did not adopt the Equator Principles. See Appendix III for a list of the banks included in the analysis. All data are for the accounting year 2005, except for stock market returns (2003-2006). *, **, *** denote significance at 10%, 5%, and 1% respectively.

a t-test for equality of means, equal variances assumed.

b t-test for equality of means, equal variances not assumed.

c t-test for equality of means conducted on the natural logarithm of the variable to account for the non-normality of the data.

d Factor scores of CSR indicators, see table 3.2 for the factor analysis results.

Secondly, we conduct an event study to find out whether EP adoption does impact on the financial market value of the signatory banks. We stress the explorative nature of the analysis and as such, the analysis can be best interpreted as a descriptive study.

3.4.1 Descriptives and t-test of Equality of Means

As an explorative investigation, we test whether the mean scores of the two groups on the CSR variables, firm characteristics, and financial risk and return are significantly different. In the last two columns of table 3.1, we give the results of our tests for equality of the means of the variables. We present two t-statistics, one where we assume equal variances for both groups, and one were we do not assume equal variances. As to the CSR variables, we calculate factor scores based on a list of indicators that are in the EIRIS dataset. The values of the indicators are integer and range from -1 to 3. We conduct factor analysis on the initial 412 financial institutions in the EIRIS dataset and extract three factors. We label these three factors "Stakeholders", "Governance", and "Environment". The list of indicators and the factor loadings are in table 3.2. Table 3.1 shows that the financial institutions that adopted the EP have a significantly higher score on Environment and Stakeholders.

For the firm characteristics, we have the surprising finding that almost all the size related firm attributes are significantly different at the 1% level. Institutions that adopted the EP are significantly larger than those that did not. This hints at the notion - put forward in section 3.2 - that CSR behavior is especially displayed by banks that are in the spotlight. Adhering to the Equator Principles then can be seen as a way of reputation management. As to the financial structure of the banks, for equity to total assets the two groups are significantly different from one each other at the 5% level. When it comes to operating profits, we see that EP banks have a significantly lower Return on Average Assets, indicating that there might be real costs associated with signing up to the Principles. However, our test is not suitable to establish any causality. Also, we did not directly test the costs so we cannot confirm C. Wright and Rwabizambuga (2006) idea that CSR screening is difficult and costly. Furthermore, we establish that for the remaining items the differences between the two groups are not significantly different at 5%. As to the financial market perspective, table 3.1 shows that financial return, beta's and financial risk of the two groups of institutions are not that much different from each other. Where we do find significance, it is not very strong (only at 10%) and not very robust, i.e. one would have to assume identical variances. This does not

Table 3.2. Factor analysis of corporate social responsibility indicators

Pattern Matrix	Factor Loading		
Variable	*Stakeholders*	*Governance*	*Environment*
Environmental policy	0.04	0.06	**0.86**
Environmental management	-0.07	0.03	**0.97**
Environmental reporting	0.00	0.08	**0.68**
Environmental impact improvement	0.26	-0.04	**0.51**
Governance of bribery and corruption	0.06	**0.74**	0.06
Governance of codes of ethics	0.03	**0.92**	0.01
Codes of ethics system	0.06	**0.56**	0.20
Codes of ethics communicated	-0.03	**0.83**	0.04
Stakeholder policy	**0.58**	0.49	-0.04
Stakeholder system	**0.93**	0.15	-0.07
Stakeholder engagement	**0.71**	0.13	0.07
Stakeholder reporting	**0.80**	-0.07	0.10
Equal opportunity policies	0.26	**0.57**	0.07
Equal opportunity systems and practices	**0.75**	0.06	0.08
Health and safety system	**0.67**	0.03	0.19
Job creation & security	**0.77**	-0.10	0.00
Trade union participation	**0.42**	-0.28	0.17
Customer & supplier policies	**0.46**	0.16	0.09
Customer & supplier systems	**0.79**	0.13	-0.04
Community involvement	**0.45**	0.33	0.05

Extraction Method: Maximum Likelihood.
Rotation Method: Oblimin with Kaiser Normalization
Source: Ethical Investment Research Services (EIRIS)

imply that adopting the EP can not be linked to actual less risky performance. A decomposition of financial risk of the EP banks might feature significant differences in size and leverage. This is in line with the general finding in the finance literature which asserts that 'being big' reduces risk (see Fama and French, 1993; Elton et al., 2002). Furthermore, as we lack exact data on banks' CSR performance in project finance, we cannot test whether actual free riding behavior (see Gunningham and Sinclair, 2002) does occur.

In all, we have established that financial institutions that adopted the EP show a significantly higher score on their CSR policies, are significantly larger and carry some extra costs compared to institutions which did not adopt. When we relate this to the hypotheses above, we arrive at a somewhat mixed conclusion. For some characteristics (most profitability and solvency indicators, and financial returns) we find that there is no significant difference between financial institutions that

did and those that did not adopt the EP. In this respect, these results are in line with hypothesis 1 of no differences implying that the socially responsible conduct of the financial institutions who adopted the EP is not priced. However, for other characteristics (almost all CSR indicators and for all size indicators) we do find a significant difference between the two groups. More specifically, the adopters score higher on CSR features, are larger and carry some extra cost. The combination of observing larger banks adopting the EP and observing lower operational profits for these banks suggests that 1.) Adopting the EP is not window-dressing, but exhibits real costs. 2.) For larger banks the benefits– which we think of as being reduced risk, albeit not observable in the financial data– of signing up outweigh these costs.

So far, however, our "analysis" yields more questions than answers and a thorough econometric approach is needed to properly analyze these issues, which is beyond the scope of this chapter. However, our preliminary findings give at least some idea of the direction in which future research should be heading.

3.4.2 Event Study

In order to assess the impact of adoption of the EP on financial return, we conduct an event study. The event is the announcement that the bank has adopted the EP. We proceed to perform an event study as suggested by MacKinlay (1997). First, we calculate daily returns of the return index for every signatory party with a quotation on the stock market (see the appendix), as well as the daily returns of corresponding country indices (see the appendix). Using these returns we then estimate normal returns. We use an estimation window of 60 days. The estimation window ranges from 90 days prior to the event till 30 days prior to the event. The choice of the length of the event window is somewhat arbitrary, but generally the results are robust to variation. For these samples we estimated four different factor models, which we describe below. Using a multi-factor market model one assumes that a security's daily return is correlated with the market index as well as other relevant factors, for example macroeconomic indices. The model specification is linear:

$$R_{i,t} = \alpha + \beta R_{m,t} + \epsilon_t$$

Here $R_{i,t}$ is the daily return of bank i, $R_{m,t}$ is a vector of daily returns of the underlying factors, and ϵ_t is an error term. We estimate this equation using Ordinary Least Squares. For model 1 we use a single-factor approach: the main local market index. For model 2 we estimate a two-factor model in line with Flannery and James (1984).

Here, the first factor is the local market index and the second factor is an index of a constant maturity default-free bond. For model 3 we use the return of a world financials index in combination with the return on an index of a constant maturity default-free bond. Finally, in model 4, we estimate a three-factor model, using the return of a local market index, the return on a world financials index, and the return on an index of a constant maturity default-free bond. We assume the error term has an expectation equal to zero and calculate the standard deviation of the error term for statistical inference. It is well-known that there exist particular characteristics associated with daily stock returns, such as (Generalized) Auto-Regressive Conditional Heteroskedasticity ((G)ARCH). However, as S. J. Brown and Warner (1985) show, tests ignoring these characteristics are well-specified and daily returns generally present few difficulties for event studies.

Using the parameters of the fitted model we then calculate abnormal returns, which are defined as the daily returns minus the expected returns based on our model specification. We calculate the abnormal returns for the period of 10 days prior to the event until 10 days after the event. Again, this choice is arbitrary, yet conventional. We average the abnormal returns of all EP banks around the event date. These data are in table 3.3. Since the abnormal returns have expectation zero and standard deviation equal to the standard deviation of the error term, we can test whether abnormal returns around the event date are significantly different from zero. According to Kothari and Warner (2006), any cross-correlation due to the fact that banks adopt on the same date is accounted for when estimating a factor model. For this purpose, we calculate the cumulative abnormal returns (CAR), for different event windows.

The CARs are depicted in Figure 3.1 a)- d) and are associated with our models 1, 2, 3, and 4, respectively. The graphs all display a period of 10 days prior the event until 10 days after the event. The graphs also show 10% significance boundaries. Moreover, table 3.4 presents CARs and associated t-statistics and probability values for our models for several event windows. For example [-1, 1] means that the cumulative abnormal returns have been calculated for the period of one day before the event till one day after the event. From our figures it becomes clear that EP adoption, on average, does not result in abnormal returns that are significantly higher or lower than what is to be expected. Table 3.4 confirms this for several event windows. Also, we show additional robustness checks in the form of testing for the subsample of the initial banks (model 4a) that together announced the adoption of the EP on June 4th 2003, as well as for the sample of the latest 15 adopters (model

Table 3.3. Abnormal Returns for event study after the effect of adopting the Equator Principles

	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 4a**		**Model 4b**	
day	AR	*t-stat.*	AR	*t-stat.*	AR	*t-stat.*	AR	*t-stat.*	AR	*t-stat.*	AR	*t-stat.*
-10	0.07	(1.10)	0.04	(0.69)	0.02	(0.19)	0.04	(0.64)	0.02	(0.52)	−0.02	(−0.44)
-9	−0.09	(−1.37)	−0.09	(−1.44)	−0.07	(−0.88)	−0.09	(−1.50)	−0.05	(−1.59)	−0.02	(−0.61)
-8	−0.03	(−0.43)	−0.04	(−0.62)	−0.09	(−1.15)	−0.05	(−0.83)	0.00	(0.09)	−0.02	(−0.60)
-7	−0.05	(−0.77)	−0.05	(−0.86)	−0.03	(−0.34)	−0.05	(−0.87)	−0.01	(−0.23)	−0.04	(−1.04)
-6	0.05	(0.83)	0.05	(0.83)	−0.06	(−0.74)	0.04	(0.70)	0.00	(0.12)	0.05	(1.32)
-5	0.05	(0.78)	0.06	(0.89)	0.03	(0.41)	0.05	(0.79)	0.04	(1.17)	0.00	(0.05)
-4	0.06	(1.01)	0.07	(1.04)	0.05	(0.67)	0.06	(0.94)	0.01	(0.43)	0.03	(0.80)
-3	−0.07	(−1.15)	−0.05	(−0.82)	−0.19**	(−2.37)	−0.07	(−1.13)	−0.04	(−1.27)	0.00	(0.06)
-2	−0.01	(−0.11)	0.01	(0.12)	−0.03	(−0.35)	0.01	(0.16)	−0.02	(−0.71)	0.05	(1.29)
-1	−0.12*	(−1.93)	−0.14**	(−2.16)	−0.15*	(−1.87)	−0.15**	(−2.43)	−0.02	(−0.69)	−0.07*	(−1.85)
0	0.04	(0.62)	0.04	(0.71)	0.06	(0.79)	0.03	(0.52)	−0.02	(−0.60)	0.02	(0.60)
1	0.10	(1.56)	0.10	(1.52)	0.09	(1.10)	0.09	(1.49)	−0.02	(−0.61)	0.03	(0.84)
2	0.01	(0.17)	0.02	(0.24)	0.11	(1.32)	0.02	(0.33)	−0.01	(−0.38)	0.03	(0.88)
3	0.23***	(3.67)	0.25***	(3.91)	0.23***	(2.84)	0.26***	(4.10)	0.01	(0.30)	0.21***	(5.43)
4	−0.10	(−1.50)	−0.09	(−1.49)	−0.09	(−1.15)	−0.09	(−1.44)	0.01	(0.43)	−0.04	(−0.90)
5	0.05	(0.75)	0.04	(0.63)	−0.01	(−0.11)	0.03	(0.48)	0.03	(0.79)	0.00	(0.06)
6	−0.03	(−0.42)	0.01	(0.19)	0.06	(0.73)	0.01	(0.22)	−0.04	(−1.17)	0.02	(0.49)
7	−0.05	(−0.83)	−0.06	(−0.92)	−0.13	(−1.59)	−0.07	(−1.15)	0.01	(0.29)	−0.02	(−0.58)
8	−0.03	(−0.45)	−0.01	(−0.20)	−0.13	(−1.59)	−0.01	(−0.20)	−0.03	(−0.79)	−0.02	(−0.62)
9	−0.05	(−0.76)	−0.05	(−0.77)	−0.07	(−0.86)	−0.06	(−0.93)	−0.03	(−0.98)	−0.05	(−1.34)
10	−0.15**	(−2.37)	−0.13**	(−2.10)	−0.14*	(−1.73)	−0.12*	(−1.93)	−0.01	(−0.19)	−0.06	(−1.56)

AR = Abnormal Returns, *t-stat.* = Student's t-statistic, AR values calculated using factor models: $R_i = \alpha + \beta R_m + \epsilon$, where R_i is bank i's return and R_m a vector of market indices that serve as proxies for the underlying factors. For the factors we have used a model with a single local financial index for model 1, a two-factor model using a local index and an index of constant maturity default-free bonds for model 2, a two-factor model using a "financials" index and an index of constant maturity default-free bonds for model 3, and a three-factor model using a local index, a "financials" index, and an index of constant maturity default-free bonds for model 4. Model 4a relates to the initial adopters; 4b to the latest 15. Estimation window = [-90,-30]. For a list of the indices used see Appendix II.*,**, ***, significant at the 10%,5%,1% level respectively (two-tailed).
Source: Datastream.

4b).

Apparently, the news of banks adopting the EP is "no news" to the stock market. We give four possible interpretations. First, it could literally be no news, in the sense that adoption is a formality and these banks already conducted their business in line with the EP. Second, shareholders might feel that although the adoption is a good signal, factual information and transparency of projects is still lacking and hence they do not see this as valuable or, for that matter, credible information. Third, shareholders might think that there is no relation between good moral standards and good business. Fourth, project finance is just a small part of the ban-

Table 3.4. Event study results after the effect of adopting the Equator Principles on stock market returns

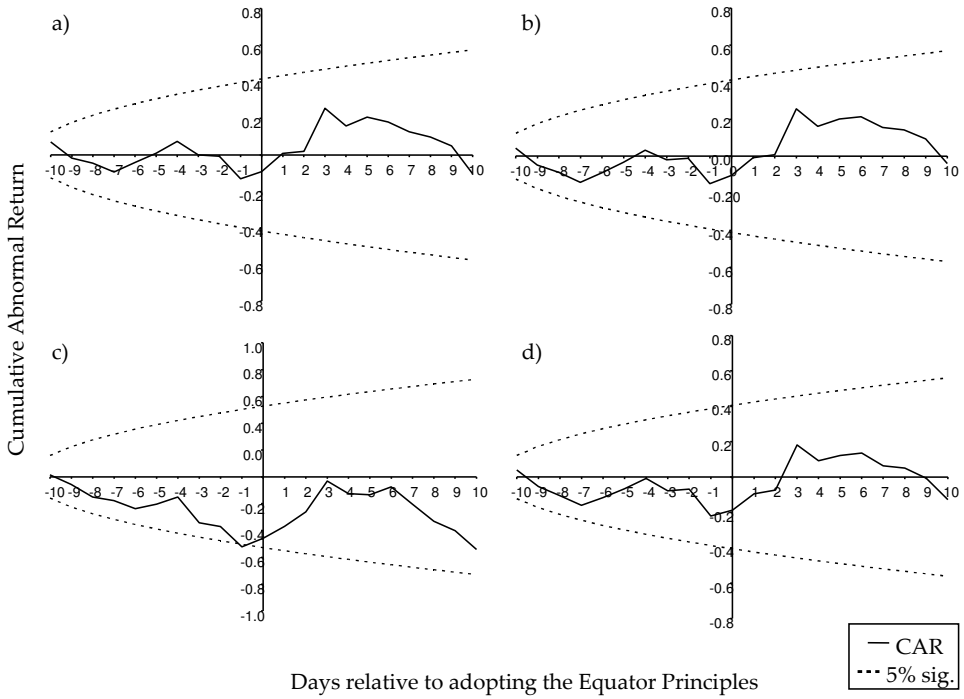
Event Window	**Model 1** CAR (*t-statistic*)	**Model 2** CAR (*t-statistic*)	**Model 3** CAR (*t-statistic*)	**Model 4** CAR (*t-statistic*)	**Model 4a** CAR (*t-statistic*)	**Model 4b** CAR (*t-statistic*)
[0]	0.04	0.045	0.064	0.033	−0.02	0.023
	(*0.619*)	(*0.707*)	(*0.785*)	(*0.523*)	(*−0.603*)	(*0.597*)
[-1,1]	0.016	0.004	0.002	−0.026	−0.064	−0.016
	(*0.14*)	(*0.036*)	(*0.011*)	(*−1.311*)	(*−1.095*)	(*−0.234*)
[-2,2]	0.019	0.027	0.081	0.004	−0.1	0.069
	(*0.136*)	(*0.191*)	(*0.446*)	(*0.031*)	(*−1.336*)	(*0.789*)
[-5,5]	0.247	0.29	0.103	0.238	0.016	0.224
	(*1.164*)	(*1.38*)	(*0.384*)	(*1.15*)	(*0.178*)	(*1.604*)
[-10,10]	−0.102	−0.04	−0.542	−0.128	−0.17	0.089
	(*−0.35*)	(*−0.137*)	(*−1.458*)	(*−0.446*)	(*−1.108*)	(*0.498*)

CAR = Cumulative Abnormal Returns, *t-stat.* = Student's t-statistic, CAR values calculated using factor models: $R_i = \alpha + \beta R_m + \epsilon$, where R_i is bank i's return and R_m a vector of market indices that serve as proxies for the underlying factors. For the factors we have used a model with a single local financial index for model 1, a two-factor model using a local index and an index of constant maturity default-free bonds for model 2, a two-factor model using a "financials" index and an index of constant maturity default-free bonds for model 3, and a three-factor model using a local index, a "financials" index, and an index of constant maturity default-free bonds for model 4. Model 4a relates to the initial adopters; 4b to the latest 15. Estimation window = [-90,-30].
Source: Datastream.

king business. Then, the net economic impact of EP adoption is likely to be very limited. If project finance constitutes 2% of a banks business, and adopting the Equator Principles reduces the value of that business by 20%, the banks' stock market value will drop by 0.4%, which is a return well within their daily fluctuations on the stock exchange.

