CCSO Centre for Economic Research

University of Groningen

CCSO Working Papers **June, 2006**

CCSO Working paper 2006/03

Corporate social responsibility in a general equilibrium stock market model: Solving the financial performance puzzle

Lammertjan Dam
Department of Economics, University of Groningen

CCSO Working Papers
http://www.eco.rug.nl/ccso

Corporate Social Responsibility in a General Equilibrium Stock Market Model:

Solving the Financial Performance Puzzle

Lammertjan Dam *

University of Groningen, Department of Economics, P.O. Box 800, 9700 AV Groningen, The Netherlands

Abstract

We analyze corporate social responsibility (CSR) in a general equilibrium stock market model with uncertainty in production. Production generates non-market costs and consumers take this into account when they construct their portfolio. We deduce empirically testable hypotheses and analyze how CSR affects various financial performance indicators. We show that our model offers an excellent explanation of the seemingly contradictory findings in the existing empirical literature. We stress that our findings are not a result of assumptions on the operational level of the firm. We conclude that there is a clear and direct association between CSR and different measures of corporate financial performance.

Key words: Socially Responsible Investment, Corporate Social Responsibility, General Equilibrium, Stock Market, Financial Performance
JEL classification codes: D21, D53, G11, G30, M14

1. Introduction

What is the relation between corporate social performance (CSP) and corporate financial performance (CFP)? Analyzing financial performance is central in accounting and finance since the origin of enterprise. The naming and

* Corresponding author. Address: University of Groningen, Department of Economics, P.O. Box 800, 9700 AV Groningen, The Netherlands, or L.Dam@rug.nl, tel: +31(0)50-3637190.

formal recognition of corporate social responsibility (CSR) is a relatively recent phenomenon. Generally, it is assumed that CSR is the taking account of non-financial consequences of production. Especially, concerns about the natural environment, employees, ethics and society as a whole are thought to constitute an important part of the firm's responsible behavior (see Caroll, 1999, for an overview). Rating agencies like KLD and Ethical Investment Research Service (EIRIS) have come up with large lists of issues they consider when assessing CSR. 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 firm's liabilities for hazardous waste, use of recycled materials and alternative fuels, etc. Among others, Geoffrey Heal (2005), has pointed out how CSR might be related to the firm's financial performance. He finds six linkages: reducing risk, reducing waste, improving relations with regulators, generating brand equity, improving human relations and employee productivity, and lowering the cost of capital. There is a growing empirical literature trying to obtain an answer to this question. However, so far, the empirical results have not given a clear-cut answer. 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%)." There are numerous explanations of these diverse results, primarily in the business and operations management literature and often presented in a rather 'ad-hoc' way (see McGuire et al., 1988; Heal, 2005; McWilliams et al., 2006). However, there is no economic theory that tries to incorporate socially responsible investment and corporate social responsibility in a full equilibrium neo-classical framework [1] .

[1] Worth mentioning is the model by Heinkel et al. (2001) in which *green screening* takes place in the portfolio selection process. This model is similar to the model of asymmetric information by Merton (1987), where "screening" takes place 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 fall short of a full explanation of the empirical observations.

The lack of a full equilibrium model has consequently created a lack of understanding and a misinterpretation of the empirical results with respect to the relation between corporate social responsibility and corporate financial performance. In a world without externalities and with homogeneous agents, several standard financial performance measures can be interpreted in the same way and partial equilibrium analysis is sufficient to develop a full understanding of the relation. But with non-market costs, heterogeneous consumers, and heterogeneous production processes, these financial performance measures need not have the same interpretation, a consequence which partial equilibrium analysis will not reveal. Although the focus of critiques has always been on the measurement of "social performance", ironically, we find that it is the differences in the operationalization of "financial performance" that creates the confusion. We demonstrate the source of this confusion utilizing a general equilibrium stock market model. More specifically, we analyze the implications of corporate social responsibility for three financial performance measures that are most often used in the empirical literature, namely: 1. the Market-to-Book ratio (or Tobin's Q); 2. Return on Assets (ROA) or similar accounting ratio's (Return On equity, Return On Investment, Return On Sales); 3. (Risk adjusted) stock market returns (Jensen's alpha). We show that it makes a huge difference which financial performance measure is used when comparing socially responsible firms to irresponsible firms. For Market-to-Book we expect a positive relation with social performance, for ROA also a positive relation, and for stock market returns this relation is ambiguous at the aggregate level and negative at the industry level.

The intuition of our model is as follows. We introduce heterogeneous consumers and heterogeneous firms in a general equilibrium stock market model analogues to Diamond (1967). We assume that besides production of market-traded goods, firms generate non-market costs through, for example, environmental damage due to the use of real capital in production. Firms differ in their technology with respect to the amount of damage they create. Consumers have an interest in firms via shareholdings and they differ with respect to their preferences over damage. First we show that a social planner's solution coincides

with the competitive stock market allocation, given that firms are maximizing market value. This result is in accordance with the basic argument made by Jensen (2002) that the single objective of a firm is to maximize its market value. We define this type of corporate behavior as "socially responsible behavior". The other type of behavior we consider is pure profit maximization, which differs from market value maximization in this setting and we label it "irresponsible behavior" as this type of behavior does not take into account external or non-market costs. Analyzing corporate social responsibility in such a way is in line with the definition of corporate social responsibility provided by Heal (2005).

An outcome of market value maximization, i.e. socially responsible behavior, is that socially responsible firms internalize some of the non-market costs by, for instance, substituting labor for capital to reduce pollution. In other words, they submit to a higher cost of capital compared to the market. Consequently, the operating profit measures such as Return on Assets, will be higher for socially responsible firms. Another effect is that firms that engage in social responsibility generate less non-market costs and the demand for shares of these firms will be higher compared to their irresponsible peers, since some consumers who are also investors care about the social costs that are generated by the firm besides the cash flows. Consequently, the stock price and hence the market value of the firm increases. The higher demand also increases the Market-to-Book value relative to irresponsible firms.

We therefore have two opposing effects of social responsibility on stock market returns. First, as a result of a higher return on capital, the stock market returns are relatively higher for socially responsible firms. Second, the increased stock market value through the increased demand for shares reduces the relative stock market return of socially responsible firms. In equilibrium the net effect is that irresponsible firms generate higher stock market returns relative to their industry peers. However, both the difference in and the level of stock market returns depend on the amount of damage per output, since firms in industries that use more damaging technologies have a higher potential to create value by internalizing non-market costs compared to firms in industries

that use less polluting technologies. We consider industries that differ with respect to their "damage technology" and assume that the distribution of firms that engage in corporate socially responsible behavior is unrelated to industry type. Consequently, at the aggregate level it is ambiguous whether socially responsible firms generate higher or lower stock market returns compared to irresponsible firms. We emphasize that our model yields these results without assuming any operational relation between profits and socially responsible behavior. Whatever relations there might exist on the operational level is irrelevant to our results as these are simply a consequence of market clearing, driven by investor preferences.

Having gained these new insights, we carefully inspect what types of financial performance measures are used in a large number of empirical studies. We group the studies according to the financial performance measure used and inspect the observed relation of this measure with the measure of social responsibility. When the empirical results are presented this way, we find that they are not conflicting with our general equilibrium model. Therefore, we conclude that our model is fully capable of explaining the various empirical findings on the relation between CSR and financial performance, which implies that the existing empirical evidence is not mixed, but in fact very strong.

The remainder of this paper is organized as follows. In the next section we give the ingredients of the model. In Section 3. we calculate the optimal allocation by a social planner. Then we introduce financial markets and analyze the effects of two types of behavior, namely socially responsible behavior (market value maximization) and irresponsible behavior (pure profit maximization) on three different types of financial performance measures. In Section 5. we relate our results to the existing empirical literature and discuss our findings. Finally, we conclude in Section 6.

