Corporate Social Responsibility and Asset Pricing*

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Abstract

This paper presents an asset pricing model of corporate social responsibility (CSR) and its effect on firm risk. We model CSR activities as an investment in higher customer loyalty, defined as a low price elasticity of demand. The model allows us to investigate how CSR affects production, firm value, systematic risk and expected returns for the firms making the investment decision. The model also allows us to study the impact of industry trends in CSR. The paper investigates the model predictions empirically and finds evidence consistent with: CSR firms exhibit lower systematic risk and expected returns; systematic risk of CSR firms has increased over time; the ratio of CSR profits to non-CSR profits is countercyclical; and increased industry CSR adoption lowers systematic risk for non-adopters.

JEL classification: G12, G32, D43, L13, M14.

Keywords: corporate social responsibility, customer loyalty, systematic risk, expected return.

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1 Introduction

Corporate social responsibility (CSR) represents a growing strategic concern for many corporations around the world. Despite its increased popularity in the last two decades, not much is known theoretically about the stock market implications of actively engaging in CSR and of industry trends in CSR. We introduce a CSR investment decision into an equilibrium asset pricing model and evaluate empirically the model predictions linking systematic risk to firm-level CSR choices and industry CSR trends.

A growing literature asserts that firms engage in profit maximizing CSR (e.g., Baron, 2001, and McWilliams and Siegel, 2001). According to the profit maximizing view, firms undertake CSR activities because they expect a net benefit from them. For example, CSR may help firms avoid the temptations of short-termism at the expense of long-term intertemporal profits (Bénabou and Tirole, 2010). Alternatively, profit maximizing CSR can be viewed as a product differentiation strategy whereby firms try to gain competitive advantage over their rivals (see e.g. Bagnoli and Watts, 2003, Fisman et al., 2006, and Siegel and Vitalino, 2007).[1] This is the view we take in this paper. Specifically, following Luo and Bhattacharya (2006, 2009), we model CSR activities as an investment in customer loyalty. This benefit of CSR improves firms' operating margins, i.e. allows firms to earn greater operating profits per unit of revenue. As a result of higher margins – not higher sales – firms overall operating profits also increase. Consistent with our modelling approach, Gillan et al. (2010) find evidence that CSR activities are positively associated with higher earnings, while sales for CSR firms are unaffected. On the cost side, CSR carries an investment cost that introduces a leverage effect into expected returns: The greater operating profits earned have a more than proportional impact on the stock price and overall expected returns decline with CSR. Because in the model expected returns are compensation for systematic risk, systematic risk also declines with CSR.

This partial equilibrium effect contrasts with another effect that arises in the model's industry equilibrium. The fact that CSR firms are able to earn higher profits leads to more firms choosing to invest in CSR. Greater adoption of CSR in the industry has two main effects. First, it dilutes profits of CSR firms. Second, the new adopters have higher CSR

[1] Navarro (1988) and Webb (1996) also model CSR as a mechanism to affect sales. See also Navarro (1988) and Becchetti et al. (2005) for evidence.

investment costs. Both effects dampen the mechanism highlighted above and may lead to CSR firms displaying higher systematic risk and higher expected returns than non-CSR firms. We show that a critical parameter in describing the relative riskiness of CSR firms is consumers' preference for CSR goods, in the form of their expenditure share in CSR goods. A sufficiently low expenditure share caps the proportion of firms investing in CSR and implies that CSR firms have lower systematic risk and expected returns than non-CSR firms. A calibrated version of the model suggests that market beta of CSR firms is about 30% lower than market beta of non-CSR firms.

We use the model's industry equilibrium to develop a new prediction on how industry trends in CSR adoption affect non-adopters' risk. We show that when CSR firms benefit from increasingly loyal demand, non-adopters systematic risk decreases. This result arises because the fewer firms that chose not to invest in CSR are able to extract higher operating profits given consumers' fixed expenditure shares. These profits are incorporated into the stock price more than proportionately because of the investment costs, resulting in lower expected returns and systematic risk.