When the event studies are done for subsets of larger banks, smaller banks, and banks at the individual level, we do not observe any significant effect. The press releases surrounding the dates of the initial adoptions suggest a combination of the first two arguments made above, and economic rationale hints in the direction of the fourth argument made. Whatever the 'true' relation of financial performance and EP adoption might be, our results suggest that on a systematic basis there is no significant response to the news item itself. As such, the event study is congruent with hypothesis 1 which asserts that the feature of EP adoption is not priced in the financial markets. Even if it is priced, apparently this effect is negligible in practice.

Figure 3.1. Event study after the announcement effect of adopting the Equator Principles



CAR = Cumulative Abnormal Returns, CAR values calculated using factor models: $R_i = \alpha + \beta R_m + \epsilon$, where R_i is bank i's return and R_m a vector of market indices that serve as proxies for the underlying factors. For the factors we have used a model with a single local financial index for model 1, a two-factor model using a local index and an index of constant maturity default-free bonds for model 2, a two-factor model using a "financials" index and an index of constant maturity default-free bonds for model 3, and a three-factor model using a local index, a "financials" index, and an index of constant maturity default-free bonds for model 4. Estimation window = [-90,-30].
Source: Datastream.

3.5 Conclusion

On a voluntary basis, about 40 financial institutions have adopted the Equator Principles. In adopting these Principles, the banks seek to ensure that the projects they finance are developed in a manner that is socially responsible and reflects sound environmental management practices. The Equator Principles apply to project finance of projects with a total cost of at least US$ 10 million, predominantly in developing countries. The adopters were being accused by non-governmental organizations for window-dressing or greenwashing as the Equator Principles would not go far

enough in the direction of sustainable development and as the transparency of the projects is rather poor. The Principles is an example of self-regulation (see Carraro and Siniscalco, 1998) and result in stricter rules and policies than is required by traditional law. The Principles fill gaps that are left by traditional law (see Shelton, 2000). In this chapter, we investigated whether the institutions that adopted the Equator Principles are different from non-adopters. To this extent, we investigate their policies regarding social responsibility, their main firm characteristics, and their operational and financial market performance.

We find that the corporate social responsibility policies of the financial institutions parties that adopted the Equator Principles are rated significantly higher than those of financial institutions that did not sign up. Furthermore, the former are bigger. This confirms our notion that CSR behavior is especially displayed by banks that are in the spotlight. We could not relate the reduced risk to a decrease in signatories' reputation risk because of lack of data. Most financial and firm characteristics do not show significant differences between the two groups, although we do find some indirect evidence that signing up to the Principles is associated with higher costs, which would confirm the ideas of C. Wright and Rwabizambuga (2006). The combination of observing larger banks adopting the EP and observing lower operational profits for these banks suggests that adopting the EP is not window-dressing but exhibits some real costs. For larger banks the benefits - which we think of as being reduced risk, albeit not observable in the financial data - of signing up outweigh these costs. Several event studies showed that shareholders did not react negatively to signing up; implying that shareholders expected that adhering to the Equator Principles does not significantly affect shareholder value. The reason could be that for large banks, project finance is just a small part of their total business, or it reflects that there is no direct trade-off between CSR and stock returns.

Overall, the evidence leads us to conclude that there really are some distinctive features between the banks that did adopt the Equator Principles and those that did not. Especially, the social responsibility of the former is rated higher and they are considerably large than the non-adopters. Probably given the small size of project finance in total banking business, we do not find a significant impact on the adopters' stock market value when they announce adoption. We argue that adoption is undertaken by banks that pay a lot of attention to CSR policies and conduct. By adopting the Equator Principles, they can signal this to the public, as the adoption of the principles receives a lot of media attention. Adoption comes at some costs, but it also improves the adopters' reputation and, as such, positively impacts on

the risk profile of the adopter. In order to assess whether the Equator Principles really result in the intended goals we need to have reliable data about the projects and their characteristics, which calls for international accounting standards with respect to environmental, social, and ethical performance. This is also necessary in order to assess whether free riding actually does occur. Further research after the Equator Principles especially would need to address these issues.

3.A Appendix

Table 3.A.1. List of private banks, their country of charter, and adoption date of the Equator Principles (list closed at 7/10/2006)

Bank	Country	Date of adoption
ABN AMRO Bank, N.V. [ab]	Netherlands	June 4, 2003
Banco Bradesco[b]	Brazil	September 8, 2004
Banco do Brasil	Brazil	March 3, 2005
Banco Espirito Santo (BES)[b]	Portugal	August 16, 2005
Banco Ita BBA[b]	Brazil	August 12, 2004
Bank of America[b]	US	April 15, 2004
Bank of Tokyo Mitsibishi (BTM)	Japan	December 22, 2005
Barclays plc [ab]	UK	June 4, 2003
BBVA Bank[b]	Spain	May 18, 2004
BMO Financial Group	Canada	September 15, 2005
Caja Navarra	Spain	January 9, 2006
Calyon[a]	France	June 4, 2003
CIBC Bank[b]	Canada	December 3, 2003
Citigroup Inc. [ab]	US	June 4, 2003
Credit Suisse Group [ab]	Switzerland	June 4, 2003
Dexia Group[b]	Belgium	September 18, 2003
Dresdner Bank	Germany	August 18, 2003
Eksport Kredit Fonden	Denmark	May 14, 2004
FvO	Netherlands	October 19, 2005
Fortis[b]	Netherlands	February 17, 2006
HSBC Group[b]	UK	September 4, 2003
HVB Group[a]	Germany	June 4, 2003
ING Group[b]	Netherlands	June 23, 2003
JPMorgan Chase[b]	US	April 25, 2005
KBC Bank[b]	Belgium	January 27, 2004
Manulife	Canada	May 11, 2005
MCC Bank	Italy	July 29, 2003
Millenium BCP	Portugal	January 2, 2006
Mizuho Corporate Bank[b]	Japan	October 27, 2003
NedBank[b]	South-Africa	November 10, 2005
Rabobank Group[a]	Netherlands	June 4, 2003
Royal Bank of Canada[b]	Canada	July 21, 2003
Scotiabank[b]	Canada	January 18, 2005
Standard Chartered Bank[b]	UK	October 8, 2003
Sumitomi Mitsui Banking Corp. (SMBC)[b]	Japan	February 23, 2006
The Royal Bank of Scotland [ab]	UK	June 4, 2003
Unibanco[b]	Brazil	June 1, 2004
Wells Fargo[b]	US	July 11, 2005
WestLB AG[a]	Germany	June 4, 2003
Westpac Banking Corporation [ab]	Australia	June 4, 2003

a. belongs to the ten banks that announced on June 4, 2003 that they were adopting the Principles.
b. institutions about which we had all data and that were used in our analyses.

Table 3.A.2. List of indices and interest rates used in the event studies in section 3.4.2

Country	**Index Used**	**Interest Rate used**
Australia	ASX ALL ORDINARIES	AUSTRALIA BENCHMARK BOND 10 YR
Belgium	BEL 20	BELGIUM BENCHMARK BOND 10 YR
Brazil	BRAZIL BOVESPA	BRAZIL CDI - MIDDLE RATE
Canada	S&P/TSX COMPOSITE INDEX	CANADA BENCHMARK BOND 10 YR
Japan	TOPIX	JAPAN BENCHMARK BOND -RYLD.10 YR
Netherlands	AEX INDEX (AEX)	NETHERLAND BENCHMARK BOND 10 YR
Portugal	PORTUGAL PSI-20	PORTUGAL BENCHMARK BOND 10 YR
South-Africa	FTSE/JSE ALL SHARE	SOUTH AFRICAN LONGEST DATED
Spain	IBEX 35	SPAIN BENCHMARK BOND 10 YR
Switzerland	SWISS MARKET	SWITZERLAND BNCHMRK. BOND 10 YR
UK	FTSE ALL SHARE	UK BENCHMARK BOND 10 YR
US	S&P 500 COMPOSITE	US TREAS.BENCHMARK BOND 30 YR
World	MSCI WORLD FINANCIALS	

Source: Datastream.

Table 3.A.3. List of included banks and their country of charter for the descriptive statistics and tests for equality of means in section 3.4.1

Bank	Country	Bank	Country
Citigroup	USA	Prudential Financial	USA
J P Morgan Chase & Co.	USA	Lloyds TSB Group	UK
HSBC Holdings	UK	Uni Credito Italiano	Italy
Bank of America	USA	US Bancorp	USA
The Royal Bank of Scotland Group	UK	National Australia Bank	Australia
Mitsubishi Tokyo Financial Group	Japan	Nomura Holdings	Japan
Mizuho Financial Group	Japan	Com.wealth Bank of Australia	Australia
Credit Agricole	France	Suntrust Banks	USA
ING Groep	Netherlands	San Paolo-IMI	Italy
Wells Fargo	USA	Nordea	Sweden
Sumitomo Mitsui Financial Group	Japan	Lehman Bros	USA
Credit Suisse Group	Switzerland	Commerzbank	Germany
Barclays	UK	Resona Holdings	Japan
Banco Bilbao Vizcaya Argentaria	Spain	ANZ Bank	Australia
UFJ Holdings	Japan	National City	USA
Fortis	Belgium	Toronto-Dominion	Canada
Bayerische Hypo- und Vereinsbank	Germany	BB&T	USA
ABN-Amro Holding	Netherlands	Danske Bank	Denmark
Royal Bank of Canada	Canada	Bank of Montreal	Canada
KBC Groupe	Belgium	DBS Group Holdings	Singapore
Dexia	Belgium	Banca Monte dei Paschi di Siena	Italy
Bank of Nova Scotia	Canada	Capitalia	Italy
Canadian Imperial Bank	Canada	Bank of New York	USA
Westpac Banking Corporation	Australia	Bank Austria Creditanstalt	Austria
Standard Chartered	UK	Old Mutual	UK
Sumitomo Trust & Banking	Japan	Fifth Third Bancorp	USA
Banco Comercial Portugues	Portugal	BOC Hong Kong (Holdings)	Hong Kong
Mitsui Trust Holdings	Japan	Takefuji	Japan
Mizuho Trust and Banking	Japan	North Fork Bancorporation	USA
Banco Espirito Santo	Portugal	United Overseas Bank	Singapore
Manulife Financial	Canada	Acom	Japan
Banco Santander Central Hispano	Spain	PNC Financial Services Group	USA
Wachovia	USA	Shinsei Bank	Japan
BNP Paribas	France	Skandinaviska Enskilda Banken	Sweden
Deutsche Bank	Germany	Golden West Financial	USA
UBS	Switzerland	Banca Nazionale del Lavoro	Italy
HBOS	UK	Keycorp	USA
Merrill Lynch	USA	Natexis Banques Populaires	France
Société Générale	France	Banche Popolari Unite	Italy
Morgan Stanley	USA	Mediobanca	Italy
Goldman Sachs Group	USA	CIT Group	USA
Banca Intesa	Italy	Promise Company	Japan
Macquarie Bank	Australia	Shizuoka Bank	Japan
Industr. & Commerc. Bank of China	Hong Kong		

Chapter 4

Socially Responsible Investment in an Overlapping Generations Model

4.1 Introduction

A problem of growing concern is the threat to the environment resulting from polluting economic activity. From economic theory we know that there is an externality associated with the conservation of the environment. This externality exhibits two dimensions. First, there is an intra-generational dimension. The environment is a public good and as such its conservation suffers from the standard free rider problem. Second, there is an inter-generational dimension. Since pollution typically accumulates, future generations bear the costs of the actions of the current generation. Various studies have proposed fiscal policy measures to manage the long-term threat of pollution to the environment in order to achieve sustainable development. This chapter proposes an alternative mechanism to deal with the inter-generational aspect of the pollution externality.

In recent years, not only policy makers, but also large corporations have put sustainable development on their agenda. Corporations publicly report that they engage in corporate social responsibility (CSR) or sustainability programs. This attitude creates the possibility of socially responsible investment (SRI). In 2005, about one out of every ten dollars under professional management in the United States

This chapter is an adapted version of Dam (2006b).

was involved in socially responsible investing.[1] The idea is that shareholders do not only care about the cash flows of a project, but also about how these cash flows are generated. For instance, an investor might oppose to use child labor or heavily polluting technologies in production processes. Socially responsible investment funds, or "green funds", allow the stock market to function as a tool in dealing with environmental externalities. Typically agents are short-lived, so they do not internalize the long-term effects of pollution. However, in the presence of a forward looking stock market, we show that proper valuation can resolve the coordination failure between current and future generations.

To capture the conflict between generations, we study the environment in a Diamond type overlapping generations (OLG) model, in line with John and Pecchenino (1994, JP). Agents live for two periods. They work when they are young, retire and derive utility from consumption and environmental quality when they are old. We adapt the model of JP such that, instead of choosing between consumption and *environmental maintenance*, agents choose between investing in bonds and corporate shares. The novelty of our model is that investors acknowledge that as owners of the firm they are also responsible for the generation of the externality. The change from a consumption into an investment decision allows us to introduce and analyze the role of a stock market. Magill and Quinzii (2003) point out that when corporate ownership rights are traded separately on a stock market, externalities or frictions can push the value of equity away from the value of real capital goods. The introduction of this "missing market" can potentially deal with the negative externality of pollution in a natural way, as especially the stock market can be characterized by its forward-looking nature.

We are not the first to study the threat to the environment in a Diamond-type OLG model (John and Pecchenino, 1994; John et al., 1995; Guruswamy Babu et al., 1997; Zhang, 1999; Seegmuller and Verchère, 2004; Wendner, 2006). This literature shows that a social optimum will arise if 1) market failures are corrected using Pigovian taxes or environmental regulations and 2) an optimal distribution of welfare is achieved using lump-sum transfers or the accumulation/repayment of public debt. The proposed tax programs are usually not straightforward, because they often require the use of various instruments. The reason is that even without environmental externalities the decentralized economy need not be Pareto-optimal.[2] However, the fact that in the presence of market frictions the value of financial

[1] Social Investment Forum, 2005 Report on Socially Responsible Investing Trends in the United States.

[2] This is the well known result of Diamond (1965) that agents can over- or under invest in physical capital compared to the Golden Rule solution.

equity is not necessarily equal to the replacement value of physical capital is a possibility that has not been explored in the literature mentioned above. This chapter is also closely related to Mäler (1994) in which property rights on renewable resources are traded between generations. Mäler (1994) shows that in such a setting, the market solution is optimal in the first-best sense, which is in accordance with the Coase (1960) Theorem.

The introduction of a stock market in an OLG model brings some technical complications that we address in this chapter. Various studies discuss the indeterminacy of asset prices in OLG models (See, for example, Woodford, 1984; Tirole, 1985; Huffman, 1986; Magill and Quinzii, 2003). However, we show that our model does not suffer from this indeterminacy.

In section 4.2 we present the core of the model. We describe preferences and technology and calculate the benchmark equilibrium for the case of a central planner. In section 4.3 we turn to the discussion on socially responsible investment and its consequences for corporate valuation and reporting on firm value. We show that when introducing a stock market, proper valuation resolves the coordination problem. We briefly discuss dynamics. We conclude in section 4.4.