2. Technology, preferences, and states of nature

We consider n firms and we assume that production by firm i can be written as a decomposable function of capital intensity k_i and a random variable θ reflecting the state of nature, as in Diamond (1967). The output of firm i when state θ occurs is given by:

$$y_i(k_i, \theta) = g_i(\theta) f_i(k_i) \tag{1}$$

with $f_i'(k_i) > 0$, $f_i''(k_i) < 0$. We also 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. Moreover, the firm generates an economic bad, which we may think of as environmental damage, and for simplicity we assume it is proportional to production:

$$D^i = D^i(f_i(k_i)) = D_i f_i(k_i) \tag{2}$$

Environmental damage is produced with certainty, so it is state independent. It is quite a natural assumption that capital intensity is related to environmental damage. We can also give a different interpretation to Eq. (2) in terms of social costs for employees. If a firm hires relatively more employees, it can reduce the work load per employee and therefore the work-related stress, so that more men on the job increases health and safety conditions. A higher number of employees reduces capital intensity so that there is a correlation between total social damage and capital intensity. Note that we do not go into the matter of how this relationship between capital intensity and social costs affects operations or profitability. Furthermore, we assume that each firm produces the same good and the same bad. The reason for this single good approach is that we want to be able to interpret the production of the good as perfectly substitutable cash flows received by a shareholder [2].

[2] Note that later it will turn out that shares are not perfect substitutes, which is not merely due to uncertainty, but to differences in the levels of damage produced by firms.

There are m consumers and consumer j has individual preferences for the good and the bad which are represented by a utility function $U_j(c, d)$, where c is consumption and d is total damage due to production, $u'_{cj} > 0, u''_{cj} < 0, u'_{dj} < 0, u''_{dj} < 0$. We will make some further restrictive assumptions on technology and preferences, which do not drive our results, but allow for explicit solutions and a better intuition. We assume constant absolute risk aversion (CARA) preferences and a constant marginal rate of substitution between consumption and damage. Furthermore, $g_i(\theta) \sim N(1, \sigma_i^2)$ and we consider the simple case where covariances between the $g_i(\theta)$'s equal zero [3] . An agent wants to maximize expected utility:

$$V_j = E[U_j(c_j, d_j)] \tag{3}$$

There are some issues with modeling preferences over social damage this way. For example, the environment is a public good. Moreover, the generated social damage need not be a physical product. However, in order not to blur the analysis with free-rider effects, underprovision, or other problems related to non-market costs, we treat the bad as a divisible, privately owned product. This type of preference representation does not provide a detailed description of the actual mechanism that drives socially responsible investment behavior. Nonetheless, it does account for a group of investors who are interested in aspects of the firm other than cash-flows. So for now, we simply treat social damage as a negatively valued product, but we will discuss this in more detail later.

3. 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. By analogy with Diamond (1967) the planner has full control over the allocation of the produc-

[3] This is not strictly necessary and one can in principle incorporate covariances in the analysis, however we choose to omit them since the effects of covariances on prices and portfolio selection are well known and do not affect our analysis qualitatively. See, for example, Cochrane, 2001.

tion 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 could in principle come up with an allocation that is achieved by a competitive economy with a complete set of contingent commodity markets (see Arrow and Debreu, 1954). However, we look at a limited set of markets, i.e. we do not allow for insurance companies etc., and therefore assume that the cost elements that restrict the set of markets limits 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 the firms before production is completed. Firm i is instructed to deliver a fraction α_{ij} of its output to individual j, independent of the state of nature. This implies that total consumption and damage of individual j is equal to:

$$c_j = \sum_{i=1}^{n} \alpha_{ij} y_i(k_i, \theta) \tag{4}$$

$$d_j = \sum_{i=1}^{n} \alpha_{ij} D_i f_i(k_i) \tag{5}$$

Furthermore, total consumption should equal total output which is a restriction on the α_{ij}'s:

$$\sum_{j=1}^{m} \alpha_{ij} = 1 \tag{6}$$

and we have a constraint on available capital:

$$\sum_{i=1}^{m} k_i = \bar{k} \tag{7}$$

A Pareto 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, $j = 1, .., m$. We rewrite the constraint Eq. (6) so that $\alpha_{i1} = 1 - \sum_{j=2}^{m} \alpha_{ij}$. Then substitute for α_{i1}, consumption and damage using Eq. (4) and Eq. (5) and form the Lagrangian:

$$E\left[U_1\left(\sum_{i=1}^{n}(1-\sum_{j=2}^{m}\alpha_{ij})y_i(k_i,\theta), \sum_{i=1}^{n}(1-\sum_{j=2}^{m}\alpha_{ij})D_i f_i(k_i)\right)\right] + \sum_{j=2}^{m}\nu_j\left(E\left[U_j\left(\sum_{i=1}^{n}\alpha_{ij}y_i(k_i,\theta), \sum_{i=1}^{n}\alpha_{ij}D_i f_i(k_i)\right)\right] - \bar{V}_j\right) + \mu\left(\bar{k} - \sum_{i=1}^{m}k_i\right) \tag{8}$$

Maximizing with respect to the α_{ij} 's and k_i's gives the following first-order necessary conditions:

$$-\left(E[U'_{c1}y_i(k_i,\theta)] + D_i E[U'_{d1}f_i(k_i)]\right) + \nu_j\left(E[U'_{cj}y_i(k_i,\theta)] + D_i E[U'_{dj}f_i(k_i)]\right) = 0 \qquad i = 1, 2, .., n; j = 2, 3, .., m \tag{9}$$

$$\left(1 - \sum_{j=2}^{m}\alpha_{ij}\right)\left(E[U'_{c1}y'_i(k_i,\theta)] + D_i E[U'_{d1}f'_i(k_i)]\right) + \sum_{j=2}^{m}\nu_j\alpha_{ij}\left(E[U'_{cj}y'_i(k_i,\theta)] + D_i E[U'_{dj}f'_i(k_i)]\right) = \mu \qquad i = 1, 2, .., n \tag{10}$$

Since production is decomposable we have

$$E[U'_{cj}y_i(k_i,\theta)] = f_i(k_i)E[U'_{cj}g_i(\theta)]$$
$$E[U'_{cj}y'_i(k_i,\theta)] = f'_i(k_i)E[U'_{cj}g_i(\theta)]$$

We substitute these two equations in Eq. (9) and Eq. (10). Then we combine these first order conditions by substituting for the Lagrange multiplier ν_j. If Eq. (9) holds, the summation terms in Eq. (10) drop out and we get

$$f'_i(k_i)\left(E[U'_{c1}g_i(\theta)] + D_i E[U'_{d1}]\right) = \mu$$

Substituting for μ we get a simple allocation rule:

$$\frac{f'_1(k_1)}{f'_i(k_i)} = \frac{E[U'_{c1}g_i(\theta)] + D_i E[U'_{d1}]}{E[U'_{c1}g_1(\theta)] + D_1 E[U'_{d1}]}, i = 2, 3, .., m \tag{11}$$

This expression equates the marginal rate of transformation with the expected marginal rates of substitution. Comparing this result to Diamond (1967) we observe that the marginal rates of substitution are adjusted for social costs.

4. Stock market equilibrium

In this section we introduce financial markets. Preferences, technology and the states of nature are unchanged, but trade on a stock market is allowed and we have production factor markets and a bond market. Firms hire factors and reward factors with payments independent of the state of nature. We first describe the portfolio selection process of consumers. Then we introduce two types of corporate behavior, namely socially responsible and irresponsible behavior, and characterize the market equilibrium. Next we study the implications of the types of corporate behavior for three widely used financial performance measures; namely the Market-to-Book ratio, Return on Assets, and stock market returns. We illustrate our propositions with a numerical example.