The model offers three other predictions. First, the model predicts that greater systematic risk is associated with greater co-movement of net profits with the productivity shocks. This implies that net profits of CSR firms relative to net profits of non-CSR firms decrease with aggregate productivity shocks. Second, stock valuations of CSR firms are on average higher than those of non-CSR firms because of the higher risk that investors must absorb when holding non-CSR stocks. Third, output prices of CSR firms carry a premium relative to output prices of non-CSR firms.[2]

We test the model predictions using a comprehensive dataset on firm-level CSR from MSCI's Environmental, Social and Governance (ESG) database. The database provides coverage for companies that constitute several major international stock indices. The full sample includes 34 countries and 3,005 firms from 2004 to 2010, equivalent to an unbalanced panel with 9,795 firm-year observations. We first document that the level of systematic risk is significantly lower for firms with higher CSR score. One standard deviation increase in CSR score reduces the level of systematic risk by 20%. Next, assuming that the expenditure

[2]There is a large literature on the empirical association of CSR and firm value. See Margolis et al. (2007) for a meta analysis, and Gillan et al. (2010) and Fisher-Vanden and Thorburn (2011) for recent analyses. For evidence on prices of goods from CSR vs non-CSR companies, see Ailawadi et al. (2011).

share of CSR firms increases in economic upturns, we predict and find evidence consistent with CSR firms becoming relatively riskier in times of high GDP growth. Similarly, under the premise that the expenditure share of CSR goods has increased over time, we predict and find evidence consistent with CSR firms becoming relatively riskier in the latter part of the sample, even controlling for GDP growth. In addition, we also demonstrate that the ratio of CSR profits to non-CSR profits is countercyclical, which is predicted by the model if in fact CSR firms are less risky. Our tests are conducted on a sample of U.S. firms only and on the full sample of 34 countries, without observing significant differences.

We also test the prediction that industry CSR trends affect the level of systematic risk of non-CSR firms. We find that the level of systematic risk of the bottom quartile CSR score firms in each industry co-varies negatively with the level of CSR in the industry. This evidence is stronger in the full sample. Finally, we test our baseline predictions using expected returns and find evidence that is consistent with the model and the previous findings on systematic risk, though not as strong statistically. We address several potential concerns with our tests including the reverse causality that may be present in the data.

There are two main arguments in the literature that share the same positive view that CSR firms have lower levels of systematic risk and expected returns. First, Heinkel et al. (2001) assume that some investors (i.e., green investors) choose not to invest in non-CSR stocks, which as Errunza and Losq (1985) and Merton (1987) have shown, creates an additional risk premium for these stocks (Barnea et al., 2009, endogenize this choice). Intuitively, a smaller fraction of investors is forced to hold all of non-CSR stocks and will therefore ask for a higher expected return. Our paper builds on firm heterogeneity rather than investor heterogeneity and we derive novel predictions that exploit the presence of such heterogeneity. In addition, firm heterogeneity is an equilibrium outcome rather than being assumed.[3]

Second, Hong and Kacperczyk (2009) hypothesize that 'sin' stocks – tobacco, alcohol, and guns –, that can be viewed as anti-CSR stocks, are neglected stocks and thus carry higher expected returns. They do not, however, predict that systematic risk is also higher

[3] Also, Starks (2009) discusses investors' perceptions about the importance of corporate governance versus corporate social responsibility. She argues that investors perceive the former to be very relevant whereas only a minority perceive the later to also be relevant. Our paper does not assume that investors care about CSR and instead focusses on the role of consumers and their actions, based on their perceptions of corporate responsible policies.

for these firms. Our paper complements their study by theoretically linking expected returns of CSR and non-CSR stocks to systematic risk and documenting this link empirically.