4.2 A two sector environmental OLG model

We introduce environmental quality in a standard Diamond (1965) OLG model. Environmental quality is modeled as a renewable resource. Pollution due to production decreases the 'stock' of environmental quality. In this section we discuss technology, consequences for environmental quality, and household preferences.

4.2.1 Technology, preferences and environmental quality

Output is represented by a linear homogeneous production function $F(K_t, L_t)$ where K_t denotes the capital stock and L_t labor used at time t. Capital invested at t, denoted I_t, becomes productive at $t+1$. Firms depreciate capital at a uniform rate δ:

$$K_{t+1} = (1-\delta)K_t + I_t \tag{4.1}$$

Because of constant returns to scale, we can rewrite output as a function of per capita capital k_t: $F(K, L) = f(k_t)L_t$ where $f(k_t)$ is production per capita. We use lower case letters, i_t, k_t, c_t, to denote per capita investment, capital, and consumption. Ca-

pital K_t creates contemporaneous pollution. We assume there is a linear relation between capital and pollution and as a consequence we are free to choose our unit of account of pollution. We normalize such that one unit of capital creates one unit of pollution.

Environmental quality E_t is modeled as a renewable resource (see JP, 1994):

$$E_{t+1} = (1-\beta)E_t - K_{t+1} \tag{4.2}$$

with $0 < \beta < 1$ representing the rate of natural recovery. Without pollution, environmental quality will return to its virgin value which is equal to zero. Note that E_t takes only non-positive values; $E_t \leq 0$. Basically, environmental quality is the negative of a stock of pollution.

At each date t a generation of finitely-lived consumers of fixed size L is born. Consumers live for two periods and have preferences defined over per capita consumption c_{t+1} and environmental quality E_{t+1} at old age characterized by a utility function $u(c_{t+1}, E_{t+1})$. This simplification is quite common in OLG models which include environmental quality (see Guruswamy Babu et al., 1997 and JP, 1994). Since we focus on intergenerational conflicts due to investment choice (how are savings used), and not due to savings behavior (how much is saved), we can make this simplifying assumption without loss of generality.

4.2.2 A centrally planned economy

We calculate both the optimal transition path and the long-run efficient steady state benchmark equilibrium for the case of a central planner. Consider a central planner that maximizes a social welfare function that assigns a fixed weight $1/(1+R)$ to the utility of each generation, with the planner's discount rate $R > 0$. The planner maximizes:

$$\max \sum_{t=0}^{\infty} (1+R)^{-t} u(c_t, E_t) \tag{4.3}$$

subject to

$$c_t = f(k_t) + (1-\delta)k_t - k_{t+1} \tag{4.4}$$

$$E_t = (1-\beta)E_{t-1} - k_t \tag{4.5}$$

and given initial values k_0, E_0. Along the optimal path the following first-order condition must hold:

$$\frac{1-\beta}{1+\rho_{t+1}}[f'(k_{t+1}) - (\rho_{t+1} + \delta)] = f'(k_t) - (\rho_t + \delta) - \frac{u_{E_t}}{u_{c_t}}, \tag{4.6}$$

with $(1+\rho_{t+1}) \equiv (1+R)\frac{u_{c_t}}{u_{c_{t+1}}}$ the inverse of the marginal rate of intertemporal substitution. Equation (4.6) provides the planner with a simple investment rule. A hat on a variable denotes its steady state value. The steady state associated with equation (4.6) reads:

$$f'(\hat{k}) = R + \delta + \frac{1+R}{R-\beta}\frac{u_{\hat{E}}}{u_{\hat{c}}}. \tag{4.7}$$

We see that when the discount rate R goes to infinity, $f'(k)$ goes to infinity, implying (assuming Inada conditions) a steady state with zero production. In this case the planner allocates all capital in the first period to the old generation to use for consumption.

Next we turn to steady state efficiency. We substitute the steady state values of capital, consumption, and environmental quality in the utility function and choose the level of capital that maximizes utility $u(f(\hat{k}) - \delta\hat{k}, -\hat{k}/\beta)$. A steady state $(\hat{k}, \hat{E}, \hat{c})$ is steady state optimal if it satisfies the following first-order condition:

$$f'(\hat{k}) = \delta + \frac{1}{\beta}\frac{u_{\hat{E}}}{u_{\hat{c}}}. \tag{4.8}$$

We can see that the optimal path will lead to the efficient steady state if the planner's discount rate $R = 0$, since then the steady state solution of (4.7) is equal to (4.8), which is not very surprising since there is no time preference nor uncertainty in the model.

4.3 Competitive economy

In this section we study a stock market economy with socially responsible investors and compare the outcome to the social planner's allocation. Note that when we discuss the portfolio selection problem, we slightly change the interpretation of the second argument in the utility function. This does not imply, however, that we are comparing apples with oranges. We argue that *ex post* the equilibrium outcome can be compared to the benchmark case.

4.3.1 Consumers

Consumers inelastically supply one unit of labor when young at a real wage rate w_t, save all their wages, invest in either bonds or shares, yet to be defined, and consume when old. The price of the consumption good is the numeraire. For simplicity, we assume that firms do not issue new equity. This may seem quite restrictive. However, as we will show the Modigliani-Miller theorem holds. We can thus normalize the number of shares to one. A young agent j at time t takes as given the interest rate r_t and environmental quality E_t at time t, the price p_t per share and dividends d_t per share. He constructs a portfolio of b_t^j bonds and n_t^j shares to maximize his utility:

$$u(c_{t+1}^j, e_{t+1}^j), \tag{4.9}$$

with

$$e_{t+1}^j = n_t^j E_{t+1}. \tag{4.10}$$

The second argument e_{t+1}^j in the utility function captures two things. First, as before it reflects the level of environmental quality. Second, it measures to what extent consumer j feels that he is actually *responsible* for the level of environmental quality. The more shares n_t^j he owns of the polluting firm, the more he will feel responsible for the stock of the pollution. [3]

The consumer maximizes his utility (4.9) subject to:

$$c_{t+1}^j = b_t^j(1 + r_{t+1}) + n_t^j(p_{t+1} + d_{t+1}) \tag{4.11}$$

$$w_t = b_t^j + n_t^j p_t. \tag{4.12}$$

Equation (4.12) is the budget constraint. Socially responsible investment is modeled through equation (4.10). An investor acknowledges that, by buying shares of the firm, he is also partly responsible for the state of environmental quality. In fact, he behaves *as if* property rights on environmental quality are defined via his shareholdings. Nyborg et al. (2006) use a comparable approach in the context of socially responsible consumers and present a detailed discussion of the psychological background of "green consumerism". The investor has to make a trade-off between investing responsibly (in bonds) or irresponsibly (in the polluting firm);

[3] In fact, we overcome public good issues by assuming that each investor privately obtains a fraction of environmental pollution in proportion to his shareholdings, so that we can focus on the intergenerational externality.

to a socially responsible investor it matters how the cash-flows are generated. This type of modeling is standard in models of vertical differentiation where goods have a quality dimension (see, e.g. Tirole, 1988, p. 296-298) and has been applied to model green consumers (see e.g.,S. Bansal and Gangopadhyay, 2003; Cremer and Thisse, 1999). We simply push this type of modeling in the direction of investment behavior.

We assume that consumers have perfect foresight. The first-order optimality condition of the consumer problem takes the form of a pricing equation:

$$p_t = \frac{p_{t+1} + d_{t+1} + \Delta_{t+1} E_{t+1}}{1 + r_{t+1}}. \tag{4.13}$$

The current price equals the discounted future price plus dividends plus the stock of pollution times the marginal rate of substitution between environmental quality and consumption

$$\Delta_{t+1} E_{t+1} \equiv \frac{u_{E_{t+1}}}{u_{c_{t+1}}} E_{t+1}$$

which we define as the "externality" premium. We label this a premium since in the steady state the firm has to deliver a return equal to $d/p = r - E\Delta/p \geq r$ (remember that $E_t \leq 0$). With social damage, the return on an asset depends on characteristics other than direct financial gain.

We can also give an alternative interpretation to these non-financial characteristics, for instance, the investor might consider externalities to be liabilities such as potential environmental scandals or consumer boycotts. Hence, the externality premium represents any liability or negatively valued characteristic of the firm, or any subjective ethical concerns of investors, that cannot be directly observed in financial statements. This implies that even if the investor himself does not have ethical concerns, the social liabilities associated with irresponsibility give rise to an additional risk factor and premium.

In equilibrium the demand for shares equal the supply. Since the population size and the number of shares are normalized to one, each investor owns exactly one share and equation (4.10) reads $e_{t+1} = E_{t+1}$. This means that *ex post*, society acknowledges responsibility exactly in accordance with actual total pollution. This consistent equilibrium property allows us to compare the market outcome to the social optimum.

As the novelty of our model lies in how we approach socially responsible investment, we elaborate on this preference structure with an example. Suppose an

investor enjoys utility from living in or near a forest and has the opportunity to invest in either bonds or in a firm that uses wood to fuel its production. As owner of this firm, an investor acknowledges responsibility for the state and degradation of the forest and is therefore only willing to invest in the firm if there is a premium on the return on investment compared to the interest rate. Effectively, a socially responsible investor acts as if she privately acquired a parcel of the forest and requires payments whenever the firm decides to cut down some of her trees. By analogy, investing in bonds is not associated with gaining control over the firm and is therefore free of this externality-premium.

The broad interpretation of property and control rights plays a crucial role in classifying this type of investment as either *behavioral* or *rational*. Whether socially responsible investment is rational or not is subject of discussion, but it is certainly distinct from traditional behavioral economics. To conclude, socially responsible investment fits with theories such as compensating wage differentials (see e.g. Rosen, 1974) or vertical differentiation as used in environmental economics as mentioned above, but we can also interpret social responsibility as an additional risk factor, which is more in line with asset pricing theory.

4.3.2 Corporate behavior

At time t a firm issues corporate bonds B_t. For simplicity, we assume that firms do not issue new equity. We have:

$$F(K_{t+1}, L_{t+1}) - w_{t+1}L_{t+1} - (1 + r_{t+1})B_t + B_{t+1} = I_{t+1} + D_{t+1} \tag{4.14}$$

A firm can use its production net of labor payments and net interest payments to finance its real capital investments or to pay out dividends D_{t+1}. We choose a particular financing policy where firms issue one period bonds to finance investments, i.e. $B_t = I_t$. Rewriting (4.14), in per capita form using $d_t = D_t/L$, and rearranging we find:

$$d_{t+1} = f(k_{t+1}) - w_{t+1} - (1 + r_{t+1})i_t \tag{4.15}$$

where we have implemented the financing policy. We normalize the number of consumers and shares to one so that in equilibrium we find for the stock market

value of the firm:

$$v_t = \frac{v_{t+1} + d_{t+1} + \Delta_{t+1} E_{t+1}}{1 + r_{t+1}} \tag{4.16}$$

The total value of the firm m_t is equal to its share value plus debt value:

$$m_t \equiv b_t + v_t = \frac{f(k_{t+1}) - w_{t+1} - i_{t+1} + \Delta_{t+1} E_{t+1} + m_{t+1}}{1 + r_{t+1}} \tag{4.17}$$

which depends only on output and the financial structure does not make a difference (Modigliani and Miller, 1958).

A firm makes investments in real capital to maximize shareholder value according to (4.16). We let the optimal investment i_t^* at time t depend on the state variables k_t and E_t, such that for the firm's market value $v_t^* = v^*(k_t, E_t)$ we have:

$$v_t^* = \frac{f(k_{t+1}) - w_{t+1} - (1 + r_{t+1}) i^*(k_t, E_t) + \Delta_{t+1} E_{t+1} + v_{t+1}^*}{1 + r_{t+1}} \tag{4.18}$$

which is a Bellman Equation. The maximum principle then gives the following first-order conditions[4]:

$$\frac{1 - \beta}{1 + r_{t+1}} [f'(k_{t+1}) - (r_{t+1} + \delta)] = f'(k_t) - (r_t + \delta) - \Delta_t \tag{4.19}$$

$$f(k_t) - f'(k_t) k_t = w_t \tag{4.20}$$

We can see immediately that equation (4.19) is equivalent to the planner's solution (4.6), provided that the interest rate is equal to the marginal rate of intertemporal substitution of the planner, i.e. $1 + r_t = (1 + R) \frac{u'_{c_t}}{u'_{c_{t+1}}}$. If this is the case, than the stock market economy is both dynamically and steady-state efficient.

Iteratively substitute (4.19) and find:

$$f'(k_t) = (r_t + \delta) + \sum_{\tau=0}^{\infty} \frac{(1 - \beta)^\tau}{\prod_{i=0}^{\tau} (1 + r_{t+i})} \Delta_{t+\tau} \tag{4.21}$$

which states that the marginal product of one unit of capital today should equal the familiar $(r_t + \delta)$ plus the discounted sum of the externality premia Δ_t of of all future generations. Since pollution due to investment today yields an externality

[4] To solve the maximization problem, it is useful to rewrite (4.2) as $E_{t+1} = (1 - \beta) E_t - (1 - \delta) k_t - i_t$ and note that the firm takes into account the direct effect on the externality premium $\Delta_t E_t$, but not second-order effects, i.e. it treats Δ_t as a price.

flow of $(1-\beta)$ one period ahead we have a discount rate equal to $\frac{1-\beta}{1+r_t}$. If firms adopt this investment policy, firm value is maximized and the externality is fully internalized.

For comparison reasons, we show that the possibility of the market value of the firm differing from its replacement value matters for corporate behavior. Imposing that the market value of the firm should equal its replacement value[5], i.e. $v_t = (1-\delta)k_t$, yields first order conditions equivalent to JP, namely

$$f'(k_t) = r_t + \delta - \Delta_t \tag{4.22}$$

and (4.20). Now the marginal product of capital covers only the externality premium of the current generation. This is equivalent to JP who assume that there is a form of intragenerational coordination to establish optimal provision of the public good for agents alive at time t, but no intergenerational coordination. Finally we point out that pure profit maximization, e.g. maximizing discounted cash flows -not firm value- yields the familiar conditions:

$$f'(k_t) = r_t + \delta \tag{4.23}$$

and (4.20). Production factors are rewarded their marginal productivity, but the externality is not internalized by the firm.

4.3.3 Equilibrium and dynamics

In equilibrium we assume factor markets clear, and utility and firm value are maximized. Note that we have not dealt yet with the ambiguity of role of the the interest rate r_t. The return on equity requires an externality-premium relative to the the interest rate, but it does not fix the level of the interest rate. We should clear the bond market to find an endogenous interest rate. However, this makes the dynamic analysis less straightforward and adds little to the core of the analysis. We choose not to blur the focus of this chapter and keep the model tractable. We therefore take the interest r_t rate as given and constant. One can think of our economy as a small, open economy that faces full capital mobility. Alternatively, there can be trade in government bonds. Since bonds are risk-free externality-free assets and there is no growth, one can view the interest rate as a rate of pure time preference. Since the rate of pure time preference is equal to zero in our model, it would imply that

[5] Young agents buy the *depreciated* capital stock from the old.

bonds are simply a storing technology.

In equilibrium we can write wages, consumption, and the externality premium in terms of the state variables capital and environmental quality, i.e. $w_t = w(k_t) = f(k_t) - f'(k_t)k_t$, $c_t = c(k_t, k_{t+1})) = f(k_t) + (1-\delta)k_t - k_{t+1}$, and $\Delta_t = \Delta(k_t, k_{t+1}, E_t) = \frac{u'_{E_{t+1}}}{u'_{c_{t+1}}}$. Equations, (4.2), (4.16) and (4.19) can then be used to study dynamic behavior. The paths of the state variables k_t, E_t,and v_t fully determine all other variables. In a steady state we have:

$$f'(\hat{k}) = r + \delta + \frac{1+r}{r+\beta}\hat{\Delta} \tag{4.24}$$

$$\hat{E} = -\frac{\hat{k}}{\beta} \tag{4.25}$$

$$\hat{v} = (1 - \delta - \frac{1-\beta}{r+\beta}\Delta)\hat{k} \tag{4.26}$$

A hat on a variable denotes its steady state value. Equation (4.24) and (4.25) uniquely[6] determine the steady state values for k_t and E_t, from which the steady state value for v_t follows directly. Here we require that the standard transversality condition holds; $\lim_{T\to\infty} \prod_{\tau=0}^{T} \frac{V_T}{r_t \cdots r_{t+\tau}} = 0$.

To study the stability of the steady state and the dynamics of the economy, we first note that the system of three difference equations is decomposable. Equation (4.2) and (4.19) define an independent subsystem that can be studied separately, since there is no feedback from v_t on k_t and E_t. Before we study the independent subsystem we focus on the difference equation in v_t, the pricing equation for the stock market value of the firm.