4.1. Portfolio selection

A consumer has initial wealth W_j, which consists of initial shareholdings and production factors. Assets are indexed by i and generate payoffs R_i and damage D^i. The consumer receives these cash and pollution flows proportional to his shareholdings. Asset i can be bought at price p_i. Consumers can also buy bonds and the price of a bond is the numeraire. Since one unit of a bond is a commitment to pay a fixed amount of r units of consumption, this is a risk free and pollution free asset. The consumer receives fixed payments for both his initial inputs and 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 the ω_{ij} is the number of shares consumer j holds in firm i and the last equation is the budget constraint. 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 conditions for a maximum:

$$E[U'_{cj} R_i] + E[U'_{dj}] D^i - p_i \kappa = 0 \tag{12}$$

Bond holders and suppliers of input factors have no voting rights with respect to corporate decisions and are not held responsible for the social damage generated by the firm. This justifies why we consider the risk free assets to be pollution free assets as well. Taking the derivative with respect to b_j gives us an expression for the Lagrange multiplier κ:

$$\kappa = E[U'_{cj} r] = E[U'_{cj}] r \tag{13}$$

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

$$p_i = \frac{1}{E[U'_{cj}] r} \left(E[U'_{cj} R_i] + E[U'_{dj}] D^i \right) \tag{14}$$

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

$$p_i = \frac{1}{E[U'_{cj}]r}\left(E[U'_{cj}]E[R_i] + \text{cov}[U'_{cj}, R_i] + E[U'_{dj}]D^i\right) \tag{15}$$

$$= \frac{E[R_i]}{r} + \frac{E[U''_{cj}]}{E[U'_{cj}]}\frac{\text{cov}[c_j, R_i]}{r} + \frac{E[U'_{dj}]}{E[U'_{cj}]}\frac{D^i}{r} \tag{16}$$

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 *Stein's lemma*. We can write this expression as:

$$p_i = \frac{E[R_i]}{r} - \frac{1}{r}\left(\delta\text{cov}[c_j, R_i] + \lambda_j D^i\right) \tag{17}$$

where $\delta = -\frac{E[U''_{cj}]}{E[U'_{cj}]}$ is the measure of absolute risk aversion, and $\lambda_j = -\frac{E[U'_{dj}]}{E[u'_{cj}]}$ the implicit subjective conversion price, or the subjective marginal rate of substitution, of environmental damage to consumption of consumer j. We can write Eq. (17) in a familiar form. For this demonstration, we normalize the price of asset i to one, so that we have an expression in terms of returns:

$$E[R_i] = r + \lambda_j D^i + \delta\text{cov}[c_j, R_i] \tag{18}$$

This equation is a modified CAPM equation, with a term adding to the intercept, which can be interpreted as a "social cost premium". With non-market costs, an asset's return, and specifically alpha, depends on other characteristics than financial risk. Therefore, our model predicts that a significant part of investor behavior is affected by non-financial characteristics of the firm. We can give a very general interpretation to these non-financial characteristics, for instance, potential consumer boycotts or environmental scandals. Each individual investor has subjective believes on the possibility of these occurring, reflected by the parameter λ_j. So, basically, we are saying that D^i represents any liability or negatively valued characteristic of the firm that cannot be observed in financial statements.

We define the expected profit of firm i by $\mu_i = E[R_i]$, and its variance by $\bar{\sigma_i}^2 = \text{Var}[R^i]$. We further assume that agents differ only with respect to their marginal rate of substitution, so that λ_j corresponds to agent $j = 1, ..., n$. With CARA preferences and a constant marginal rate of substitution between

consumption and damage, the pricing equation for agent j becomes:

$$p_i = \frac{1}{r}[\mu_i - \delta\omega_{ij}\bar{\sigma_i}^2 - \lambda_j D^i] \tag{19}$$

which we can express as a demand function for shares:

$$\omega_{ij} = [\mu_i - p_i r - \lambda_j D^i]\frac{1}{\bar{\sigma_i}^2\delta} \tag{20}$$

We see that a consumer with a higher preference for environmental quality (high λ_j) will hold less of the share if the firm pollutes. Furthermore, higher risk lowers demand proportional to the risk aversion of investors.

Suppose there are N_i shares for firm i. In equilibrium it must hold that the total demand for shares equals the number of shares

$$\sum_{j=1}^{m} \omega_{ij} = N_i \tag{21}$$

which yields

$$\left((\mu_i - p_i r)m - D^i \sum_{j=1}^{m} \lambda_j dj\right) \frac{1}{\bar{\sigma_i}^2\delta} = N_i \tag{22}$$

If we rewrite this equation, we get for the price in equilibrium:

$$p_i = \frac{1}{r}\left(\mu_i - \delta\frac{N_i}{m}\bar{\sigma_i}^2 - D^i\frac{\sum_{j=1}^{m}\lambda_j}{m}\right) \tag{23}$$

If we 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, $m = N_i = 1$, we get that the stock market value of the firm M_i is:

$$M_i = p_i = \frac{1}{r}[\mu_i - \delta\bar{\sigma_i}^2 - \bar{\lambda}D^i] \tag{24}$$

These results are similar to Heinkel et al. (2001) and Merton (1987) in the case of no shortselling. If shortselling is not allowed it means that the demand for shares, Eq. (20), cannot become negative. Then, for very polluting firms (high $\lambda_j D^i$), Eq. (20) is a binding constraint since ω_{ij} needs to be nonnegative and so demand for very polluting firms is equal to zero. In this case environmental screening takes place, since some stocks are omitted from the selection process. If shortselling is restricted and we have a dichotomous distribution for

agents' preferences (so either a very 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. Restricting shortselling complicates the summation in Eq.(21), but will yield qualitatively similar results to the case where shortselling is allowed. In our model, we do 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 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.

4.2. Corporate behavior

The firm guarantees a payment of r to the production factors irrespective of the state of nature and hence it satisfies the definition of the risk-free rate. Profits of the firm are given by:

$$\pi_i = g_i(\theta) f_i(k_i) - r k_i \tag{25}$$

Expected profits and the variance of profits are:

$$\mu_i = E[\pi^i] = f_i(k_i) - r k_i \tag{26}$$
$$\bar{\sigma_i}^2 = \mathrm{Var}[\pi^i] = \sigma_i^2 f_i^2(k_i) \tag{27}$$

Define total value of the firm as the market value plus the capital stock, $M_i + k_i$. Using Eq. (2), Eq. (24), and Eq. (26)-(27) we find the value of the firm in equilibrium:

$$\begin{aligned} M_i + k_i &= \frac{1}{r}[f_i(k_i) - r k_i - \delta \sigma_i^2 f_i^2(k_i) - \bar{\lambda} D_i f_i(k_i)] + k_i \\ &= \frac{1}{r}[f_i(k_i) - \delta \sigma_i^2 f_i^2(k_i) - \bar{\lambda} D_i f_i(k_i)] \end{aligned} \tag{28}$$

So we can see that the value of the firm only depends on output and not on the financing structure, which is in accordance with Modigliani and Miller (1958).