From a normative perspective, however, this paper contrasts with the papers by Heinkel et al. and Hong and Kacperczyk. By endogenizing the CSR choice, the paper views CSR as a profit maximizing choice available to managers – rather than being linked to investor constraints – and highlights its trade-offs. The view of CSR as a profit maximizing choice, however, contrasts with the view expressed prominently in Friedman (1970) that CSR destroys shareholder value. In Friedman (1970) CSR can only make sense if managers are usurping the power of shareholders in the firm. In others (e.g., Bénabou and Tirole, 2010), CSR can be rationalized if the corporation is viewed as acting on behalf of its stakeholders. The implications of these other assumptions to firm risk have not yet been developed.

We are not the first ones to demonstrate an empirical link between CSR and systematic risk. Becchetti and Ciciretti (2009) provide evidence that CSR portfolios have a lower exposure to systematic risk than control portfolios and Oikonomou et al. (2010) show that CSR stocks have lower exposure to market risk. In addition, Sharfman and Fernando (2008) show that environmental performance is associated with lower cost of capital.

The evidence linking CSR with expected returns is mixed. Hong and Kacperczyk (2009) find that sin stocks have higher expected returns after controlling for risk. Brammer et al. (2006) find similar evidence for socially least desirable stocks with UK data. Geczy et al. (2003) show that controlling for market risk, the cost of socially responsible investing is small, but significantly negative when size, value and momentum factors are controlled for. Galema et al. (2008) find that there is no difference between risk-adjusted returns of CSR and non-CSR stocks, but that CSR lowers book-to-market ratios and thus impacts stock returns and valuations. Since book-to-market ratio is positively associated with expected stock returns (Fama and French, 1992), CSR may thus have an indirect negative effect on expected returns. In addition, Renneboog et al. (2008) show that socially responsible mutual funds underperform their benchmarks, but not more than conventional mutual funds, except for a small number of countries.

In contrast, Derwall et al. (2005) show that the most ecologically efficient firms experience higher expected returns that cannot be accounted for by risk factors. Kempf and

Osthoff (2007) form a strategy whereby they invest in most socially responsible stocks and short sell least socially responsible ones. This strategy exhibits significantly positive abnormal results. In addition, and to the extent that employee satisfaction is associated with being socially responsible, Edmans (2011) finds that a portfolio consisting of the "100 Best Companies to Work for in America" earns superior abnormal returns.

This paper is also related to the literature linking firm's investment choices to its systematic risk and expected returns. Berk et al. (1999) show that the book-to-market premium can be explained by firm-level investments. Carlson et al. (2004) relate book-to-market effects to operating leverage. Novy-Marx (2011) shows empirically that operating leverage predicts cross-sectional returns. Gomes and Schmid (2010) endogenize both investment and financing choices and show that high financial leverage is associated with more safe assets-in-place and less risky growth options. Aguerrevere (2009) and Lyandres and Watanabe (2011) explore how firm-level investments and product market competition relate to stock returns.

We organize the rest of the paper as follows. Section 2 presents the model. Section 3 derives the equilibrium of the model and Section 4 analyzes the equilibrium properties regarding risk and expected returns of CSR and non-CSR firms. Section 5 presents the data used in our empirical tests and Section 6 discusses the results. Section 7 concludes the paper. Proofs are relegated to the appendix as is an extension of the model to an infinite horizon setting.

2 The Model

Consider an economy where production, asset allocation, and consumption decisions are made over two dates, 1 and 2. There is a representative investor and a continuum of firms with unit mass. We present an infinite horizon version of the model in the Appendix.

Household sector The representative investor has preferences defined over life-time consumption

$$U(C_1, C_2) = \frac{C_1^{1-\gamma}}{1-\gamma} + \beta E\left[\frac{C_2^{1-\gamma}}{1-\gamma}\right]. \tag{1}$$

The relative risk aversion coefficient is $\gamma > 0$ and the parameter $\beta < 1$ is the rate of time preference. The expectations operator is denoted by $E[.]$.