Impose the steady state values for capital and environmental quality and substitute these in (4.16) and rewrite:

$$v_{t+1} = (1+r)v_t - \hat{d} - \hat{\Delta}\hat{E} \tag{4.27}$$

and we see that $1 + r > 1$ is an unstable root of the system. Therefore, provided that the independent subsystem in k_t and E_t is stable, the whole system is saddle-point stable.[7]

[6] Equation (4.25) is a downward sloping curve and using implicit differentiation we find for (4.24) that $dE/dk = [f'(k) - \delta][\frac{u''_c}{u'_c} / \frac{u''_E}{u'_E}] + \frac{r+\beta}{1+r} \frac{f''(\hat{k})}{(u''_E/u'_E)(u'_E/u'_c)}$ which is positive for all $k \geq 0$ and $E \leq 0$ satisfying (4.24), so that (4.24) implicitly defines $\hat{E}$ as a strictly increasing function in $\hat{k}$. The implied single crossing property of the two functions defines a unique steady state.

[7] Formally, since (4.16) is a second order difference equation we need to rewrite the linearized system in four first-order difference equations and calculate the four eigenvalues of the associated matrix. One can show that these are equal to the two eigenvalues of the independent subsystem, $1 + r$, and zero.

For given initial values k_0 and E_0, the firm value jumps to the saddle-point stable path and hence v_0 is determinate. Often OLG models, in which assets are traded suffer from indeterminacy of asset prices. The system is then determinate in the sense that for given initial values the whole path of the economy can be derived. However, the initial asset price is not an equilibrium result, but must be exogenously given to the model. In our model, however, if the transversality condition is met, asset prices are fully determined.

In the steady state the total value of the firm is equal to $\hat{m} = \hat{v} + \hat{b} = \hat{v} + \delta\hat{k} = (1 - \frac{1-\beta}{r+\beta}\hat{\Delta})\hat{k}$. The market value of the firm is lower than its replacement value $\hat{k}$ because of the externality it generates. Note, however, that this discrepancy between market value and replacement value does not imply that there are arbitrage opportunities. If capital goods are to be used for consumption, production is stopped and so is future pollution. Then, immediately the market value of the firm will jump to its replacement value.

We turn to the stability of the independent subsystem by log-linearizing equations (4.2) and (4.19) around the steady state. A variable with a tilde denotes a percentage change from its initial value e.g. $\tilde{k}_t = d \log k_t$

$$\begin{bmatrix} -f'(\hat{k})\frac{1-\beta}{1+r}\epsilon_{kl} - \sigma_c\hat{\Delta}\frac{\hat{k}}{\hat{c}} & 0 \\ \hat{k} & \hat{E} \end{bmatrix} \begin{bmatrix} \tilde{k}_{t+1} \\ \tilde{E}_{t+1} \end{bmatrix}$$
$$= \begin{bmatrix} -f'(\hat{k})\epsilon_{kl} - \sigma_c\hat{\Delta}\frac{\hat{k}}{\hat{c}}[f'(\hat{k}) + (1-\delta)] & -\sigma_E\hat{\Delta} \\ 0 & (1-\beta)\hat{E} \end{bmatrix} \begin{bmatrix} \tilde{k}_t \\ \tilde{E}_t \end{bmatrix} \quad (4.28)$$

with $\epsilon_{kl} = \frac{f''(\hat{k})\hat{k}}{f'(\hat{k})}$ the elasticity of substitution between capital and labor, $\sigma_c = \frac{u''_c c}{u'_c}$ the elasticity of marginal utility of consumption, and $\sigma_E = \frac{u''_E E}{u'_E}$ the elasticity of marginal utility of environmental quality. Since it is always possible to find an interest rate such that the system is stable, we analyze stability in the case where the economy is steady-state efficient, $r = 0$. The loglinearized system can be rewritten as:

$$\begin{bmatrix} \tilde{k}_{t+1} \\ \tilde{E}_{t+1} \end{bmatrix} = \frac{1}{A} \times \begin{bmatrix} -f'(\hat{k})\epsilon_{kl} - \sigma_c \hat{\Delta} \frac{\hat{k}}{\hat{c}} [f'(\hat{k}) + (1-\delta)] & -\sigma_E \hat{\Delta} \\ -\beta(f'(\hat{k})\epsilon_{kl} + \sigma_c \hat{\Delta} \frac{\hat{k}}{\hat{c}} [f'(\hat{k}) + (1-\delta)]) & (1-\beta)A - \beta\sigma_E \hat{\Delta} \end{bmatrix} \begin{bmatrix} \tilde{k}_t \\ \tilde{E}_t \end{bmatrix} \tag{4.29}$$

with $A = -f'(\hat{k})\frac{1-\beta}{1+r}\epsilon_{kl} - \sigma_c\hat{\Delta}$. The absolute value of the determinant of this matrix is less than one if $f'(\hat{k}) - \delta < \frac{\beta}{1-\beta}$; a necessary condition for stability since in general the determinant of a matrix is equal to the product of its eigenvalues. In a steady state this is equivalent to $\frac{\hat{\Delta}}{\beta} < \frac{\beta}{1-\beta}$ which implies that for we require that the marginal rate of substitution between environmental quality and consumption should not be too high. Furthermore we need that σ_c and σ_E should not be too large.

In figure 4.1 the curve $E_{min} - A$ is associated with equation (4.24), the line $0 - A - JP - B$ with equation (4.25), and point A with the steady state of the independent subsystem. We also depict the JP steady state as defined by equation (4.22); an equilibrium in which one requires that the value of the firm is equal to its replacement value at all times. In such an equilibrium environmental quality is too low and invested capital is too high. Finally, if firms maximize pure profits instead of value -which is equivalent to an economy in which investors are not socially responsible- the economy will end up in point B and environmental quality will be even lower, naturally. As mentioned before, point A is also the first-best optimal steady state equilibrium. Finally, since the social planner finds the same allocation rule as the competitive economy, we argue that the introduction of a stock market does not bring additional restrictions in terms of stability requirements.

4.4 Conclusion

One of the key issues in achieving sustainable development is managing the impact of economic activity on the environment. In the last decade, corporations have increasingly put sustainable development on their agendas, creating the possibility of socially responsible investment. This chapter argues that the stock market can play a role in achieving sustainable development.

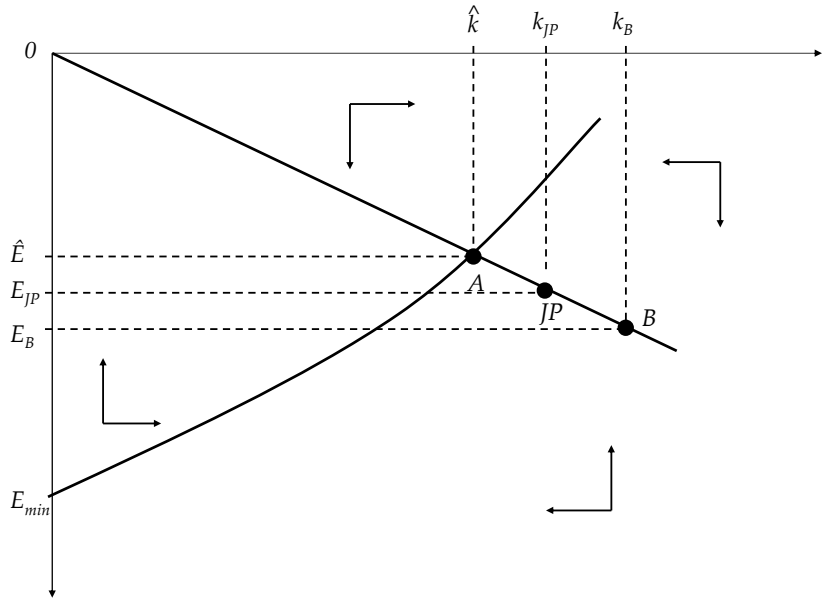


Figure 4.1. Comparison of steady state equilibria.

The line $0 - A - JP - B$ is associated with equation (4.25) and any point on this line can be a steady state economic outcome. The curve $E_min - A$ is associated with equation (4.25). Point A is the steady-state equilibrium in a stock-market economy with socially responsible investors. The stock-market assures intra and intergenerational coordination with respect to environmental quality. The arrows reflect the dynamic forces of this equilibrium. Point JB is the steady-state equilibrium of the economy of John and Pecchenino (1994) in which there is only coordination within each generation with respect to environmental quality. Point B reflects an economy without any coordination.

We analyze this in an Diamond-type overlapping generations model with short-lived consumers that care about environmental quality, comparable to John and Pecchenino (1994). A lack of coordination between old and young agents leads to overaccumulation of pollution. We show that introducing an equity market that allows for trade of property rights can resolve the coordination failure. The intuition is straightforward: since the stock market is forward looking, equity allows for trade in future valued capital, incorporating the welfare loss of pollution of future generations.

The novelty of this chapter lies in how socially responsible investment is modeled in a dynamic setting. Such behavior will only lead to the social optimum if the *stock* of externalities is considered in firm valuation, not the *flow*. As such, a socially responsible investor acts as if property rights are assigned to the firm as well as to

the stock of pollutants.

Finally, we have focused on a specific externality, namely the intergenerational problems associated with short-lived agents and a long-lived public good. The emphasis has been on environmental issues. However, the idea that proper firm valuation can incorporate negative externalities can be generalized.

4.A Appendix

Derivation of Social Optimum

The social planner maximizes

$$\max \sum_{t=0}^{\infty} (1+R)^{-t} u(c_t, E_t) \tag{4.A.1}$$

subject to

$$c_t = f(k_t) + (1-\delta)k_t - k_{t+1} \tag{4.A.2}$$

$$E_t = (1-\beta)E_{t-1} - k_t \tag{4.A.3}$$

and given initial values k_0, E_0. Define the value function as:

$$V_t = V(k_t, E_t) \equiv \max_{i_\tau, \tau \geq 0} \sum_{\tau=t}^{\infty} (1+R)^{\tau-t} u(f(k_\tau) - i_\tau, E_\tau), \tag{4.A.4}$$

where we use $i_t = k_{t+1} - (1-\delta)k_t$. Let the optimal value of the control variable i_t at time t be a function of the state variables k_t and E_t, so $i_t^* = i_t(k_t, E_t)$. We have the following Bellman equation:

$$V_t = u(f(k_t) - i_t^*, E_t) + \frac{1}{1+R} V(k_t(1-\delta) + i_t^*, E_t(1-\beta) - k_t(1-\delta) - i_t^*), \tag{4.A.5}$$

where we directly substituted the constraints and rewrite (4.2) as $E_{t+1} = (1-\beta)E_t - (1-\delta)k_t - i_t$. Taking the derivative with respect to the control variable i_t^* gives the first order condition for optimality:

$$\frac{dV_t}{di_t^*} = -u_{c_t} + \frac{1}{1+R}\left[\frac{dV_{t+1}}{dk_{t+1}} - \frac{dV_{t+1}}{dE_{t+1}}\right] = 0. \tag{4.A.6}$$

To solve we take the derivative of the value function with respect to the state variables:

$$\frac{dV_t}{dk_t} = u_{c_t} f'(k_t) + \frac{1-\delta}{1+R}\left[\frac{dV_{t+1}}{dk_{t+1}} - \frac{dV_{t+1}}{dE_{t+1}}\right] \tag{4.A.7}$$

$$\frac{dV_t}{dE_t} = -u_{E_t} + \frac{1-\beta}{1+R}\frac{dV_{t+1}}{dE_{t+1}}, \tag{4.A.8}$$

where we have applied the envelope theorem. Combine (4.A.6) and (4.A.7) to find:

$$\frac{dV_t}{dk_t} = u_{c_t}(f'(k_t) + (1-\delta)) \tag{4.A.9}$$

Substitute (4.A.9) led in (4.A.6) and rewrite:

$$\frac{dV_{t+1}}{dE_{t+1}} = -u_{c_t}(1+R) + u_{c_{t+1}}(f'(k_{t+1}) + (1-\delta)). \tag{4.A.10}$$

Substituting (4.A.10) and (4.A.10) lagged in (4.A.8) and rearranging gives

$$\frac{1-\beta}{(1+R)\frac{u_{c_t}}{u_{c_{t+1}}}}[f'(k_{t+1}) - ((1+R)\frac{u_{c_t}}{u_{c_{t+1}}} - 1 + \delta)] \\ = f'(k_t) - ((1+R)\frac{u_{c_{t-1}}}{u_{c_t}} - 1 + \delta) - \frac{u_{E_t}}{u_{c_t}}, \tag{4.A.11}$$

which is the difference equation that characterizes optimality (4.6).

Consumers maximization problem

The Lagrangean for the problem is given by

$$\max_{b_t^j, n_t^j, \lambda} L = u(b_t^j(1+r_{t+1}) + n_t^j(p_{t+1}+d_{t+1}), n_t^j E_{t+1}) - \lambda(b_t^j + n_t^j p_t - w_t), \tag{4.A.12}$$

where λ is the Lagrange multiplier and we have substituted the expressions for e_{t+1} and c_{t+1}. The first order conditions for optimality are:

$$u_c[1+r_{t+1}] - \lambda = 0, \tag{4.A.13}$$

$$u_c[p_{t+1}+d_{t+1}] + u_E - \lambda p_t = 0, \tag{4.A.14}$$

$$b_t^j + n_t^j p_t - w_t = 0. \tag{4.A.15}$$

Substituting (4.A.13) in (4.A.14) and rearrange to find the pricing equation (4.13).

Firm's maximization problem

The optimal investment i_t^* at time t depends on the state variables k_t and E_t. The value function $v_t^* = v^*(k_t, E_t)$ yields the following Bellman Equation:

$$v_t^* = \frac{f(k_{t+1}) - w_{t+1} - (1+r_{t+1})i^*(k_t, E_t) + \Delta_{t+1}E_{t+1} + v_{t+1}^*}{1+r_{t+1}}, \tag{4.A.16}$$

with $i_t = k_{t+1} - (1-\delta)k_t$ and $E_{t+1} = (1-\beta)E_t - (1-\delta)k_t - i_t$. Taking the derivative of the value function with respect to the control variable gives the first order condition:

$$\frac{dv_t^*}{di_t^*} = \frac{1}{1+r_{t+1}}\left[f'(k_{t+1}) - (1+r_{t+1}) - \Delta_{t+1} + \frac{dv_{t+1}^*}{dk_{t+1}} - \frac{dv_{t+1}^*}{dE_{t+1}}\right] = 0. \quad (4.A.17)$$

Note that the firm takes into account the direct effect on the externality premium $\Delta_t E_t$, but not second-order effects, i.e. it treats Δ_t as a price. To solve we take the derivative of the value function with respect to the state variables:

$$\frac{dv_t^*}{dk_t} = \frac{1-\delta}{1+r_{t+1}}\left[f'(k_{t+1}) - \Delta_{t+1} + \frac{dv_{t+1}^*}{dk_{t+1}} - \frac{dv_{t+1}^*}{dE_{t+1}}\right] \quad (4.A.18)$$

$$\frac{dv_t^*}{dE_t} = \frac{1-\beta}{1+r_{t+1}}\left[\Delta_{t+1} + \frac{dv_{t+1}^*}{dE_{t+1}}\right], \quad (4.A.19)$$

where we have applied the envelope theorem. Combining (4.A.17) and (4.A.18) gives:

$$\frac{dv_t^*}{dk_t} = (1-\delta), \quad (4.A.20)$$

which can be led one period and substituted in (4.A.17) to find:

$$\frac{dv_{t+1}^*}{dE_{t+1}} = f'(k_{t+1}) - (r_{t+1}+\delta) - \Delta_{t+1}. \quad (4.A.21)$$

Substituting (4.A.21) and (4.A.21) lagged in (4.A.19) and rearranging gives

$$\frac{1-\beta}{1+r_{t+1}}[f'(k_{t+1}) - (r_{t+1}+\delta)] = f'(k_t) - (r_t+\delta) - \Delta_t, \quad (4.A.22)$$

which is the implicit difference equation that characterizes the optimal path, equation (4.19).

Chapter 5

Corporate Social Responsibility and Multinational Enterprises' Location Decisions

5.1 Introduction

This chapter addresses the relation between the responsibility of the firm and its international locational choices based on countries' environmental regulation. Becchetti et al. (2005) show that large and international operating firms are more sensitive to demands from stakeholders to take account of many non-financial issues when conducting their business. It appears that they are urged to behave in a more socially responsible manner. Heal (2005) defines corporate social responsibility (CSR) as the extent to which firms internalize externalized costs and avoid distributional conflicts.[1] Companies are assumed to be socially responsible because they anticipate a net benefit from these actions. Examples of such benefits might include reputation enhancement, the ability to charge a premium price for their output, or the use of CSR to recruit and retain high quality employees. These benefits are presumed to offset the higher costs associated with CSR, since resources must be allocated to allow the firm to achieve CSR status. Theoretical studies emphasize how CSR activity is to be matrixed into a firm's strategy. We explore whether any 'res-

This chapter is based on Dam and Scholtens (2008).