Suppose the firm wants to maximize its market value. We assumed a decomposable production function so the effect of the state of nature is multiplicative. As a price taker, the firm calculates that its value will change in proportion to output. This means that when doubling inputs, the firm calculates that its value becomes

$$\frac{f_i(2k_i)}{f_i(k_i)}(M_i + k_i)$$

and hence the stock market value:

$$\frac{f_i(2k_i)}{f_i(k_i)}(M_i + k_i) - 2k_i$$

In general, when the input level and market value equal $\hat{k_i}$, $\hat{M_i}$, the firm calculates the market value at 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 the input level such that the derivative of the market value with respect to k_i equals zero, which yields at the equilibrium input level where $\hat{k_i} = k_i$

$$\frac{f_i'(k_i)}{f_i(k_i)}(M_i + k_i) = 1 \tag{29}$$

Substituting the expression for the market value of the firm Eq. (28) in Eq. (29) 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

$$f_i'(k_i)[1 - \delta\sigma_i^2 f_i(k_i) - \bar{\lambda}D_i] = r \tag{30}$$

If we consider the numerator of the left hand side of Eq. (11), f_1', to be associated with the risk free, pollution free technology, then we can substitute $f_1' = r$. Furthermore $E[U_{c1}' g_i(\theta)] + D_i E[U_{d1}'] = E[U_{c1}'](1 - \alpha_{i1}\delta\sigma_i^2 f_i(k_i) - \lambda_1 D_i)$, for the risk free technology ($i = 1$) the numerator of the right hand side of Eq. (11) is equal to $E[U_{c1}']$. Substituting these expressions in Eq. (11) and averaging over all consumers to get the average λ_j and noting that $\sum_{j=1}^{m} \alpha_{ij} = 1$, we

see that Eq. (30) is equal to the social planner's solution Eq. (11) [4].

This is 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, firms should have one objective and that is to maximize the value of the firm. This is often wrongly interpreted as "firms should maximize profits". This is the statement that is put forward by Milton Friedman (1970), who has claimed that "The social responsibility of business is to increase its profits" [5]. 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. Of course, firms can still be over or under valued with respect to their created non-market costs due to free-rider effects, myopic behavior, or mis-pricing in general, leading to pollution levels that are too high, but that does not mean that Jensen's basic argument is wrong.

Friedman argues that firms are taxing consumers through reduced profits by

[4] Note that the assumption that produces this result with such ease is that damage is proportional to capital intensity. This justifies the believe of the firm that its market value changes proportional to output. If damage is not proportional to per capita output then the derivation becomes more complicated.

[5] Arguments can be made to support this claim. If the non-market costs are incorporated through consumption behavior on the consumption good 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 costs generated by each firm in the supply chain are 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.

engaging in corporate social responsibility and that consumers can spend on social responsibility programs themselves if they want to. However, this argument fails to acknowledge that pollution due to production can also be considered to be a form of taxation. From an efficiency point of view it might be better to prevent environmental damage, rather than to deal with it indirectly by cleaning it up later. Our model shows that prevention is indeed preferable, as profit maximizing behavior generates a market outcome that is different from a social planner's solution. Comparing the planner's outcome to a profit maximizing market equilibrium, the increased profits in such an equilibrium can never outweigh the higher social costs of production. We do not even mention the fact that for some damaging processes it might be physically impossible to undo them, implying a social cost of infinity, which makes the argument trivial.

We consider two types of corporate behavior. The first is socially responsible behavior. Since maximizing market value yields the social optimum, we consider it to be consistent with corporate social responsibility. So a socially responsible firm maximizes its stock market value. The second type of corporate behavior is pure profit maximization without considering non-market costs. We call this irresponsible behavior. So the irresponsible firm uses a cost of capital that is too low, i.e. it only pays the risk-free rate plus a risk premium, but not a pollution premium. A socially responsible firm (SR) sets its capital-labor ratio k^{SR} such that:

$$f'^{SR}(k^{SR}) = \frac{r}{1 - \delta\bar{\sigma}^2_{SR} - \bar{\lambda}D^{SR}} \tag{31}$$

And an irresponsible firm (IR) sets its capital-labor ratio k^{IR} such that:

$$f'^{IR}(k^{IR}) = \frac{r}{1 - \delta\bar{\sigma}^2_{IR}} \tag{32}$$

Where $\bar{\sigma}^2_{SR} := \sigma^2_{SR} f^{SR}(k^{SR})$ and $\bar{\sigma}^2_{IR} := \sigma^2_{IR} f^{IR}(k^{IR})$. The difference between the two expressions is that the irresponsible firm does not consider the social costs $\bar{\lambda}D^{IR}$. This is in line with the definition of corporate social responsibility by Heal (2005, p. 393): "CSR involves taking actions which reduce the extent of externalized costs or avoid distributional conflicts". Note that the choice of

being socially responsible or socially irresponsible is exogenous to our model. There is no economic mechanism that forces firms to be socially responsible [6] .

4.3. Implications

In this section, we will explore the implications of a firm's choice to operate socially responsible on financial performance. The bulk of empirical studies on socially responsible investment basically adopt the intuition of Eq. (24), namely that in equilibrium there is a trade-off between stock-market returns and corporate social responsibility. It is then assumed that any financial performance measure will reveal this. Next, financial performance measures of socially responsible firms are compared with financial performance measures of irresponsible firms. Note that this logic is based on a partial equilibrium result assuming either identical production technologies with respect to pollution standards in each sector or a homogeneous distribution with respect to CSR behavior among different sectors. 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 of financial performance that are widely used in the empirical literature. These three are Market-to-Book (or Tobin's Q), Return on Assets and Stock Market Returns.

Proposition 1 *Define the Market-to-Book ratio as total market value divided by installed capital,* $(M + k)/k$*. Consider the degree of homogeneity* $\alpha_i = \alpha$ *for all firms. It then follows that:*

(1) the Market-to-Book ratio of socially responsible firms is always larger than the Market-to-Book ratio of irresponsible firms, irrespective of the level of damage per output

(2) the Market-to-Book ratio of socially responsible firms is constant, irrespective of the level of damage per output

[6] If shareholders disagree with the policy of a firm they can either sell the stocks (Exit) or try to influence firm policy at shareholder meetings (Voice). As we assume that the individual investor is small, the latter is not an option.

PROOF. 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. (31) in Eq. (28) we have 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. (32) in Eq. (28) we have that the total market value of the irresponsible firm is equal to $(M^{IR} + k^{IR})/k^{IR} = \alpha^{-1}\left(1 - \frac{\bar{\lambda}}{r}f'(k)D_{IR}\right) < \alpha^{-1} = (M^{SR} + k^{SR})/k^{SR}$. $\square$

Note that this result holds even if 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 attained.

Proposition 2 *Define the Return on Assets ratio (ROA) as profits divided by installed capital, π/k. Consider the degree of homogeneity $\alpha_i = \alpha$ for all firms. We correct ROA for risk, that is we compare ROA for identical risk levels. It then follows that:*

(1) ROA of socially responsible firms is always larger than ROA of irresponsible firms

(2) ROA of irresponsible firms is constant, but for socially responsible firms is increasing in damage per output D_i

PROOF. Again, note that if $f_i(k_i)$ is homogeneous of the degree alpha then $\frac{f_i'(k_i)k_i}{f_i(k_i)} = \alpha$. Using the definition of profits we have $\text{ROA} = \pi_i/k_i = f_i(k_i)/k_i - rk_i/k_i = f_i'(k_i)/\alpha - r$. Substituting for $f_i'(k_i)$ using Eq. (32) we see that for the irresponsible firm

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

which does not depend damage per output D_i. For socially responsible firms we substitute for $f_i'(k_i)$ using Eq. (31) and find that

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

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

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

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

By setting a lower capital-labor ratio, the socially responsible firm achieves two things. First, it reduces some of its social costs. Second, it creates a higher ROA to compensate for social costs. In a conventional setting, observing a ROA that is too high would induce additional investments, since the optimal Market-to-Book ratio has not been reached. However, with non-market costs, socially responsible investors appreciate this behavior, which is reflected in the stock price. Consequently, the optimal Market-to-Book ratio is achieved by choosing a lower capital-labor ratio.

Proposition 3 *Define stock market returns as π/M. Assume that whether or not a firm engages in corporate social responsibility is unrelated to its technology. More specifically, the choice is assumed to be unrelated to the per output created social costs D_i. It then follows that*

(1) the sign of the difference in risk-adjusted stock market returns of socially responsible firms and irresponsible firms is ambiguous. Moreover, this even holds when all firms have the same degree of homogeneity; $\alpha_i = \alpha$.

(2) socially responsible firms have lower stock market returns compared to irresponsible firms within the same industry (that is, for firms with the same damage per output D_i) .