There are two types of goods in the economy. Low elasticity of substitution goods, which we associate with goods produced by socially responsible firms (CSR goods), and high elasticity of substitution goods, which we associate with other firms (non-CSR goods). We label these using the subscripts G and P, respectively. Consumption C_2 is a Dixit-Stiglitz aggregator over all consumption goods c_i,

$$C_2 = \left(\int_0^{\mu} c_i^{\sigma_G} \right)^{\frac{\alpha}{\sigma_G}} \left(\int_{\mu}^{1} c_i^{\sigma_P} \right)^{\frac{1-\alpha}{\sigma_P}} .$$

where $0 < \sigma_j < 1$ is the elasticity of substitution within $j = G, P$ goods. A lower elasticity of substitution implies lower price elasticity of demand and a more "loyal" demand. We therefore are interested in the case $\sigma_G < \sigma_P$. The parameter α fixes the share of expenditure allocated to CSR goods and μ measures the equilibrium fraction of CSR firms in the economy.

Investor optimization is subject to two single-period budget constraints. At date 1, the investor is endowed with stocks and with cash $W_1 > 0$ expressed in units of the aggregate good, which can be used for consumption and investment. The investor decides on the date 1 consumption, C_1, stock holdings, D_i, and the total amount to lend to firms, B, subject to the date 1 budget constraint,

$$\int_0^1 Q_i di + W_1 \geq C_1 + \int_0^1 Q_i D_i di + B, \tag{2}$$

the stock prices Q_i, and the interest rate r. The presence of $\int_0^1 Q_i di$ on the left hand side of the budget constraint (2) indicates that the representative investor is both a seller and a buyer of stocks.

The investor decides on the date 2 consumption of the various goods c_i, subject to the date 2 budget constraint:

$$W_2 \equiv \int D_i \left(\pi_i - B_i \left(1 + r\right)\right) + wL + B\left(1 + r\right) \geq \int p_i c_i. \tag{3}$$

In the budget constraint, π_i is the operating profit generated by firm i and $B_i(1 + r)$ is the debt repayment by firm i so that $\pi_i - B_i(1 + r)$ is the net profit.[4] W_2 denotes the

[4]A negative profit $\pi_i - B_i(1 + r)$ is allowed and interpreted as an equity issue to the investor at $t = 2$.

consumer's wealth at the beginning of date 2, w is the wage rate, L is the amount of labor inelastically supplied and p_i is the price of good i. The investor behaves competitively and takes prices as given.

Production sector At date 1, firms choose which production technology to invest in. The decision is based on expected operating profitability and fixed costs of operation. Each firm is endowed with a fixed cost of operation. Firms that invest in CSR pay a fixed cost f_{Gi} while non-CSR firms pay f_P. The distribution of fixed costs f_{Gi} across firms is a uniform that takes values between 0 and 1. Firms finance f_i by raising debt B_i from investors, and therefore have zero cash flow at date 1.

The model assumes that a higher fixed cost does not lead to a higher benefit for CSR firms. Instead, all CSR firms have access to the same elasticity of substitution σ_G independently of their fixed cost of investment. This assumption captures the idea that the "low hanging fruit" is not equally costly to all the firms. Technically, the assumption introduces in a simple fashion an upper bound to the net benefits of CSR, which helps in the derivation of equilibria with interior values for μ.

At date 2, firm i chooses how much to produce of x_i in order to maximize operating profits. Firms act as monopolistic competitors solving:

$$\pi_i = \max_{x_i} \left\{ p_i\left(x_i\right) x_i - w l_i \right\}, \tag{4}$$

subject to the equilibrium inverse demand function $p_i\left(x_i\right)$ as well as the constant returns to scale technology,

$$l_i = A^{\delta_i} \kappa_i x_i. \tag{5}$$

Production of one unit of output costs $A^{\delta_i}\kappa_i$ units of labor input, where δ_i measures the sensitivity of firm i's technology to the productivity shock A. CSR goods may be viewed as more resource intensive, $\kappa_G > \kappa_P$, but this assumption is not necessary for our results.