[1] While definitions for CSR vary, the term generally refers to actions taken by firms with respect to their employees, communities, and the environment, which go beyond what is legally required of a firm. Recent theories of CSR (P. Bansal and Roth, 2000; Baron, 2001; McWilliams and Siegel, 2000, 2001; Bagnoli and Watts, 2003; Heal, 2005) assert that firms engage in "profit-maximizing" CSR.

ponsible' behavior can be found in the internationalization patterns of firms. In this respect, our research focuses on the so-called Pollution Haven Hypothesis (PHH). The PHH states that due to stronger environmental regulations in developed countries, firms in dirty sectors migrate toward poor countries with low environmental regulation (Mani and Wheeler, 1997). Various studies test the PHH and link foreign direct investment to environmental regulation (Sorsa, 1994; Levinson, 1996; Janicke et al., 1997; List and Co, 2000; List, 2001; Antweiler et al., 2001; Talkukdar and Meisner, 2001; Cole and Elliott, 2003; Damania et al., 2003; Eskeland and Harrison, 2003; Cole et al., 2006). We analyze how social responsibility of international firms interacts with environmental regulation, governance, and wealth of target countries.

International location decisions by MNE's are complex corporate decisions. For a brief review on international location decisions, see e.g. Dam et al. (2007). The economic rationale of the PHH is usually explained from a comparative advantage perspective: countries with little regulations put fewer restrictions on a firm's operations and fewer restrictions reduce non-market/indirect costs. The empirical evidence of the relevance of the PHH is at best mixed. Some studies present evidence in favor of the PHH (Low and Yeats, 1992; Xing and Kolstad, 2002; Mani and Wheeler, 1997). There are also arguments against the PHH, stating that due to an increase in "global eco-consciousness", multinationals are induced to innovate in cleaner production instead of migrating toward countries with poor environmental standards (Letchumanan and Kodama, 2000). Other studies find no evidence in favor for or against the PHH (Sorsa, 1994; Repetto, 1995). Data on regulation are often lacking, though. Therefore, proxies for environmental regulation such as corruption indices have been used to test the PHH (Smarzynska Javorcik and Wei, 2004). However, this complicates the interpretation of results.

If multinational enterprises apply their domestic standards in their overseas operations, we increasingly may expect that the poverty characteristics of a country will have less impact on firms' internationalization policies. Weak environmental regulation will not be regarded as a comparative advantage from the socially responsible firm's perspective. Then, the main hypothesis tested in this chapter is that socially responsible firms will be less likely to be located in countries with lax environmental regulations. We are well aware of the fact that the presence of a firm in a country may be the result of investment decisions made long ago, under possibly different regimes. The inertia would seem to blur the effects of regulation on the probability of firms having presence in those countries. However, we also witness that there is inertia in regulation and, especially, in its enforcement. Given that both

processes are slow, we expect that our analysis about regulatory quality and firms' social responsibility is informative in connection with the internationalization behavior of the firm.

Our study uses firm level data by Ethical Investment Research Services (EIRIS) on CSR and by AMADEUS on subsidiary location of 540 large European MNEs. We consider 44,149 subsidiaries located in 188 different countries. Apart from using the traditional proxies, such as corruption indices or wealth measures (e.g. GDP per capita), we also use more direct measures of country environmental regulation from the World Business Environment Survey (WBES) and from the World Development Indicators (WDI). We estimate a binary choice model to test whether firms that adopt a less stringent environmental standard are relatively more likely to be present in developing countries or countries with weak environmental regulation. As such, we investigate the relationship between CSR, wealth, and environmental quality by taking the international location behavior of large multinationals into account. We find that firms with low social responsibility locate their operations more often in countries with weak environmental regulation. The PHH-literature also focuses on unobserved heterogeneity and endogeneity of pollution regulations. For example, countries that receive lots of investment in polluting industries may levy strict regulations as a consequence. Countries that become richer as a consequence of investment may in turn levy stricter regulations. As our data about CSR are only available on a cross-section basis, we are unable to investigate the causal relation. Therefore, we provide preliminary evidence about the interaction between corporate social responsibility and the international location behavior of firms

This chapter adds to the existing literature in various ways. First of all, we test the PHH using actual location data of Multinational Enterprises. By using firm-level data we adopt a more direct analysis compared to other studies that test the PHH. Furthermore, we use country-level data that are a better indication of environmental regulation compared to the Pollution Abatement and Control Expenditures surveys of the OECD or other proxies used. We also shed some new light on whether poverty and poor environmental regulation are related. Finally, since we have firm-level data on corporate environmental standards, we add to the debate whether there is a technological shift due to increased responsibility or that there is migration behavior in line with the PHH. If we consider countries with high corruption or high poverty as being "havens" we do not find similar evidence. Thus, using corruption indices and income as proxies for the quality of environmental re-

gulation is not helpful as it leads to the wrong conclusions. The major finding of this study is that firms with good social responsibility tend to avoid locating their operations in countries where environmental regulation is weak. However, firms with poor social responsibility appear to move their operations to these countries. The structure of the remainder of this chapter is as follows. In section 5.2, we present our model and introduce our data. The results of our analysis and the discussion are in section 5.3. We conclude in section 5.4.

5.2 Data and methodology

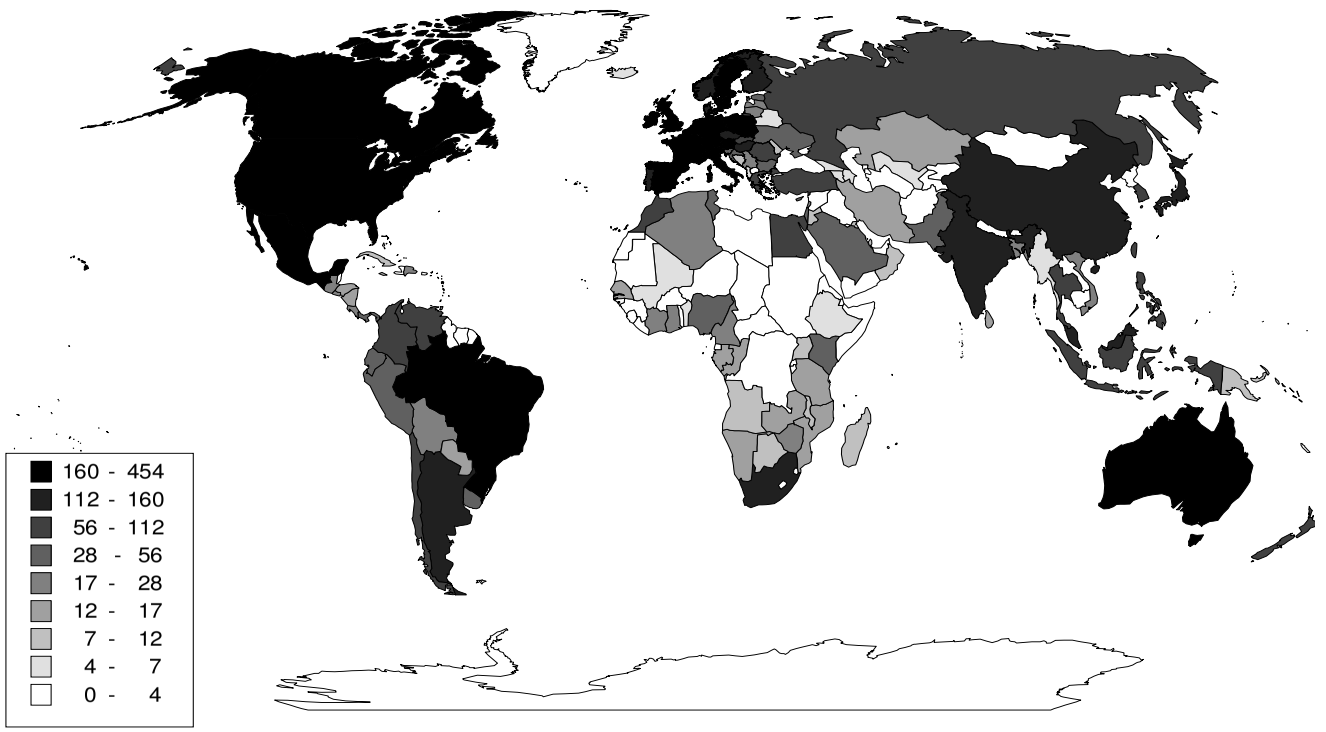
EIRIS has composed a cross-sectional dataset which covers 2685 MNEs, located world-wide and which contains information on company policy, reporting as well as on breaches by or convictions of the MNE. The topics that are dealt with are environmental issues, stakeholder issues, business ethics, and genetic engineering. Accordingly, for each topic ratings between -2 and 3 are assigned to individual companies. The details on CSR scoring are in the Appendix. (For detailed studies on country and industry differences based on the CSR scores, see Dam and Scholtens, 2005, 2006a, 2007). We used four variables as indicators of environmental quality: "Environmental Policy", "Environmental Management", "Environmental Reporting" and "Environmental Performance Impact Improvement". The descriptive statistics of these variables are reported in table 5.1. Since the variables take discrete values between -1 and 3, there is little variation in each individual variable. Therefore, we consider these indicators to have an underlying latent variable which measures a firm's environmental responsibility. We applied factor analysis to these four indicators to generate a single 'common' factor. Accordingly, we named the resulting factor scores "Environmental Responsibility" and used this variable in our econometric analysis.[2] Table 5.1 also shows that there is a high correlation between the four indicators of corporate environmental responsibility.

From the dataset, we selected companies that are in the Dow Jones Stoxx 600 selection list, a list of the largest publicly quoted European companies. Note that AMADEUS only covers Europe. We disregard financial institutions such as banks or insurance companies. Table 5.2 gives an overview of the number of multinational enterprises, classified by the country in which the company is chartered and by industry. We also visualize the global presence of the firms in figure 5.1.

Overall, it appears that most MNEs are based in the UK and a ranking of the

[2] The results of the factor analysis are comparable to the findings in Table 3.2.

Figure 5.1. Global presence of European based multinational enterprises



Number of Multinational Enterprises present in each country in in 2004, in the sample of the 540 largest European Multinational Enterprises.
Source: AMADEUS and own calculations.

Table 5.1. Descriptive statistics of variables representing environmental responsibility of multinational enterprises

			Correlations			
Variable	Mean	Standard Deviation	*Environmental Policy*	*Environmental Management*	*Environmental Reporting*	*Environmental Performance Impact Improvement*
Environmental Policy	0.26	1.41	1			
Environmental Management	0.41	1.71	0.79	1		
Environmental Reporting	−0.39	1.08	0.7	0.67	1	
Environmental Performance Impact Improvement	−0.16	1.18	0.72	0.68	0.69	1

Source: EIRIS.
For definitions of the variables see the Appendix

number of MNEs in each country is in accordance with what one would expect on the basis of population sizes of the countries. An exception, however, is Switzerland, which is relatively overrepresented in the sample. We observe that some countries are dominantly active in certain industries. For example, Spain and Italy have a relatively large share of companies in utilities, the Netherlands in the oil and gas industry and the UK dominates in consumer services.

Data on the international location of firms is extracted from reported subsidiaries of firms. To this extent, we have used AMADEUS, a large database that contains accounting information of European firms. Note that a subsidiary can have subsidiaries itself. Accordingly, AMADEUS classifies subsidiaries at different accounting levels, where each subsidiary level is divided into sublevels. Since there are various complex and exotic subsidiary structures, we only look at the subsidiaries at the highest reported level and use information on the country location of the subsidiary and the most recent information on sales and assets of the subsidiary (2004-2005). We created a balanced cross-section data set of 540 companies.

For each company we have information on presence in 233 countries (for a list of included countries see the Appendix), yielding vectors of 125,820 observations. Surely, not every individual firm has operations in each country. Impressively however, in 188 of the 233 countries at least one multinational is present. Table 5.3 gives an overview of the average number of countries an MNE is operating in by region and industry. It shows that, on average, an MNE is active in 17 countries. Firms

Table 5.2. Number of multinational enterprises by industry and home country.

Country	Basic Materials	Consumer Goods	Consumer Services	Health Care	Industrials	Oil & Gas	Technology	Telecommunications	Utilities	*All*
Austria	1	0	0	0	2	0	0	1	1	*5*
Belgium	2	1	2	1	1	0	0	2	1	*10*
Switzerland	5	4	1	8	10	0	2	1	0	*31*
Germany	5	9	7	7	14	0	3	1	2	*48*
Denmark	0	2	0	5	3	0	0	1	0	*11*
Spain	0	2	10	1	8	3	2	2	6	*34*
Finland	3	2	2	0	2	1	2	1	0	*13*
France	2	12	14	2	13	2	8	1	2	*56*
United Kingdom	15	32	73	9	61	7	19	6	12	*234*
Greece	0	1	2	0	1	1	0	2	1	*8*
Italy	0	4	7	0	4	2	1	3	6	*27*
Luxembourg	0	0	0	0	1	0	0	0	0	*1*
Netherlands	2	5	4	1	4	4	5	1	0	*26*
Norway	2	1	0	0	1	1	1	1	0	*7*
Portugal	0	0	1	0	1	0	0	1	1	*4*
Sweden	3	4	2	3	9	1	1	2	0	*25*
All	*40*	*79*	*125*	*37*	*135*	*22*	*44*	*26*	*32*	*540*

Source: AMADEUS.

that produce basic materials are active in more countries than firms from other industries and conduct most of their activities in Europe. It appears the oil and gas industry is most evenly scattered over the globe. The utilities industry scores the lowest on international presence. Moreover, most MNEs in the data set are active in the US and Canada, which explains the average of around two for the region Central and North America. The Eastern Asian, European and North American markets are by far the most attractive in absolute as well as in relative numbers. We also extracted firm specific control variables from the AMADEUS database. These are age of the MNE in years, number of employees, leverage as measured by debt divided by total assets, and liquidity as measured by liquid to total assets.

Table 5.3. Average number of countries in which MNEs are operating by industry and region

	Industry									
Region (Total #Countries)	Basic Materials	Consumer Goods	Consumer Services	Health Care	Industrials	Oil & Gas	Technology	Telecommunications	Utilities	*Average*
Africa (58)	2.1	2.1	0.7	0.8	1.5	3.4	0.5	0.5	0.3	*1.3*
Antarctica (4)	0	0	0	0	0	0	0	0	0	*0*
Caribbean & Bahamas (21)	0.4	0.5	0.1	0.2	0.3	1	0.2	0.7	0.1	*0.3*
Central & North America (13)	2.6	2.2	0.9	2.4	1.8	2.5	1.7	1.2	1	*1.7*
Eastern Asia (25)	4.3	3.6	1.2	3.9	2.4	2.1	2.6	0.8	0.4	*2.4*
Europe (45)	12	11.2	6.2	12	9.3	8	8.3	7.4	4.6	*8.7*
Middle East (15)	0.6	0.8	0.3	0.5	0.6	1	0.3	0.3	0.2	*0.5*
Oceania (29)	1	0.8	0.3	1	0.6	0.6	0.4	0.1	0.2	*0.6*
South America (13)	2.8	2.1	0.7	1.7	1.6	2.3	1.1	0.9	1.3	*1.5*
Western Asia (10)	0.2	0.2	0.1	0.1	0.1	0.3	0.1	0	0	*0.1*
World (233)	**25.8**	**23.4**	**10.5**	**22.6**	**18.3**	**21.1**	**15.3**	**12**	**8**	**17**

Source: AMADEUS and own calculations.
The entries are industry averages of the number of countries an MNE is operating in per region. Total number of countries per region is in parentheses. A list of countries included is in the Appendix. The column Average MNE is a sample average irrespective of industry and the row World is a sample average irrespective of Region.