PROOF. First we point out that $\pi/M = \frac{\pi/k}{M/k} = \frac{\text{ROA}}{\text{Market-to-Book}_{-1}}$. Here we can see the intuition of the ambiguity. ROA is higher for socially responsible firms, but Market-to-Book is lower for irresponsible firms. However, this does not prove anything yet, as one of the two effects could be dominating. We assume that the levels of risk are identical $\bar{\sigma}^2_{SR} = \bar{\sigma}^2_{IR} = \sigma^2$. 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 output. The sign of the difference of these two equations depends on the combination of D_{SR} and D_{IR}. More specifically, stock market returns of the irresponsible and Responsible 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} is higher than the right-hand side of this equation, then the socially responsible firm has higher stock market returns, otherwise lower. Since the fraction on the right hand side is larger than or equal to 1, we see that if $D_{SR} = D_{IR}$, that is we compare within one industry, we have that stock market returns are lower for socially responsible firms. □

The underlying intuition is that CSR is a measure of the degree of internalization of non-market costs, not just the extent to which it creates non-market costs. 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, we cannot say much on stock market returns of socially responsible firms at the aggregate level.

Note that all of the results hold without assuming anything on the operational relation between productivity and pollution. Whether or not more polluting firms are more productive is irrelevant to our general equilibrium analysis.

4.4. Numerical illustration

In this section, we give a numerical example to give a feel for how our theoretical model could be tested empirically. For this example, we consider a world with no uncertainty, so $\sigma^2 = 0$ and we assume that every firm uses a Cobb-Douglas production technology, given by $f_i(k_i) = f(k_i) = \sqrt{k_i}$, where k_i is the capital-labor ratio. For ease of discussion, we interpret the social cost of production as pollution in this example. Furthermore, we assume that a firm can act according to the two types of behavior we discussed before. The first is CSR, which is maximization of stock market value. The other kind of behavior is pure profit maximization. So, for a socially responsible firm, we have according to Eq. (31):

$$f'(k_i) = r/(1 - \bar{\lambda} D_i)$$

For a firm that simply maximizes profits $\pi_i = f(k_i) - rk_i$; e.g. it does not take all the shareholders' preferences in account but only those with low preference for the environment, we get the simplified version of Eq. (32):

$$f'(k_i) = r$$

In Table 1, we give a numerical example, given this simple structure. This Table presents hypothetical financial reports by 6 different companies that differ with respect to pollution per output, which we consider to be different across industries, and which differ with respect to corporate behavior. Our model gives apparent tools for empirical work, as a lot of these financial ratio's are publicly available. Moreover, it points out that supposing that screening only takes place with respect to environmental damage levels is wrong. There is a difference between CSR screening and green screening. Let us say that the threshold damage level of including a company at 0.41. Then the clean irresponsible firm (bottom right in Table 1) is included in the portfolio but the responsible dirty firm (Top Left) not, whereas this latter firm creates more net value for the green shareholder. Again this illustrates that CSR is not just a question of how dirty a firm is but whether the firm takes its dirtiness into account when making production decisions. When screening takes place based

on the total amount of pollution firms create, the screened firms can be socially responsible as well as irresponsible.

Suppose that the "Dirty" industry in Table 1 has had a lot of pressure from, for example, NGO's or consumer boycotts. Each firm in the "Dirty" industry behaves socially responsible and hence only financial reports in accordance with the top left of Table 1 are observed. The two other industries ("Normal" and "Clean") are acting irresponsible, so for those firms we observe reports according to the bottom center and bottom right of Table 1 respectively. Let us use these reports to compare stock market returns of socially responsible versus irresponsible firms. The return of responsible firms is 0.5, and the average of the two irresponsible firms between 0.42 and 0.5. In this case responsible firms generate higher stock market returns.

Let us now consider the reverse case where the "Normal" industry is acting socially responsible, but the "Clean" and "Dirty" are not. Then the return of the responsible firms is 0.42, and the average return of the two irresponsible firms between 0.42 and 0.75. Now we have the result that irresponsible firms generate higher returns compared to the example above where socially responsible firms generate higher returns. Unless one can identify a relation between industry type and the choice of being socially responsible, looking at stock market returns is not going to give clear-cut results and Market-to-Book (in this framework) is a better indicator. In the next section we illustrate that the paradoxical implications of CSR on financial performance have unnecessarily created confusion in the empirical literature.

5. Discussion

The empirical findings on the relation between Corporate Social Performance (CSP) and Corporate Financial Performance (CFP) appear to be contradicting. However, using our model we show that in fact this is not the case. Much of the confusion is generated by the use of the term "financial performance" for different financial indicators. As we showed in the previous section, it mat-

Table 1
Numerical example of financial indicators of socially responsible vs irresponsible firms.

BEHAVIOR	INDUSTRY TYPE Dirty ($\lambda D_i = 1/3$)	Normal ($\lambda D_i = 1/4$)	Clean ($\lambda D_i = 1/5$)
socially responsible			
Capital installed k	1.78	2.25	2.56
Stock Market value M	1.78	2.25	2.56
Total Market Value $M + k$	3.56	4.50	5.12
Market-to-Book $(M + k)/(k)$	2.00	2.00	2.00
Profits π	0.89	0.94	0.96
Stock Market Return π/M	0.50	0.42	0.38
Return On Assets π/k	0.50	0.42	0.38
Social costs of Pollution D^i	0.44	0.38	0.32
irresponsible			
Capital installed k	4.00	4.00	4.00
Stock Market value M	1.33	2.00	2.40
Total Market Value $M + k$	5.33	6.00	6.40
Market-to-Book $(M + k)/(k)$	1.33	1.50	1.60
Profits π	1.00	1.00	1.00
Stock Market Return π/M	0.75	0.50	0.42
Return On Assets π/k	0.25	0.25	0.25
Social costs of Pollution D^i	0.67	0.50	0.40

We consider three industries that differ with respect to their pollution per output, $\bar{\lambda} D_i$ and two types of corporate behavior; socially responsible and irresponsible behavior. Socially responsible firms set k such that $f'(k_i) = r/(1 - \bar{\lambda} D_i)$ irresponsible firms set $f'(k_i) = r$. Calculations are made using $f(k) = \sqrt{k}$, $r = 1/4$, $\pi = f(k) - r(k)$, $M = (\pi - \lambda D^i)/r$, $D^i = D_i f(k_i)$. See text for a derivation of these formulas.

ters what kind of financial performance measure actually is being used. If Market-to-Book is the financial performance measure, one can expect a positive relation between CSP and CFP. For Return-on-Assets we also expect a positive relation. However, for stock market returns the relation is negative at the industry level and ambiguous at the aggregate level.

We will relate our propositions to the findings in the empirical literature, carefully paying attention to what type of performance measure is used. For this purpose, we consulted two widely cited survey articles on the link between Corporate Social Performance 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 [7] or stock market returns. This results in a survey of 67 studies.

5.1. Studies using Market-to-Book

Proposition 1 predicts that the Market-to-Book ratio should be higher for socially responsible firms compared to irresponsible firms, but that across industries the Market-to-Book is constant for socially responsible firms, independent of the amount of damage per unit of production. In the two review studies used, there are only a few studies that use Market-to-Book, or equivalently Tobin's Q, as a financial performance measure to investigate the relation between CSR and financial performance. The usual way to measure Tobin's Q is to calculate the ratio of the stock market value of the company to the cost of its tangible assets. Table 2 shows that all studies that have used the Market-to-Book index find a strong and positive relationship between corporate social performance and Market-to-Book. This is in line with Proposition 1. For example, King and Lenox (2001) also use Tobin's Q and they make a distinction in industries. We quote their findings:

> 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 (..).