The economy is subject to an aggregate productivity shock A, realized at date 2 before production takes place. The productivity shock changes the number of labor units needed to produce consumption goods. High aggregate productivity is characterized by low values of A. The productivity shock A is assumed to have bounded support in the positive real numbers.

Market clearing In equilibrium, at date 1, asset markets clear, $D_i = 1$, for all i, and $B = \int B_i di$. At date 2, goods markets clear, $x_i = c_i$, for all i, and the labor market clears, $\int l_i di = L$.

3 Equilibrium

We start by solving the model equilibrium at date 2.

3.1 Date-2 equilibrium

Let $\mu \in (0,1)$ denote the fraction of CSR firms. The outcome of the date-2 equilibrium is given as a function of the value of μ. We start by solving the consumer's problem. Let λ denote the Lagrange multiplier associated with the date-2 budget constraint (3). The first order condition for each CSR c_l is

$$\alpha C_2^{-\gamma} \left(\int_0^\mu c_i^{\sigma_G} di \right)^{\frac{\alpha}{\sigma_G}-1} \left(\int_\mu^1 c_i^{\sigma_P} di \right)^{\frac{1-\alpha}{\sigma_P}} c_l^{\sigma_G - 1} = \lambda p_l, \tag{6}$$

and the first order condition for each non-CSR c_k is

$$(1-\alpha) C_2^{-\gamma} \left(\int_0^\mu c_i^{\sigma_G} di \right)^{\frac{\alpha}{\sigma_G}} \left(\int_\mu^1 c_i^{\sigma_P} di \right)^{\frac{1-\alpha}{\sigma_P}-1} c_k^{\sigma_P - 1} = \lambda p_k. \tag{7}$$

Multiplying both sides of each first order condition by the respective c_j, and integrating over the relevant range gives

$$\alpha C_2^{1-\gamma} = \lambda \int_0^\mu p_i c_i di, \tag{8}$$

and

$$(1-\alpha) C_2^{1-\gamma} = \lambda \int_\mu^1 p_j c_j dj. \tag{9}$$

By taking the ratio of these two conditions it is straightforward to see that the parameter α gives the expenditure share of CSR goods. The appendix provides the remaining steps that allow us to solve for the demand functions:

$$c_l = \alpha \frac{p_l^{\frac{1}{\sigma_G - 1}}}{\int_0^\mu p_i^{\frac{\sigma_G}{\sigma_G - 1}} di} W_2, \tag{10}$$

$$c_k = (1-\alpha) \frac{p_k^{\frac{1}{\sigma_P - 1}}}{\int_\mu^1 p_i^{\frac{\sigma_P}{\sigma_P - 1}} di} W_2. \tag{11}$$

The elasticity of substitution σ_j determines the price elasticity of demand which equals $\frac{1}{\sigma_j - 1}$. Higher elasticity of substitution is associated with more responsive demands and lower loyalty.

It remains to find the value of λ as a function of goods prices and date 2 wealth. Adding up (8) and (9) gives $C_2^{1-\gamma} = \lambda W_2$. Finally, replacing the demand functions into the consumption aggregator gives the value of λ.

We now turn to the firms' problem. Each firm acts as a monopolistic competitor and chooses x_i according to (4). The first order conditions are

$$\begin{aligned} \sigma_G p_l &= w A^{\delta_l} \kappa_l, \\ \sigma_P p_k &= w A^{\delta_k} \kappa_k. \end{aligned}$$

The second order condition for each firm is met because $0 < \sigma_j < 1$. Using these first order conditions, we get the optimal value of operating profits,

$$\pi_j = (1 - \sigma_j)\, p_j x_j. \tag{12}$$

Goods with lower elasticity of substitution σ_j, i.e. goods with more loyal demand, allow producers to extract higher rents, all else equal.