Furthermore, we extracted market capitalization in billions of euros from the Dow Jones Stoxx 600 selection list. An overview of the descriptive statistics is in table 5.4. If one compares the median values to the mean of the variables age, employees, leverage, and the liquidity ratio in table 5.4, it becomes clear that these variables have a heavily skewed distribution. For example, an MNE has 35,048 employees on average, whereas an MNE has a median of 12,854 employees. To account for the skewness we calculated the natural logarithm of the variables. As expected, employees and market capitalization are highly correlated (correlation coefficient equals 0.61) as larger firms require both more capital and more labor in general. Age shows some correlation with employees and market capitalization. One can argue that the growth of MNEs is initially high, but as a certain level of size is reached, the additional years will not matter much to size. The liquidity ratio and leverage show no correlation with the other firm characteristics. Interestingly, the larger MNEs show behavior which is more environmentally responsible, as the variable environmental responsibility has a positive and relatively large correlation

Table 5.4. Descriptive statistics of multinational enterprises

						Correlations[a]					
Variable	Min	Max	Mean	Standard Deviation	Median	*Age*	*Employees*	*Market Capitalization*	*Liquidity*	*Leverage*	*Environmental Responsibility*
Age in Years	0	171	46	40	31	1					
Employees (1000s)	0.04	419.20	35.04	60.99	12.85	0.26	1				
Market Cap.(bEU)	0.13	155.89	6.37	14.75	1.95	0.15	0.61	1			
Liquidity (%)	0.08	16.72	1.3	1.22	1.01	−0.04	−0.08	−0.02	1		
Leverage (%)	0.05	1.51	0.62	0.18	0.63	0.03	0.26	0.03	−0.23	1	
Environmental Responsibility[b]	−1.5	1.82	0	0.97	0.2	0.12	0.36	0.47	−0.04	0.04	1

Source: EIRIS, AMADEUS and own calculations.
a In these correlations and all subsequent calculations, natural logarithms have been taken of Age, Employees, Market Cap. and Liquidity to account for the skewed distribution.
b Factor scores of the four environmental responsibility indicators listed in table 5.1.
For variable Definitions see the Appendix.

with employees and market capitalization.

We use three pairs of variables on the country level. We use two distinct sources each to measure environmental regulation, corruption, and poverty. To measure a country's environmental regulation standard, we use the World Business Environment Survey (WBES) 2000 by the World Bank Group, which contains information on financial and legal constraints for 79 countries. This data set is also used in the study by Beck et al. (2005). The advantage of this survey is that it measures the stringency of regulations that businesses experience in practice. A country can have very strict environmental laws, but these are not effective when they are not enforced. We also extracted the perceived corruption in a country from this dataset. We also use the World Development Indicators (WDI), e.g. we counted in how many international environmental treaties such as the Kyoto protocol a country is participating and how many international plans or strategies a country adopted. We also used the WDI dataset to get information on poverty. We first used a national poverty measure, namely the percentage of the population that is below the national poverty line. We also used an international poverty measure, namely the percentage of the population that has an income of less than 2 US$ a day (in

Table 5.5. Correlations of country characteristics

	Environmental Regulation	*Environmental Plans and Treaties*	*Control of Corruption*	*Corruption Perception*	*International Poverty*	*National Poverty*
Environmental Regulation	1					
Environmental Plans and Treaties	0.22	1				
Control of Corruption	0.11	0.05	1			
Corruption Perception	0.04	−0.01	0.97	1		
International Poverty	0.04	0.13	−0.5	−0.49	1	
National Poverty	0.05	−0.03	−0.41	−0.44	0.54	1

Sources: Transparancy International, World Development Indicators, World Business Environment Survey, Kaufmann et al. (2005). For variable definitions see the Appendix.

2005). The data on corruption is by Transparency International (TI). TI constructs a so-called Corruption Perceptions Index (CPI) 2004, rating 146 countries from 1 to 10 measuring corruption, with 1 being the most corrupt and 10 the least. In this index, Finland is the least corrupt and Haiti and Bangladesh are the most corrupt countries. Alternatively, we also use the Kaufmann et al. (2005) dataset. This set presents estimates of six dimensions of governance covering 209 countries and territories for five time periods: 1996, 1998, 2000, 2002 and 2004. The dimensions are Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption. For robustness checks, we use the measure of corruption of this data set. We provide detailed variable definitions in the Appendix. An overview of the correlations of the country indicators is in table 5.5.

In table 5.5 we see that the three pairs of measures of corruption, environmental regulation, and poverty all are positively correlated. Higher values of Environmental Regulation and Corruption indicate better regulation and/or more favorable conditions. The correlation of poverty with control of corruption has the expected negative sign. However, the correlation with Environmental Regulation is weak for both Corruption and Poverty and differs in sign for the various combinations. To this extent, it appears that it matters which variable one uses to test the PHH. Is the pollution haven a haven of high corruption (as tested by Smarzynska Javorcik and Wei, 2004), a haven of low regulation, or is the haven to be associated with poverty?

We will consider all three variables in our analysis in the next section.

The methodology in this chapter is similar to Dam et al. (2007) and Dam and Scholtens (2006b). We estimate a binary location choice model, namely a conditional logit model (See McFadden, 1974). For a more detailed discussion on binary choice models we refer to Greene (2000). We assume that the choice of the subsidiary location is the dependent variable. For each firm, we try to explain the choice of whether or not to be present in a country. We constructed a binary variable Y_{ij} which is equal to 1 if company i has at least one subsidiary in country j. We assume that the benefits B_{ij} to MNE i, $(i = 1, ..., N)$ of locating in country j, $(j = 1, .., J)$ is a latent variable:

$$B_{ij} = D_{ij} + \epsilon_{ij} \tag{5.1}$$

Here, D_{ij} is the deterministic part and ϵ_{ij} an error term. D_{ij} is related to country characteristics z_j and parent-level firm group characteristics x_{kj} in the following way:

$$D_{ij} = x_{kj}\beta + z_j\gamma \tag{5.2}$$

Here we put a subscript j in the term x_{kj} , since we do not a priori exclude possible interaction between parent-level firm group characteristics and country characteristics. The MNE chooses the location if the benefits are high enough, say higher than $B*$, and we only observe this outcome. The probability of observing MNE i choosing location j is:

$$P_{ij} = P(Y_{ij} = 1) = P(B_{ij} > B*)$$

The actual outcome given D_{ij} eventually depends on the distribution of the error terms ϵ_{ij}.

We test whether there is a significant interaction effect between a firm's CSR score and a country's environmental regulation. We add the following control variables: age in years, number of employees, leverage as measured by debt divided by total assets, liquidity and market capitalization. We took the logarithm of all of these variables, except for leverage. We did this as the distribution of these variables is skewed. Theoretically, skewness is not a problem, since the model is still well-specified. However, due to a few very "large" observations the variation in the independent variables will be relatively small, especially if such variables are

interacted. We therefore smooth the skewed variables. Furthermore, we created a "home" dummy, which is equal to one if we consider subsidiaries located in the same country as where the MNE is based. We omitted the observations for which this dummy was equal to one. There has been some debate whether cultural distance is an important determinant in international diversification, e.g. a meta-analysis by Tihanyi et al. (2005) indicates that these differences do not seem to matter, particularly for firms based outside the US. Nonetheless, we add a colonial dummy variable, which is equal to one if the country where the subsidiary is located in is a former colony of the country where the MNE is headquartered. As such, we control for common language advantages, historical ties, or advantages of similarities of regulatory systems. Usually, a measure of Euclidian distance to the home country is also added as a control variable in spatial models. However, since all our firms are European-based the distances on a global scale will not vary that much and the country dummy will also account for spatial effects. We therefore estimate the following model:

$$E[Y_{ij}] = P(Y_{ij} = 1) = \Lambda(\alpha_j Country_j + \beta_k Industry_k + \eta FormerColony + \gamma_i Firm_i + \delta(EnvironmentalResponsibility_i \times CountryHaven_j)) \quad (5.3)$$

Here, Country and Industry are the country and industry fixed effects. Again, we omit the observation if firm i is based in country j, since in this case Y_{ij} is always equal to one. $FormerColony = 1$ if the country is a former colony of the country where the MNE is based. $EnvironmentalResponsibility_i$ is company i's environmental responsibility score. To account for potential clustering effects, we calculate t-values using the Huber-White robust standard errors. The models differ with respect to the operationalization of $CountryHaven_j$. In models 1 and 2, $CountryHaven_j$ is an indicator of country j 's Environmental Regulation. In models 3 and 4 we used a measure of Corruption in country j. In models 5 and 6 $CountryHaven_j$ is an indicator of country j 's Poverty. Λ is the logistic distribution. Higher values of $Responsibility_i$ indicate higher social responsibility, higher values of $CountryHaven_j$ indicate better perceived environmental regulation, lower levels of corruption, and higher levels of poverty. We are specifically interested in the sign and magnitude of the parameter δ of the interacted term, $Responsibility_i \times CountryHaven_j$. If polution havens exist, we expect to find a positive value for δ.

5.3 Results

The estimation results are in table 5.6. Note that differences in sample sizes due to data availability of some countries can explain the differences in the coefficients of the various models. For brevity sake, we do not report the country and industry fixed effects. Models 1 to 6 test for three possible "Havens". Models 1 and 2 directly test the classical pollution haven hypothesis, namely that low country environmental regulation is a haven for "dirty" industries. Models 3 and 4 test whether the same relation can be observed when countries are classified by corruption levels and models 5 and 6 test the relation when countries are classified by poverty levels.

We find a positive and significant parameter estimation of the interaction between *Environmental Responsibility* and *Environmental Regulation*, and *Environmental Responsibility* and *Environmental Plans and Treaties*, supporting the PHH. So, for both measures, we find evidence in favor of the PHH. It could be that this is just a tip of the iceberg and perhaps it is in fact the corrupt countries to which firms are transferring their operations. In this perspective, models 3 and 4 test whether there is an interaction effect between *Corruption* and *Environmental Responsibility*. Here, we do find a negative significant interaction effect for both corruption measures, indicating that less responsible firms are less present in corrupt countries. For models 5 and 6, in which the supposedly haven is one of poverty, we find weak positive to no significant interaction. Nonetheless, the main message of our analysis is that we find support for the PHH in connection with firms' CSR. Furthermore, we establish that using proxies for environmental regulation, such as corruption and poverty, instead of direct measures of environmental regulation, can possibly lead to the wrong conclusions.

The analysis does not acknowledge the situation that for so-called dirty industries the notion of a pollution haven might be more relevant than for clean industries. We therefore conducted the same analysis for a subset of firms, namely those that operate in dirty industries, which are Basic Materials, Consumer Goods, Oil & Gas, and Industrials. The estimation results are in table 5.7. We find a positive and significant interaction effect for *Environmental Plans and Treaties*, supporting the PHH. We do not find a significant effect for the interaction with *Environmental Regulation*, but this could be due to the reduced number of observations. The regression results of the subset of firms in clean industries (not reported), show no significant interaction effect with *Environmental Plans and Treaties*, making a stronger case for the PHH in relation to firms' responsibility. Thus, again, we see a negative effect

Table 5.6. Country presence of multinational enterprises and possible havens

Coefficient	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
(P-value)	The "Haven" in this model is:					
Control Variables	*Environmental Regulation*		*Corruption*		*Poverty*	
Log Market Capitalization	0.329^{***}	0.307^{***}	0.291^{***}	0.299^{***}	0.317^{***}	0.324^{***}
	(15.07)	(17.64)	(17.69)	(17.67)	(14.22)	(12.36)
Log Age	0.340^{***}	0.316^{***}	0.308^{***}	0.310^{***}	0.329^{***}	0.365^{***}
	(17.22)	(20.00)	(20.23)	(20.16)	(15.65)	(15.47)
Log Liquidity	0.244^{***}	0.242^{***}	0.237^{***}	0.248^{***}	0.159^{***}	0.139^{***}
	(6.60)	(8.31)	(8.76)	(8.95)	(4.85)	(3.56)
Leverage	-0.326^{**}	-0.333^{***}	-0.320^{***}	-0.279^{**}	-0.832^{***}	-0.891^{***}
	(-2.16)	(-2.76)	(-2.83)	(-2.46)	(-5.33)	(-4.92)
Log employees	0.457^{***}	0.444^{***}	0.436^{***}	0.438^{***}	0.517^{***}	0.507^{***}
	(18.70)	(22.65)	(23.57)	(23.01)	(24.31)	(18.53)
Former Colony	0.679^{***}	0.661^{***}	0.690^{***}	0.651^{***}	0.790^{***}	0.815^{***}
	(4.18)	(5.69)	(5.77)	(5.59)	(4.30)	(4.16)
Environmental Responsibility	-0.229^{***}	-0.231^{***}	-0.170^{***}	-0.179^{***}	-0.177^{***}	-0.172^{***}
	(-9.54)	(-11.19)	(-7.76)	(-8.08)	(-6.46)	(-5.69)
"Haven" interaction term						
Environmental Responsibility	0.045^{*}					
× Environmental Regulation	(1.94)					
Environmental Responsibility		0.066^{***}				
× Environmental Plans and Treaties		(4.30)				
Environmental Responsibility			-0.080^{***}			
× Control of Corruption			(-4.81)			
Environmental Responsibility				-0.079^{***}		
× Corruption Perception				(-4.64)		
Environmental Responsibility					0.047^{*}	
× International Poverty					(1.73)	
Environmental Responsibility						0.00
× National Poverty						(0.26)
Number of observations	36949	65923	81597	65001	69611	37802

The estimated logit model is: $Presence = E[Y_{ij}] = P(Y_{ij} = 1) = \Lambda(\alpha_j Country_j + \beta_k Industry_k + \eta FormerColony + \gamma_i Firm_i + \delta(EnvironmentalResponsibility_i \times CountryHaven_j))$. $Y_{ij} = 1$ if MNE i is present in country j. Λ is the logistic function, conditional on Country fixed effects. $FormerColony = 1$ if the country is a former colony of the country where the MNE is based. $Firm_i$ are the reported firm characteristics. $Industry$ are industry dummies. For $CountryHaven_j$ we used *Environmental Regulation*, *Environmental Plans and Treaties*, *Control of Corruption*, *Corruption Perception*, *International Poverty*, and *National Poverty* respectively. Higher values of *Environmental Responsibility* indicate higher social responsibility, higher values of *CountryHaven* indicate better regulation or higher levels of poverty. For brevity sake, the country and industry fixed effects are not reported. Definitions of the variables are in the Appendix. The t-values are calculated using the Huber-White robust standard errors.* indicates significance at ten, ** at five, and *** at one percent, respectively.

for the corruption measures, indicating that responsible firms are relatively more often located in corrupt countries. Finally, it appears that poverty has no significant effect on location behavior conditional on corporate environmental responsibility.

Table 5.7. Country presence of multinational enterprises in dirty industries and possible havens

Coefficient	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
(P-value)	The "Haven" in this model is:					
Control Variables	*Environmental Regulation*		*Corruption*		*Poverty*	
Log Market Capitalization	0.379^{***}	0.349^{***}	0.328^{***}	0.333^{***}	0.406^{***}	0.434^{***}
	(11.30)	(13.22)	(13.12)	(12.83)	(12.85)	(12.31)
Log Age	0.351^{***}	0.331^{***}	0.322^{***}	0.326^{***}	0.340^{***}	0.376^{***}
	(14.15)	(17.34)	(17.51)	(17.41)	(11.87)	(11.67)
Log Liquidity	0.288^{***}	0.297^{***}	0.291^{***}	0.305^{***}	0.182^{***}	0.160^{***}
	(6.35)	(7.67)	(8.02)	(8.17)	(4.05)	(3.15)
Leverage	-0.295^{**}	-0.390^{***}	-0.390^{***}	-0.311^{***}	-0.684^{***}	-0.813^{***}
	(-1.98)	(-3.16)	(-3.25)	(-2.66)	(-3.83)	(-3.82)
Log employees	0.387^{***}	0.381^{***}	0.379^{***}	0.376^{***}	0.421^{***}	0.401^{***}
	(13.85)	(16.22)	(16.70)	(16.18)	(14.63)	(11.80)
Former Colony	0.286^{**}	0.359^{***}	0.403^{***}	0.366^{***}	0.333^{**}	0.421^{***}
	(2.49)	(3.55)	(3.86)	(3.60)	(2.17)	(2.66)
Environmental Responsibility	0.01	-0.005	0.046^{*}	0.049^{**}	0.067^{**}	0.065^{*}
	(0.36)	(-0.22)	(1.90)	(2.01)	(2.24)	(1.83)
"Haven" interaction term						
Environmental Responsibility	0.031					
× Environmental Regulation	(1.23)					
Environmental Responsibility		0.065^{***}				
× Environmental Plans and Treaties		(4.22)				
Environmental Responsibility			-0.083^{***}			
× Control of Corruption			(-4.98)			
Environmental Responsibility				-0.081^{***}		
× Corruption Perception				(-4.92)		
Environmental Responsibility					0.04	
× International Poverty					(1.42)	
Environmental Responsibility						0.00
× National Poverty						(-0.09)
Number of observations	19161	33938	41108	33460	22226	19598

The estimated logit model is: $Presence = E[Y_{ij}] = P(Y_{ij} = 1) = \Lambda(\alpha_j Country_j + \beta_k Industry_k + \eta FormerColony + \gamma_i Firm_i + \delta(EnvironmentalResponsibility_i \times CountryHaven_j))$. The regression is conducted for a sub-sample of MNEs in dirty industries. $Y_{ij} = 1$ if MNE i is present in country j. Λ is the logistic function, conditional on Country fixed effects. $FormerColony = 1$ if the country is a former colony of the country where the MNE is based. $Firm_i$ are the reported firm characteristics. $Industry$ are industry dummies. For $CountryHaven_j$ we used *Environmental Regulation*, *Environmental Plans and Treaties*, *Control of Corruption*, *Corruption Perception*, *International Poverty*, and *National Poverty* respectively. Higher values of *Environmental Responsibility* indicate higher social responsibility, higher values of *CountryHaven* indicate better regulation or higher levels of poverty. For brevity sake, the country and industry fixed effects are not reported. Definitions of the variables are in the Appendix. The t-values are calculated using the Huber-White robust standard errors.* indicates significance at ten, ** at five, and *** at one percent, respectively.