King and Lenox (2001, p. 106). This is exactly what Proposition 1 predicts, namely that Tobin's Q is constant across industries for socially responsible firms and relatively lower for irresponsible firms, independent of the environmental performance of the industry. Heal (2005) had already come 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).

[7] We also included in this category measures that were equivalent, e.g. Return on

Table 2
Studies using Market-to-Book

Authors	Relationship	Strength of result
Brown and Perry (1994)	positive	strong
Dowell Hart and Yeung (2000)	positive	strong
Fombrun and Shanley (1990)	positive	strong
King and Lenox (2001)	positive	strong

Studies using Market-to-Book (Tobin's Q) find a positive relation between Corporate Social Performance and Corporate Financial Performance.

5.2. Studies using Return on Assets

Proposition 2 tells us that we should observe a higher Return on Assets (ROA) for socially responsible firms, since these internalize non-market costs by adopting a higher cost of capital compared to the market cost of capital. Furthermore, ROA is constant across industries for irresponsible firms, since they all face the same cost of capital, but for socially responsible firms, ROA is proportional to the amount of pollution per output.

In Table 3 we present 36 studies that used Return on Assets or a comparable accounting 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 Proposition 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 70s and 80s when data availability was a problem.

There is additional evidence that supports Proposition 2. Spencer and Taylor (1987) note that the relationship is valid at the industry level. This means that differences in ROA are not due to differences in production technologies (α_i in our model). 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 performance, 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.

Equity (ROE), Return on Investment (ROI) and Return on Sales (ROS).

Table 3
Studies using Return on Assets or equivalent measure

Authors	Relationship	Strength of result
Berman et al. (1999)	Positive	Strong
Brown and Perry (1994)	Positive	Strong
Dooley and Lerner (1994)	Positive	Strong
Judge and Douglas (1998)	Positive	Strong
Preston and O'bannon (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 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
Rocknness et al. (1986)	No Effect	Weak

Studies using Accounting Data (ROA/ROE/ROI/ROS) find merely positive relations between Corporate Social Performance and Corporate Financial Performance.

5.3. Studies using stock market returns

First of all, Proposition 3 holds only if there are significant differences in CSR performance across industries. Cotrill (1990) shows that this is indeed the

case. Moreover, it is mainly polluting industries that are engaging in CSR. According to Proposition 3 this will dampen the difference between stock market returns of socially responsible companies and irresponsible companies. Table 4 gives an overview of studies that have used stock market returns as a financial performance measure. We grouped these studies in comparison studies and event studies. The reason is that event studies have to be interpreted differently. We will discuss this later.

For the comparison studies (top half of Table 4) the findings differ considerably and the majority of the studies finds mixed effects or no effect, which is in line with Proposition 3. Furthermore, McGuire *et al.* (1988) note that the positive relationship they find is stronger for accounting measures (ROA, ROE). This is in line with our theory, since the relatively higher demand for shares of socially responsible firms dampens the stock market return of these firms. Moreover, according to Proposition 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 [8].

Event studies (bottom half of Table 4) can be expected to 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. Consistent with the usage of the researchers, the results of the event studies in Table 4 are given the interpretation "positive", if news on increased social damage reduces the stock price significantly in the event window. However, such a correction of the stock price results in higher stock market returns for these firms, given that operating profits are not affected by the news. So in a

[8] 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 performance. 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.

way, it would have been better if the researchers had labeled this relation as negative, since socially responsible firms exhibit relatively lower stock market returns accordingly.

In line with Proposition 3, most event studies find the expected "positive" relationship, however, two studies on the withdrawal of international firms from South-Africa in the 1980s give a negative relationship. Then again, the studies on this specific subject present contradicting results and we also feel that withdrawal from a country is much more complex information compared to simple reported pollution levels.

5.4. Evaluation

Categorizing the empirical results according to the financial performance measure used, our overview shows that most of the observed relationships are not contradicting at all. There is a clear-cut relation between particular indicators of financial performance and CSR. To be more precise, particular financial indicators (Market-to-Book, ROA) are to be positively associated with CSR and stock market returns can be either positively or negatively associated with CSR.

In general, when the empirical literature assesses the links between CSP and CFP the conclusion is that the evidence is not very clear. We think that this results from analyzing all the studies at the same time, that is the bottom line in Table 5. However, when we distinguish between the different performance indicators, matters are put in a completely different light and we find that there indeed are very clear associations between finance and CSR. Note that in Table 5 we interpret the findings of event studies in what we feel is the appropriate way, as discussed in the previous section. Table 5 shows that the paradoxical empirical findings are in line with our propositions and that these findings should in fact be interpreted as showing very strong evidence on the relation between CSR and financial performance. This raises two issues; What are the key drivers of our model and are the underlying assumptions realistic?

Table 4
Studies using stock market returns

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

Event Studies

Authors	Relationship	Strength of result
Blacconiere and Northcut (1997)	Positive	Moderate
Blacconiere and Patten (1994)	Positive	Moderate
Klassen and McLaughlin (1996)	Positive	Moderate
Shane and Spicer (1983)	Positive	Moderate
Stevens (1984)	Positive	Moderate
Posnikoff (1997)	Positive*	Moderate
Belkaoui	Positive	Weak
Meznar Nigh and Kwok (1994)	Negative*	Strong
Wright and Ferris (1997)	Negative*	Moderate
Boyle Higgings and Rhee (1979)	Negative	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 Performance and Corporate Financial Performance.
*These are studies on the effect of announcing withdrawal from South-Africa, with conflicting results.

There are two key drivers of our model. The first is the assumption that investors prefer to hold firms in their investment portfolio that generate less social damage. This is a trivial assumption, but nonetheless an important one. Obviously, the mere existence of green funds and socially responsible screening justifies this assumption. More importantly, assuming that social damage is proportional to capital labor ratios, or capital intensity (k), is the second main driver of the results. The relationship does not have to be linear, but social

Table 5
Overview of empirical findings

Financial performance indicator	Number of studies	Positive relation	Negative relation	Mixed relation	No relation
Market-to-Book	4	4 (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	67	38 (57%)	9 (13%)	3 (5%)	17 (25%)

Overview of the results of the studies on the relation between Corporate Social Performance 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.

damage has to be increasing in capital intensity.

If social damage is interpreted as environmental damage it is not unrealistic to assume that real capital is an important source of pollution. For example, King and Lenox (2001), introduce a variable "size" which is defined as the log of assets [9] and find significant positive correlations of this size variable with total emissions and relative emissions. Liang (2005) also finds evidence that increased capital intensity is related to increased pollution levels. Generally, it is accepted that capital used in production causes a threat to the environment.

If social damage is interpreted as damage toward employees of the firm, it is not directly clear why capital intensity should affect this. Nonetheless, there is some empirical evidence that supports this claim (see, for example, Becchetti et al., 2006). Comparing a higher capital-labor ratio to the capital-labor resulting from profit maximizing behavior within one industry implies that a socially responsible firm will pay higher wages to its workers relative to the workers' productivity. So, either more men are put on the job to do the same tasks, or equivalently, they are paid more compared to the industry wage. More men on the job can improve health and safety conditions. A higher wage can be interpreted as a 'fair' wage, instead of exploiting cheap labor.