As a last robustness check, we estimate the model for a subset of non-OECD and other non-high income countries. The estimation results are in table 5.8. Again

we find support for the PHH, as reflected by the positive and significant interaction of environmental responsibilities with both measures of environmental standards. For the corruption measures, we do not find a significant interaction effect, as opposed to the previous steps in the analysis. This could be due to the little variation in corruption for the subset of poor countries. Finally, the fact that poverty is not a potential haven seems to be a robust result as we do not find a significant interaction effect with either measure. However, there is also little variation in poverty levels for the subset of poor countries, which could explain the insignificance.

Thus, although the effect we find about firms' responsibility in relation to their presence in countries with particular characteristics is statistically significant, one might question whether the effect is economically large enough to speak of true pollution havens. However, measuring this is a general problem, not just in our analysis. Note that the evidence is based mainly on firm policy, not on firm performance, given the nature of our responsibility indicators. The actual differences in levels of pollution associated with differences in environmental responsibility scores might be considerable. So, on the one hand, there might even be a stronger "haven" effect than we observe. Then again, details on how "irresponsible" firms diversify their operations in every country are not in our dataset. We can only note that certain types of firms are relatively more present in countries with low regulation; we do not know the exact nature of their activities. It could be that these 'dirty' MNEs are abusing low regulation countries. On the other hand, for instance, they might produce their goods in the home country and simply distribute through the subsidiaries in the other countries. One has to be careful to conclude that firms with lower responsibility are actually conducting PHH behavior without knowing the exact levels and location of pollution. Furthermore, our analysis is merely descriptive, as with a cross-sectional dataset we cannot account for endogeneity problems or causal relations on which the recent literature (e.g. Cole et al., 2006) has focused. Elaborating on the dataset is a major challenge in our future research. Nevertheless, we would like to classify our findings about the locational behavior of MNEs in connection with their corporate social responsibility as "strong circumstantial evidence" in favor of the PHH.

5.4 Conclusion

This chapter investigates the relationship between the corporate social responsibility and location choices of Multinational Enterprises (MNEs) and environmental

Table 5.8. Country presence of multinational enterprises and possible havens in poor countries

Coefficient	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
(P-value)	The "Haven" in this model is:					
Control Variables	*Environmental Regulation*		*Corruption*		*Poverty*	
Log Market Capitalization	0.338***	0.325***	0.318***	0.328***	0.326***	0.324***
	(13.31)	(14.24)	(14.17)	(14.34)	(13.87)	(12.36)
Log Age	0.335***	0.336***	0.339***	0.335***	0.332***	0.365***
	(14.41)	(15.83)	(16.43)	(16.08)	(14.78)	(15.47)
Log Liquidity	0.169***	0.149***	0.160***	0.162***	0.157***	0.139***
	(4.58)	(4.47)	(4.96)	(4.97)	(4.54)	(3.56)
Leverage	−0.692***	−0.866***	−0.829***	−0.764***	−0.814***	−0.891***
	(−4.22)	(−5.28)	(−5.19)	(−4.90)	(−4.96)	(−4.92)
Log employees	0.507***	0.517***	0.513***	0.507***	0.514***	0.507***
	(20.54)	(23.59)	(24.03)	(23.47)	(22.54)	(18.53)
Former Colony	0.808***	0.788***	0.811***	0.801***	0.793***	0.815***
	(3.80)	(4.53)	(4.72)	(4.58)	(4.30)	(4.16)
Environmental Responsibility	−0.207***	−0.227***	−0.192***	−0.199***	−0.179***	−0.172***
	(−7.13)	(−7.38)	(−7.01)	(−6.96)	(−6.59)	(−5.69)
"Haven" interaction term						
Environmental Responsibility	0.071***					
× Environmental Regulation	(3.18)					
Environmental Responsibility		0.057*				
×Environmental Plans and Treaties		(1.83)				
Environmental Responsibility			0.02			
× Control of Corruption			(0.59)			
Environmental Responsibility				0.01		
× Corruption Perception				(0.18)		
Environmental Responsibility					0.03	
×International Poverty					(1.21)	
Environmental Responsibility						0.00
× National Poverty						(0.26)
Number of observations	32270	53015	61313	49788	41951	37802

The estimated logit model is: $Presence = E[Y_{ij}] = P(Y_{ij} = 1) = \Lambda(\alpha_j Country_j + \beta_k Industry_k + \eta FormerColony + \gamma_i Firm_i + \delta(EnvironmentalResponsibility_i \times CountryHaven_j))$. The regression is conducted for a sub-sample of non-OECD countries and other non-high-income countries. $Y_{ij} = 1$ if MNE *i* is present in country *j*. Λ is the logistic function, conditional on Country fixed effects. $FormerColony = 1$ if the country is a former colony of the country where the MNE is based. $Firm_i$ are the reported firm characteristics. $Industry$ are industry dummies. For $CountryHaven_j$ we used *Environmental Regulation*, *Environmental Plans and Treaties*, *Control of Corruption*, *Corruption Perception*, *International Poverty*, and *National Poverty* respectively. Higher values of *Environmental Responsibility* indicate higher social responsibility, higher values of *CountryHaven* indicate better regulation or higher levels of poverty. For brevity sake, the country and industry fixed effects are not reported. Definitions of the variables are in the Appendix. The t-values are calculated using the Huber-White robust standard errors.* indicates significance at ten, ** at five, and *** at one percent, respectively.

regulation, governance, and wealth of countries. More specifically, we address the question whether MNEs transfer their "dirty" operations toward poor countries, corrupt countries or countries with low environmental regulation; the so-called Pollution Haven Hypothesis (PHH). We relate this issue to the responsibility of the firm. In this perspective, we regard corporate social responsibility as the extent to which a firm internalizes market costs. Firms that set high internal environmental standards will not experience a supposedly comparative advantage when locating in countries with poor environmental regulation. On the other hand, firms with little environmental responsibility might have incentives to engage in PHH behavior. Using firm level data and direct measures of a country's environmental regulation, we find new evidence that for firms with weak environmental standards PHH behavior can be observed. However, if we consider countries with high corruption or high poverty as being "havens" we do not find similar evidence. Thus, we establish that it is predominantly firms with poor social responsibility that appear to move their operations to countries with weak regulation. The 'good', i.e. most responsible firms tend to avoid locating their operations in these countries. As such, we conclude that CSR does matter with respect to MNEs locational behavior.

5.A Appendix

Table 5.A.1. Variable definitions and sources

Variable	Definition	Source
Environmental Performance Impact Improvement	"What level of improvements in environmental impact can the Company demonstrate?" (No data or inadequate data=-1, No improvement=0, Minor improvement=1, Significant improvement=2, Major improvement=3).	EIRIS
Environmental Reporting	"How does EIRIS rate the company's environmental reporting?" (Inadequate = -1, Weak = 0 Moderate = 1, Good =2, Exceptional = 3).	EIRIS
Environmental Management	"How does EIRIS rate the company's environmental management system?" (Inadequate = -1, Weak = 0, Moderate = 1, Good =2, Exceptional = 3).	EIRIS
Environmental Policy	"How does EIRIS rate the company's environmental policy and commitment?" (Inadequate = -1, Weak = 0, Moderate = 1, Good =2, Exceptional = 3).	EIRIS
Environmental Responsibility	Factor Scores based on a factor analysis of the above four Corporate Environmental responsibility indicators.	Own Calculations
Total Assets	Reported total assets as of 2004 in thousands of U.S. dollars.	AMADEUS
Leverage	Ratio of (current liabilities + non-current liabilities)/total assets $\times$ 100 as of 2004.	AMADEUS
Age	Age in years of the company as of 2004, based on the reported date of incorporation.	AMADEUS
Employees	Number of reported employees as of 2004.	AMADEUS
Liquidity	Reported Liquidity ratio (%) as of 2004.	AMADEUS
Market Cap	Free Float MCap (in Billion euros) as of 03-01-2005.	Dow Jones Stoxx
International Poverty	Percentage of the population below $2 a day.	World Development Indicators
National Poverty	Percentage of the population below the national poverty line.	World Development Indicators
Environmental plans and Treaties	Standardized values of the count of "Participation in treaties (Climate change, Ozone Layer, CFC control, Law of the Sea, Biological diversity, Kyoto protocol)" and "Environmental strategies or action plans" and "Biodiversity assessments, strategies or action plans".	World Development Indicators

Table 5.A.1. Variable definitions and sources (continued)

Variable	Definition	Source
Corruption Perception Index (CPI)	Standardized values of 2004 Corruption Perceptions Index (CPI) (CPI Score relates to perceptions of the degree of corruption as seen by business people and country analysts and ranges between 10 (highly clean) and 0 (highly corrupt)).	Transparency International
Environmental Regulation	Standardized country averages of : "Please judge on a four point scale how problematic are these different regulatory areas for the operation and growth of your business; Environmental regulations: 1 = No Obstacle, 2 = Minor Obstacle, 3 = Moderate Obstacle, 4 = Major Obstacle".	World Business Environment Survey (WBES)
Control of Corruption	Based on several hundred indicators, drawn from 37 separate data sources constructed by 31 different organisations. Compiled using an unobserved component technique by Kaufmann et al. (2005).	Worldbank, see Kaufmann et al. (2005)

Table 5.A.2. List of included countries and region according to the World Bank classification

Country Name	**Region**
Andorra	Europe
United Arab Emirates	Middle East
Afghanistan	Western Asia
Antigua and Barbuda	Carribean and Bahama Islands
Anguilla	Carribean and Bahama Islands
Albania	Europe
Armenia	Western Asia
Netherlands Antilles	Carribean and Bahama Islands
Angola	Africa
Antarctica	Antarctica
Argentina	South America
American Samoa	Oceania
Austria	Europe
Australia	Oceania
Aruba	Carribean and Bahama Islands
Azerbaijan	Western Asia
Bosnia and Herzegovina	Europe
Barbados	Carribean and Bahama Islands
Bangladesh	Eastern Asia
Belgium	Europe
Burkina Faso	Africa
Bulgaria	Europe
Bahrain	Middle East
Burundi	Africa
Benin	Africa
Bermuda	Central and North America
Brunei Darussalam	Eastern Asia
Bolivia	South America
Brazil	South America
Bahamas	Carribean and Bahama Islands
Bhutan	Eastern Asia
Bouvet Island	Antarctica
Botswana	Africa
Belarus	Europe
Belize	Central and North America
Canada	Central and North America

Table 5.A.2. List of included countries (continued)

Country Name	Region
Cocos Islands (or Keeling Islands)	Oceania
Congo (Democratic Republic of)	Africa
Central African Republic	Africa
Congo	Africa
Switzerland	Europe
Cte dIvoire	Africa
Cook Islands	Oceania
Chile	South America
Cameroon	Africa
China, Peoples Republic of	Eastern Asia
Colombia	South America
Costa Rica	Central and North America
Serbia and Montenegro	Europe
Cuba	Carribean and Bahama Islands
Cape Verde	Africa
Christmas Islands	Oceania
Cyprus	Europe
Czech Republic	Europe
Germany	Europe
Djibouti	Africa
Denmark	Europe
Dominica	Carribean and Bahama Islands
Dominican Republic	Carribean and Bahama Islands
Algeria	Africa
Ecuador	South America
Estonia	Europe
Egypt	Africa
Eritrea	Africa
Spain	Europe
Ethiopia	Africa
Finland	Europe
Fiji	Oceania
Falkland Islands	South America
Micronesia (Federated States of)	Oceania
Faroe Islands	Europe
France	Europe
Gabon	Africa

Table 5.A.2. List of included countries (continued)

Country Name	Region
United Kingdom	Europe
Grenada	Carribean and Bahama Islands
Georgia	Western Asia
Ghana	Africa
Gibraltar	Europe
Greenland	Central and North America
Gambia	Africa
Guinea	Africa
Equatorial Guinea	Africa
Greece	Europe
Sth. Georgia and Sandwich Isl.	Antarctica
Guatemala	Central and North America
Guam	Oceania
Guinea-Bissau	Africa
Guyana	South America
Hong Kong	Eastern Asia
Heard Island and McDonald Isl.	Oceania
Honduras	Central and North America
Croatia	Europe
Haiti	Carribean and Bahama Islands
Hungary	Europe
Indonesia	Eastern Asia
Ireland	Europe
Israel	Middle East
India	Eastern Asia
British Indian Ocean Territory	Africa
Iraq	Middle East
Iran (Islamic Republic of)	Middle East
Iceland	Europe
Italy	Europe
Jamaica	Carribean and Bahama Islands
Jordan	Middle East
Japan	Eastern Asia
Kenya	Africa
Kyrgyzstan	Western Asia
Cambodia	Eastern Asia
Kiribati	Oceania

Table 5.A.2. List of included countries (continued)

Country Name	Region
Comoros	Africa
St Kitts and Nevis	Carribean and Bahama Islands
Korea, Democratic People's Rep.	Eastern Asia
Korea, Republic of	Eastern Asia
Kuwait	Middle East
Cayman Islands	Carribean and Bahama Islands
Kazakhstan	Western Asia
Lao, People's Democratic Republic	Eastern Asia
Lebanon	Middle East
St Lucia	Carribean and Bahama Islands
Liechtenstein	Europe
Sri Lanka	Eastern Asia
Liberia	Africa
Lesotho	Africa
Lithuania	Europe
Luxembourg	Europe
Latvia	Europe
Libyan Arab Jamahiriya	Africa
Morocco	Africa
Moldova (Republic of)	Europe
Madagascar	Africa
Marshall Islands	Oceania
Macedonia	Europe
Mali	Africa
Myanmar	Eastern Asia
Mongolia	Eastern Asia
Macao	Eastern Asia
Northern Mariana Islands	Oceania
Mauritania	Africa
Montserrat	Carribean and Bahama Islands
Malta	Europe
Mauritius	Africa
Maldives	Eastern Asia
Malawi	Africa
Mexico	Central and North America
Malaysia	Eastern Asia
Mozambique	Africa

Table 5.A.2. List of included countries (continued)

Country Name	Region
Namibia	Africa
New Caledonia	Oceania
Niger	Africa
Norfolk Island	Oceania
Nigeria	Africa
Nicaragua	Central and North America
Netherlands	Europe
Norway	Europe
Nepal	Eastern Asia
Nauru	Oceania
Niue	Oceania
New Zealand	Oceania
Oman	Middle East
Panama	Central and North America
Peru	South America
French Polynesia	Oceania
Papua New Guinea	Oceania
Philippines	Eastern Asia
Pakistan	Western Asia
Poland	Europe
St Pierre and Miquelon	Central and North America
Pitcairn	Oceania
Porto Rico	Carribean and Bahama Islands
Occupied Palestinian Territory	Middle East
Portugal	Europe
Palau	Oceania
Paraguay	South America
Qatar	Middle East
Romania	Europe
Russian Federation	Europe
Rwanda	Africa
Saudi Arabia	Middle East
Solomon Islands	Oceania
Seychelles	Africa
Sudan	Africa
Sweden	Europe
Singapore	Eastern Asia

Table 5.A.2. List of included countries (continued)

Country Name	Region
Saint Helena	Africa
Slovenia	Europe
Slovakia	Europe
Sierra Leone	Africa
San Marino	Europe
Senegal	Africa
Somalia	Africa
Suriname	South America
Sao Tome and Principe	Africa
El Salvador	Central and North America
Syrian Arab Republic	Middle East
Swaziland	Africa
Turks and Caicos Islands	Carribean and Bahama Islands
Chad	Africa
French Southern Territories	Antarctica
Togo	Africa
Thailand	Eastern Asia
Tajikistan	Western Asia
Tokelau	Oceania
Timor-Leste	Eastern Asia
Turkmenistan	Western Asia
Tunisia	Africa
Tonga	Oceania
Turkey	Middle East
Trinidad and Tobago	Carribean and Bahama Islands
Tuvalu	Oceania
Taiwan	Eastern Asia
Tanzania (United Republic of)	Africa
Ukraine	Europe
Uganda	Africa
U. S. Minor Outlying Islands	Oceania
United States	Central and North America
Uruguay	South America
Uzbekistan	Western Asia
Holy See (Vatican)	Europe
St Vincent and Grenadines	Carribean and Bahama Islands
Venezuela	South America

Table 5.A.2. List of included countries (continued)

Country Name	**Region**
Virgin Islands (British)	Carribean and Bahama Islands
Virgin Islands (US)	Carribean and Bahama Islands
Viet-Nam	Eastern Asia
Vanuatu	Oceania
Wallis and Futuna	Oceania
Samoaemen	Oceania
Ceuta	Africa
Melilla	Africa
Yemen	Middle East
Mayotte	Africa
South Africa	Africa
Zambia	Africa
Zimbabwe	Africa

Chapter 6

Conclusion

6.1 Summary

Government regulation cannot at all times guarantee that the way business is conducted is perceived as 'fair' or 'just' by society. As a response, a growing number of firms self-regulate their business under the label *corporate social responsibility*. Corporate social responsibility can be defined as the extent to which firms internalize externalized costs or avoid distributional conflicts. There are various reasons for firms to engage in corporate social responsibility; preempting future regulations, liability management, vertical product differentiation, improving stakeholder relations, lowering the cost of capital, or intrinsic motivation. All these classifications boil down to identifying who reaps the benefits of corporate social responsibility and who bears the associated costs. This thesis deals with various aspects of the economics of corporate social responsibility.