In this respect, another line of reasoning is the following. Although we have

[9] They also introduce a variable called "capital intensity" and define it as capital expenditures over sales, which is different from the more standard ratio *total* capital over sales.

not modeled a labor market, we can relate social responsibility of a firm to the theory of compensating wage differentials (See, for example, Rosen, 1974). This theory basically says that if two firms offer identical jobs in terms of productivity, but one firm has poor health and safety regulations, poor work environment, higher risks, etc..., then this firm has to pay a relatively higher wage in equilibrium to attract workers. The other firm, therefore, hires relatively more labor in equilibrium due to the lower wage. This lowers the capital labor ratio of socially responsible firms. So we do not make explicit how the socially responsible company "sets" the capital labor ratio in this case, since it depends on labor supply, but it somehow makes decisions resulting in a higher capital-labor ratio through equilibrium in the labor market. This then results in a higher return on assets, since the marginal product of capital is increased. [10]

Both interpretations of social damage can be related to the capital-labor ratio theoretically and there is also some empirical evidence in favor of these claims. Unfortunately, not all empirical studies report on the correlation between the capital-labor ratio and the measure of social performance and where this is reported, it is often done on an aggregate level instead of analyzing it at the industry level, which is especially important for the interpretation of social performance in terms of firm-employee relationships. Nevertheless, since most empirical studies are in line with our theoretical propositions, it gives indirect support for the assumed relationship between social damage and the capital-labor ratio.

6. Conclusion

In this paper, we introduce a neo-classical framework to study the effects of corporate social responsibility on financial performance. We analyze the impact of socially responsible behavior on three widely used financial indicators in a general equilibrium stock market model, namely the Market-to-Book ra-

[10] Note that the compensating wage differential explanation would imply an operational profit.

tio, Return on Assets and stock market returns. To our knowledge, using a general equilibrium approach has not been done in the existing literature on corporate social responsibility.

We assume that a significant part of investor behavior is affected by non-financial characteristics of the firm. In addition, we assume that the firm has considerable control over these characteristics. We show that in such a setting corporate social responsible behavior does not have an unambiguous effect on financial performance when one gives a uniform interpretation to the different financial indicators. More specifically, we show that for Market-to-Book we expect a positive relation with social performance, for ROA also a positive relation with social performance, and for stock market returns this relation is ambiguous at the aggregate level and negative at the industry level. Given that two firms generate the same returns, investors prefer the firm that generates less social costs. So the first effect of CSR on financial performance is that in equilibrium there must be a trade-off between higher returns and lower social costs, i.e. socially responsible investors require a lower cost of capital from socially responsible firms. Related to this result is that socially responsible firms will exhibit a higher Market-to-Book ratio. Furthermore, firms can either take the importance of non-market costs into account, i.e. behave socially responsible, or simply maximize pure profits. A firm that takes non-market costs into account, subjects itself to a higher cost of capital. Consequently, the second effect of CSR on financial performance is that we observe higher operating profit measures for socially responsible firms. The two opposing effects generate an ambiguous effect of CSR on stock market returns at the aggregate level, due to the fact that industries differ with respect to the amount of social costs per output and that the choice of whether or not to behave socially responsible is independent of the industry the firm is in. These effects of CSR on financial performance must hold in equilibrium, irrespective of whether there are direct or indirect benefits of behaving socially responsible, such as eco-efficiency, improved brand equity, improved customer relationships, etc... Therefore, we stress that our results are not due to assumptions on the operational level of the firm, but simply an artifact of market clearing.

We present the existing literature of the past three decades on the relation between corporate social performance and corporate financial performance in light of our findings and show that they are in line with our propositions. Our overview clarifies that in fact it are not the empirical results that have been conflicting, but the interpretations of these results. Our findings imply that what has been labeled as mixed evidence, is in fact strong evidence of a correlation between CSR and various financial indicators.

Our analysis opens up various areas for further research. First, our model provides more specific and theoretically founded testable hypotheses for empirical work. Furthermore, our model cannot provide an understanding of why some firms choose to behave socially responsible and others not, as this choice is exogenous to the model. Moreover, in a static model it is not possible to analyze the long term considerations of firm behavior that are often associated with corporate social responsibility. These issues, among others, can be answered when we extend the simple static model or engage in empirical work that considers our propositions.

References

Abbott, W. F., Monsen, J. R., 1979. On the measurement of corporate social responsibility: Self–reported disclosure as a method of measuring corporate social involvement. Academy of Management Journal 22, 501–515.

Alexander, G. J., Buchholz, R. A., 1978. Corporate social performance and stock market performance. Academy of Management Journal 21, 479–486.

Anderson, J. C., Frankle, A. W., 1980. Voluntary social reporting: An isobeta portfolio analysis. Accounting Review 55, 467–479.

Arrow, K. J., Debreu, G., 1954. The existence of an equilibrium for a competitive economy. Econometrica 22, 265–290.

Aupperle, K. E., Carroll, A. B., Hatfield, J. D., 1985. An empirical investigation of the relationship between corporate social responsibility and profitability. Academy of Management Journal 28, 446–463.

Becchetti, L., Giacomo, S. D., Pinnacchio, D., 2006. The impact of social

responsibility on productivity and efficiency of us listed companies. Applied Economics, Forthcoming.

Belkaoui, A., (4) 1976. The impact of the disclosure of the environmental effects of organizational behavior on the market. Financial Management 5, 26–31.

Berman, S. L., Wicks, A. C., Kotha, S., Jones, T. M., 1999. Does stakeholder orientation matter? the relationship between stakeholder management models and firm financial performance. Academy of Management Journal 42, 488–506.

Blacconiere, W. G., Northcut, W. D., 1997. Environmental information and market reactions to environmental legislation. Journal of Accounting, Auditing and Finance 12, 149–178.

Blacconiere, W. G., Patten, D. M., 1994. Environmental disclosures, regulatory costs, and changes in firm value. Journal of Accounting and Economics 18, 357–377.

Bowman, E. H., 1978. Strategy, annual reports, and alchemy. California Management Review 20, 64–71.

Boyle, E. J., Higgins, M. M., Rhee, S. G., 1997. Stock market reaction to ethical initiatives of defense contractors: Theory and evidence. Critical Perspectives on Accounting 8, 541–561.

Bragdon Jr., J. H., Marlin, J. A. T., 1972. Is pollution profitable? Risk Management 19, 9–18.

Brown, B., 1997. Stock market valuation of reputation for corporate social performance. Corporate Reputation Review 1, 76–80.

Brown, B., 1998. Do stock market investors reward reputation for corporate social performance? Corporate Reputation Review 1, 271–282.

Brown, B., Perry, S., 1994. Removing the financial performance halo from fortunes "Most Admired Companies". Academy of Management Journal 37, 1346–1359.

Caroll, A., 1999. Corporate social responsibility - evaluation of a definitional construct. Business and Society 38, 268–295.

Chen, K. H., Metcalf, R. W., 1980. The relationship between pollution control record and financial indicators revisited. Accounting Review 55, 168–177.

Cochran, P. L., Wood, R. A., 1984. Corporate social responsibility and financial performance. Academy of Management Journal 27, 42–56.

Cochrane, J. H., 2001. Asset Pricing. Princeton University Press.

Cottrill, M. T., 1990. Corporate social responsibility and the marketplace. Journal of Business Ethics 9, 723–729.

Davidson III, W. N., Worrell, D. L., 1992. Research notes and communications: The effect of product recall announcements on shareholder wealth. Strategic Management Journal 13, 467–473.

Diamond, P. A., (4) 1967. The role of a stock market in a general equilibrium model with technological uncertainty. American Economic Review 57, 759–776.

Diltz, D. J., 1995. The private cost of socially responsible investing. Applied Financial Economics 5, 69–77.

Dooley, R. S., Lerner, L. D., 1994. Pollution, profits, and stakeholders: The constraining effect of economic performance on ceo concern with stakeholder expectations. Journal of Business Ethics 13, 701–711.

Dowell, G., Hart, S., Yeung, B., 2000. Do corporate global environmental standards create or destroy market value? Management Science 46, 1059–1074.

Fombrun, C., Shanley, M., 1990. Whats in a name? reputation building and corporate strategy. Academy of Management Journal 33, 233–258.

Freedman, M., Jaggi, B., 1982. Pollution disclosures, pollution performance and economic performance. Omega: The International Journal of Management Science 10, 167–176.

Freedman, M., Jaggi, B., 1986. An analysis of the impact of corporate pollution disclosures included in annual financial statements on investors' decisions. Advances in Public Interest Accounting 1, 192–212.