In chapter 2 we use a general equilibrium stock market model with production externalities to model the relation between corporate social responsibility and various measures of corporate financial performance. Investors are assumed to incorporate the production externalities in constructing their portfolios. Accordingly, socially responsible firms take this into account in their production decisions. Our model is able to explain the seemingly conflicting results of empirical studies on the relation between corporate social responsibility and corporate financial performance. We show that it makes a huge difference which financial performance measure is used to analyze the relation. For the Market-to-Book ratio we expect a positive relation with corporate social responsibility, for the Return-on-Assets ratio also a positive relation, and for stock market returns this relation is ambiguous

at the aggregate level and negative at the industry level. With externalities, different financial performance measures capture different effects. As such, one should be cautious when interpreting empirical results. Furthermore, our analysis shows that there are in fact strong linkages between corporate social responsibility and financial performance. The linkages are intuitive: engaging in corporate social responsibility compromises pure profits, but it potentially establishes maximum firm value.

In chapter 3 we empirically analyze the performance of banks that adopted the *Equator Principles*. With the Equator Principles banks try to ensure sustainable development in project finance. Using data from EIRIS, a third-party rating agency, we find that the social, ethical, and environmental policies of the non-adopters significantly differ from those of banks that did adopt the Equator Principles. The banks that did not adopt the principles are also significantly smaller. Most other bank characteristics do not show significant differences between the adopters and non-adopters. Using an event study, we show that shareholders did not react negatively to the announcement of the adoption of the Equator Principles.

In chapter 4, we link corporate social responsibility to sustainable development. Typically short-lived agents do not incorporate long-term effects of pollution, in effect forcing future generations to bear the associated costs. Such externalities are usually tackled by fiscal policy. In presence of socially responsible investors, however, the stock market can potentially deal with environmental externalities. We analyze the role of a forward-looking stock market in an overlapping generations model. Consumers choose between investing in bonds or corporate shares, taking into account that the firm pollutes. We show that when corporate property rights are traded, proper firm valuation can resolve the conflict between current and future generations.

In chapter 5 we analyze whether developing countries have comparative advantages in terms of regulations and link this to corporate social responsibility of multinational enterprises. More specifically, we use firm level data on 540 multinational enterprises with 44,149 subsidiaries in 188 countries and test whether firms with relatively low environmental standards are more often located in countries that are poor, corrupt or have weak environmental regulations. We find new empirical evidence in favor of the Pollution Haven Hypothesis, which states that multinational enterprises are transferring their dirty operations to countries with weak environmental regulation. Our findings suggest that these are not necessarily the poorest or most corrupt countries. We establish that multinational enterprises with

strong social responsibility avoid locating their operations in countries with weak environmental regulation.

6.2 Policy recommendations

This thesis is on corporate self-regulation, the message is certainly not that society does not need rules and as such it is not promoting laissez-faire policies. Not every company engages in corporate social responsibility and this simple observation by itself is an argument against deregulation. We simply acknowledge that regulation is not always optimal and some corporations are aware of this and act upon it by self-regulating, for various reasons. Second, the empirical evidence on the relationship between corporate social responsibility and financial performance might seem mixed. However, in chapter 2 we argue that if one knows how to interpret the empirical evidence, there are strong linkages between corporate social responsibility and financial performance. We want to make policy makers aware of the potential paradoxes that distinct financial performance measures create in the presence of externalities.

Another important message is that the empirical evidence suggests that a large group of investors does care about issues other than cash-flows. However, information on a firm's social and environmental performance is often lacking. Currently, with voluntary compliance comes voluntary reporting, i.e. companies that engage in social responsibility often also choose to report their conduct, but many companies feel free not to report on social or environmental issues. Reporting in itself has become a virtue of the firm. Therefore, we recommend that firms should be legally forced to report on a set of measurable, universally applicable, and objective standards, just as there exist accounting standards to provide information on financial performance. This need not be an extensive list, because correlations of such measures are generally high. One could think of the amount of greenhouse gas emissions in tonnes of CO_2 equivalents per year or the number of accidents per million hours worked.

In chapter 3 we show that investors do not reject bank policies that incorporate environmental and social standards when it comes to financing large projects. Especially for developing countries, where there is little or no environmental regulation, such financing policies are of great importance. According to our event study on adoption of the Equator Principles, having socially responsible financing policies does not affect shareholder value significantly. We therefore feel that banks

need not be hesitant in adopting socially responsible financing policies.

In chapter 4 we discuss the role of the stock market to achieve sustainable development. This is analyzed in the presence of socially responsible investors. Note however, that instead of an externality-premium, a *Pigouvian* pollution tax on dividends is an effective way of letting the stock-market deal with intergenerational externalities. Our model does not take into account the possibility of underprovision of the public good, and a Pigouvian tax can account for the intra-generational as well as the inter-generational externality.

Finally, in chapter 5 we show that we cannot reject the pollution haven hypothesis. It is questionable whether this type of internationalization pattern is preferable. Since socially responsible firms self-regulate, they have less incentives to migrate their dirty operations to countries with poor environmental regulation. This provides domestic governments with tools to regulate internationally operating firms. Subsidizing responsible firms or taxing irresponsible firms can, to some extent, exert some control on the international location decisions of the firm.

6.3 Outline for future research

Throughout this thesis, it has been taken as given whether firms behave socially responsible or not. One direction for future research is to model an underlying micro-structure of this management decision making. Models of corporate finance/governance incorporating agency costs, as discussed in e.g. Tirole (2006) can potentially explain why some firms engage in corporate social responsibility and why others do not. These type of models seem to be especially useful, as there currently are a lot of information asymmetries between corporate management and shareholders regarding environmental and social performance.

The focus so far has been on financial markets and the agents we were interested in are shareholders. The main reason is that models that analyze consumer and employee behavior, namely models of product differentiation and models of compensating wage differentials already exist. These are examples of hedonic pricing models (see Rosen, 1974). Such hedonic pricing models are few in the investment literature and modeling socially responsible investment is a novel and attractive starting point. Nevertheless, there is still a need for research addressing the interaction of corporate social responsibility with the behavior of other stakeholders. It is interesting to find out which stakeholders are specifically targeted by socially responsible firms. In this context, there is another interesting causality issue that could

be addressed. Do socially responsible firms attract socially responsible investors, or do socially responsible investors induce firms to behave socially responsible? So the question is how social responsibility is actually governed. It is interesting to combine theories of corporate governance with the literature on social responsibility.

A second direction for future research is to empirically test the three propositions in chapter 2. Although the propositions seem to be in line with the existing empirical literature, it is useful to test the three propositions using a structural econometric model. Furthermore, the propositions try to explain what has been found by empiricists. The general equilibrium model allows for more specific and theoretically based hypotheses that can also be tested. Socially responsible firms do not maximize profits and based on a naive approach we would label such firms as inefficient. However, in chapter 2 we show that with externalities, maximizing profits or value is not the same. Stochastic frontier analysis as proposed by Hughes et al. (1996) can take into account distinct corporate goals and, as such, measure "true" inefficiency. This seems to be an attractive road for empirical work.

Furthermore, the model in chapter 4 is rather stylized. Endogenizing the interest rate and including realistic savings behavior enriches the analysis. It would be interesting to see how the savings decision interacts with the investment decision and how this effects the long-run environmental quality. With an endogenous savings decision, we can have both under- or over investment in the capital stock as well as in the environmental good. A priori it is not clear how this affects economic outcomes, and worth researching.

Finally, the empirical chapters use cross-sectional data. This limits one in making conclusions based on the results. Causality issues, endogeneity problems and unobserved heterogeneity can, to some extent, be better dealt with if we expand the data-set with more observations and create a panel. For instance, it is unclear whether firms make their decisions based on regulations, or if presence of a firm affects local regulations. So far, the possible type of analysis is often severely limited by the data, but as data on corporate social responsibility becomes more available, it opens up many doors for future research.

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Samenvatting

In een sociale markteconomie kan de overheid niet altijd door regulering garanderen dat de wijze van bedrijfsvoering door de maatschappij als "eerlijk" of "rechtvaardig" wordt ervaren. Mede daardoor is er een groeiend aantal bedrijven dat aan *zelfregulering* doet onder de noemer *maatschappelijk verantwoord ondernemen*. Maatschappelijk verantwoord ondernemen kan worden gedefinieerd als de mate waarin bedrijven externe kosten internaliseren of (her)verdelingsconflicten vermijden. Er zijn diverse redenen voor een bedrijf om maatschappelijk verantwoord te ondernemen: anticiperen op toekomstige regelgeving, risico management, verticale product differentiatie, verbeteren van relaties met belanghebbenden in het bedrijf, de vermogenskostenvoet drukken of intrinsieke motivaties. Bij elk hiervan komt het er op neer dat er bekeken wordt wie de kosten draagt van maatschappelijk verantwoord ondernemen en wie de bijbehorende baten ontvangt. Dit proefschrift gaat over de economie van maatschappelijk verantwoord ondernemen, met de nadruk op de rol van financiële markten en instellingen.

In hoofdstuk 2 introduceren we een theoretisch algemeen evenwichtsmodel met een vermogensmarkt en externe effecten van productie, om de relatie tussen maatschappelijk verantwoord ondernemen en diverse maatstaven van bedrijfsfinanciële prestaties te analyseren. In het model beïnvloeden de externe effecten van productie de keuzes van beleggers bij het samenstellen van hun beleggingsportefeuille. Maatschappelijk verantwoorde ondernemingen houden hier rekening mee bij hun productiebeslissingen. Het model is in staat om de schijnbare tegenstrijdige resultaten van de bestaande empirische literatuur omtrent de relatie tussen maatschappelijke verantwoordelijkheid en financiële prestaties te verklaren. Het model laat zien dat het nogal uitmaakt welke prestatiemaatstaf wordt gehanteerd om deze relatie te bestuderen. Voor de financiële ratio marktwaarde over boekwaarde (Market-toBook; Tobin's q) verwachten we een positieve relatie met toenemende

verantwoordelijkheid, omdat maatschappelijk verantwoorde ondernemingen de marktwaarde maximaliseren en niet de financiële winst. Voor het rendement op kapitaal (Return on Assets) verwachten we ook een positieve relatie aangezien maatschappelijk verantwoorde ondernemingen de externe kosten internaliseren, dat wil zeggen ze hanteren een hogere kapitaalkostenvoet. Voor het rendement op de aandelenmarkt is de relatie met toenemende maatschappelijke verantwoordelijkheid negatief op sector niveau, maar *a priori* onduidelijk als er geaggregeerd wordt over de sectoren. Dit is zo omdat: 1. beleggers een afweging maken tussen rendement en de mate waarin externe effecten worden gegenereerd en 2. maatschappelijk verantwoord ondernemen niet gerelateerd is aan de mate van de creatie van externe effecten, maar aan de mate waarin deze effecten worden geïnternaliseerd. Het kan best zo zijn dat een chemieconcern relatief verantwoorder opereert dan een bank, ook al genereert deze laatste dan misschien minder vervuiling. De boodschap van hoofdstuk 2 is dat wanneer er externe effecten zijn, diverse prestatiemaatstaven verschillende effecten reflecteren. Daarom moet men voorzichtig zijn voor wat betreft het trekken van conclusies bij het interpreteren van empirische resultaten. Een ander belangrijk resultaat van hoofdstuk 2 is dat het laat zien dat de bestaande empirische literatuur niet in tegenspraak is, maar elkaar juist aanvult. De bestaande verwarring berust op een paradox. Er is een overduidelijk verband tussen maatschappelijk verantwoord ondernemen en financiële prestaties en dit verband is intuïtief: Maatschappelijk verantwoord ondernemen gaat ten koste van de financiële winst, maar het zorgt potentieel voor maximale waarde van het bedrijf.

In hoofdstuk 3 bekijken we een ander kanaal van financiering en doen een empirische studie naar de prestaties van banken die de *Equator Principes* hebben ondertekend. Met de Equator Principes proberen banken duurzame ontwikkeling te bereiken binnen zogenaamde projectfinanciering. Projectfinanciering is het financieren van infrastructuur, industriële projecten en/of overheidsdiensten waarbij de financieringsbeslissing wordt gedaan op basis van de kredietwaardigheid van het project en niet de kredietwaardigheid van de projectontwikkelaars. We maken bij dit onderzoek gebruik van data geleverd door EIRIS, een onafhankelijke instantie die bedrijven evalueert op sociale, ethische en milieu aspecten. Het onderzoek wijst uit dat banken die de Equator Principes ondertekenen significant beter scoren op deze aspecten vergeleken met banken die de principes niet ondertekenen. De banken die niet ondertekend hebben zijn ook beduidend kleiner. Voor wat betreft andere bankkarakteristieken vinden we geen significante verschillen. Aan de hand van een *event study* tonen we aan dat aandeelhouders niet significant nega-

tief reageren op de aankondiging van het ondertekenen van de Equator Principes. Ondertekening gaat dus niet ten koste van de marktwaarde van deze financiële instellingen.

In hoofdstuk 4 koppelen we maatschappelijk verantwoord ondernemen aan duurzame ontwikkeling. Een typisch kenmerk van een model van een economie met 'kortlevende' individuen is dat deze geen rekening houden met de lange termijn effecten van vervuiling. Daardoor dwingen ze toekomstige generaties de lasten te dragen. Dit soort intergenerationele externaliteiten worden meestal aangepakt met belastingmaatregelen. Met de opkomst van maatschappelijk verantwoord beleggen biedt de aandelenmarkt mogelijk een helpende hand om ook de *lange termijn* milieuproblematiek aan te pakken, aangezien de aandelenmarkt, in principe, wel voor eeuwig "leeft". We bestuderen de rol van een vooruitblikkende aandelenmarkt in een model met overlappende generaties. In het model houden aandeelhouders bij het samenstellen van hun beleggingsportefeuille rekening met het feit dat bedrijven vervuilen. Het blijkt dat wanneer er eigendomsrechten op het bedrijf worden verhandeld, de correcte bedrijfswaardering het conflict tussen huidige en toekomstige generaties kan oplossen. Dit betekent dat maatschappelijk verantwoord beleggen een rol kan spelen bij het nastreven van duurzame ontwikkeling.

In hoofdstuk 5 tenslotte, bekijken we maatschappelijk verantwoord ondernemen in het kader van de toenemende globalisering. We onderzoeken met name of ontwikkelingslanden een comparatief voordeel hebben in termen van regulering en koppelen dit aan maatschappelijk verantwoord ondernemen. We gebruiken hierbij data op bedrijfsniveau van de 540 grootste Europese multinationals, die in totaal meer dan 44 duizend dochterondernemingen hebben in 188 landen. We gaan na of bedrijven met een relatief slechte score op hun milieustandaarden relatief vaker gevestigd zijn in arme landen, corrupte landen, of landen met een slechte milieuwetgeving. We vinden nieuw bewijs voor de zogenaamde *vervuilingsparadijs* hypothese (Pollution Haven Hypothesis), die stelt dat multinationals hun vervuilende activiteiten naar landen met slechte milieuregelgeving verplaatsen. Ons onderzoek suggereert daarnaast dat dit niet noodzakelijkerwijs de armste of meest corrupte landen zijn. We stellen met dit onderzoek vast dat maatschappelijk verantwoorde ondernemingen landen met slechte milieuregelgeving relatief minder aantrekkelijk vinden.