Freedman, M., Stagliano, A. J., 1991. Differences in social–cost disclosures: A market test of investor reactions. Accounting, Auditing and Accountability Journal 4, 68–83.

Friedman, M., 1970. The social responsibility of business is to increase its profits. New York Times Magazine, September 13.

Graves, S. B., Waddock, S. A., 1994. Institutional owners and corporate social

performance. Academy of Management Journal 37, 1034–1046.

Graves, S. B., Waddock, S. A., 2000. Beyond built to last . . . stakeholder relations in 'built–to–last' companies. Business and Society Review 105, 393–418.

Greening, D. W., 1995. Conservation strategies, firm performance, and corporate reputation in the u.s. electric utility industry. In: Research in Corporate Social Performance and Policy, Supplement 1. Greenwich, CT: JAI Press., pp. 345–368.

Griffin, J. J., Mahon, J. F., 1997. The corporate social performance and corporate financial performance debate: Twenty–five years of incomparable research. Business and Society 36, 5–31.

Guerard Jr., J. B., (4) 1997a. Additional evidence on the cost of being socially responsible in investing. Journal of Investing 6, 31–36.

Guerard Jr., J. B., (2) 1997b. Is there a cost to being socially responsible in investing? Journal of Investing 6, 11–18.

Hamilton, S., Jo, H., Statman, M., Nov./Dec. 1993. Doing well while doing good? the investment performance of socially responsible mutual funds. Financial Analysts Journal, 62–66.

Hart, S. L., Ahuja, G., 1996. Does it pay to be green? an empirical examination of the relationship between emission reduction and firm performance. Business Strategy and the Environment 5, 30–37.

Heal, G. M., 2005. Corporate social responsibility? an economic and financial framework. Geneva Papers on Risk and Insurance: Issues and Practice 30, 387–409.

Heinkel, R., Kraus, A., Zechner, J., (4) 2001. The effect of green investment on corporate behavior. Journal of Financial and Quantitative Analysis 36, 431–449.

Heinze, D. C., 1976. Financial correlates of a social involvement measure. Akron Business and Economic Review 7, 48–51.

Herremans, I. M., Akathaporn, P., McInnes, M., 1993. An investigation of corporate social responsibility reputation and economic performance. Accounting, Organizations and Society 18, 587–604.

Ingram, R. W., 1978. An investigation of the information content of (certain)

social responsibility disclosures. Journal of Accounting Research 16, 270–285.

Ingram, R. W., Frazier, K. B., 1980. Environmental performance and corporate disclosure. Journal of Accounting Research 18, 614–622.

Jensen, M., 2002. Value maximization, stakeholder theory, and the corporate objective function. Business Ethics Quarterly 12, 235–256.

Johnson, R. A., Greening, D. W., 1999. The effects of corporate governance and institutional ownership types on corporate social performance. Academy of Management Journal 42, 564–576.

Judge Jr., W. Q., Douglas, T. J., 1998. Performance implications of incorporating natural environmental issues into the strategic planning process: An empirical assessment. Journal of Management Studies 35, 241–262.

King, A. A., Lenox, M. J., 2001. Does it really pay to be green? an empirical study of firm environmental and financial performance. Journal of Industrial Ecology 5, 105–116.

Klassen, R. D., McLaughlin, C. P., 1996. The impact of environmental management on firm performance. Management Science 42, 1199–1214.

Liang, H., 2005. Does foreign direct investment harm host country environment? evidence from coastal and interior china. University of California at Berkely, Working Paper, September.

Marcus, A. A., Goodman, R. S., 1986. Compliance and performance: Toward a contingency theory. Research in Corporate Social Performance and Policy 8, 193–221.

Margolis, J. D., Walsh, J. P., 2001. People and profits? The search for a link between a company's social and financial performance. Mahwah, NJ: Erlbaum.

McGuire, J. B., Sundgren, A., Schneeweis, T., 1988. Corporate social responsibility and firm financial performance. Academy of Management Journal 31, 854–872.

McWilliams, A., Siegel, D., Wright, P., 2006. Corporate social responsibility: Strategic implications. Journal of Management Studies 43, 1–18.

Merton, R. C., 3 1987. A simple model of capital market equilibrium with incomplete information. Journal of Finance 42, 483–510.

Meznar, M. B., Nigh, D., Kwok, C. C. Y., 1994. Effect of announcements of withdrawal from south africa on stockholder wealth. Academy of Management Journal 37, 1633–1648.

Modigliani, F., Miller, M. H., 1958. The cost of capital, corporation finance and the theory of investment. American Economic Review 48, 261–297.

Newgren, K. E., Rasher, A. A., LaRoe, M. E., Szabo, M. R., 1985. Environmental assessment and corporate performance: A longitudinal analysis using a market–determined performance measure. In: Preston, L. E. (Ed.), Research in corporate social performance and policy, 7th Edition. Greenwich, CT: JAI Press., pp. 153–164.

O'Neill, H. M., Saunders, C. B., McCarthy, A. D., 1989. Board members, corporate social responsiveness and profitability: Are tradeoffs necessary? Journal of Business Ethics 8, 353–357.

Parket, I. R., Eilbirt, H., 1975. Social responsibility: The underlying factors. Business Horizons 18, 5–10.

Patten, D. M., 1990. The market reaction to social responsibility disclosures: The case of the sullivan principles signings. Accounting, Organizations and Society 15, 575–587.

Patten, D. M., 1991. Exposure, legitimacy, and social disclosure. Journal of Accounting and Public Policy 10, 297–308.

Pava, M. L., Krausz, J., 1995. Corporate responsibility and financial performance: The paradox of social cost. Westport, CT:.

Preston, L. E., 1978. Analyzing corporate social performance: Methods and results. Journal of Contemporary Business 7, 135–150.

Preston, L. E., OBannon, D. P., 1997. The corporate social–financial performance relationship: A typology and analysis. Business and Society 36, 419–429.

Rivoli, P., 2005. The Travels of a T-Shirt in the Global Economy: An Economist Examines the Markets, Power and Politics of World Trade. Wiley, John and Sons.

Rockness, J., Schlachter, P., Rockness, H. O., 1986. Hazardous waste disposal, corporate disclosure, and financial performance in the chemical industry. Advances in Public Interest Accounting 1, 167–191.

Rosen, S., 1974. Hedonic prices and implicit markets. Journal of Political Economy 82, 34–55.

Russo, M. V., Fouts, P. A., 1997. A resource–based perspective on corporate environmental performance and profitability. Academy of Management Journal 40, 534–559.

Shane, P. B., Spicer, B. H., 1983. Market response to environmental information produced outside the firm. Accounting Review 58, 521–538.

Simerly, R. L., 1995. Institutional ownership, corporate social performance, and firms' financial performance. Psychological Reports 77, 515–525.

Spencer, B. A., Taylor, S. G., 1987. A within and between analysis of the relationship between corporate social responsibility and financial performance. Akron Business and Economic Review 18, 7–18.

Stevens, W. P., 1984. Market reaction to corporate environmental performance. Advances in Accounting 1, 41–61.

Turban, D. B., Greening, D. W., 1997. Corporate social performance and organizational attractiveness to prospective employees. Academy of Management Journal 40, 658–672.

Vance, S., 1975. Are socially responsible firms good investment risks? Management Review 64, 18–24.

Waddock, S. A., Graves, S. B., 1997. The corporate social performance–financial performance link. Strategic Management Journal 18, 303–319.

Wokutch, R. E., Spencer, B. A., 1987. Corporate sinners and saints: The effects of philanthropic and illegal activity on organizational performance. California Management Review 29, 62–77.

Wright, P., Ferris, S. P., 1997. Agency conflict and corporate strategy: The effect of divestment on corporate value. Strategic Management Journal 18, 77–83.