To solve for the equilibrium, Walras' law requires that a price normalization be imposed. We impose that the price of the aggregate consumption good is time invariant, so the price at date 2 equals the price at date 1, which is 1. This normalization imposes the following implicit constraint on prices p_l:

$$1 = \min_{c_i \in \{c_i : C_2 = 1\}} \int_0^1 p_i c_i di.$$

The price normalization implies that $W_2 = \int p_l c_l dl = C_2$, from which we obtain the usual condition for the marginal utility of date-2 wealth with constant relative risk aversion preferences, $\lambda = C_2^{-\gamma}$. The next proposition describes the date-2 equilibrium as a function of μ. The proof is relegated to the Appendix.

Proposition 1 *For any interior value of μ and any aggregate shock A, a symmetric date-2 equilibrium exists and is unique with goods prices,*

$$\begin{aligned} p_G &= \bar{p} A^{(1-\alpha)(\delta_G - \delta_P)} \frac{\sigma_P}{\sigma_G} \frac{\kappa_G}{\kappa_P}, \\ p_P &= \bar{p} A^{-\alpha(\delta_G - \delta_P)}, \end{aligned}$$

consumption,

$$
\begin{aligned}
c_G &= \frac{\kappa_P}{\sigma_P}\frac{\sigma_G}{\kappa_G}\bar{x}\frac{\alpha}{\mu}A^{-\delta_G}, \\
c_P &= \bar{x}\frac{1-\alpha}{1-\mu}A^{-\delta_P},
\end{aligned}
$$

wage rate,

$$
w = \bar{p}A^{-\bar{\delta}}\frac{\sigma_P}{\kappa_P},
$$

operating profits,

$$
\begin{aligned}
\pi_G &= \bar{p}\bar{x}\left(1-\sigma_G\right)\frac{\alpha}{\mu}A^{-\bar{\delta}}, \\
\pi_P &= \bar{p}\bar{x}\left(1-\sigma_P\right)\frac{1-\alpha}{1-\mu}A^{-\bar{\delta}},
\end{aligned}
$$

and marginal utility of wealth,

$$
\lambda = \left[\bar{p}\bar{x}\right]^{-\gamma}A^{\gamma\bar{\delta}},
$$

where $\bar{p}, \bar{x} > 0$ are functions of exogenous parameters given in the Appendix, and $\bar{\delta} = (1-\alpha)\,\delta_P + \alpha\delta_G$.

In equilibrium, a higher productivity shock (lower A) increases the demand for labor and thus also increases the wage rate. The sensitivity of the wage rate to the productivity shock is given by the weighted average of the sensitivities δ_l where the weights are the expenditure shares. Goods' prices increase or decrease depending on which types of goods are more sensitive to the productivity shock, as given by $\delta_G - \delta_P$. When $\delta_G - \delta_P < 0$, non-CSR goods' production increases in expansions as unit labor costs decrease the most for those firms. Because the aggregate price is normalized to one, the relative price of CSR goods must increase. The increase in CSR prices is consistent with the relative increase in the marginal utility of CSR goods due to the complementarity of CSR and non-CSR goods in consumption and the fact that non-CSR goods consumption has increased. The opposite occurs if $\delta_G - \delta_P > 0$. In equilibrium, though, a higher productivity shock increases profits at an equal rate for both types of goods and lowers the marginal utility of date 2 wealth.

3.2 Date-1 equilibrium

To solve for the date-1 equilibrium we need to determine the rate used by the representative investor to discount future profits. Imposing the equilibrium conditions, the date-1 budget constraint gives $C_1 = W_1 - B$, so that the intertemporal marginal rate of substitution, or stochastic discount factor, becomes:

$$m \equiv \beta \left(\frac{C_2}{C_1} \right)^{-\gamma} = \bar{m} \left[\bar{p}\bar{x} \right]^{-\gamma} A^{\gamma \bar{\delta}}, \tag{13}$$

where $\bar{m} = \beta (W_1 - B)^{\gamma}$. States of the world with low productivity (high A) carry a higher discount factor because overall consumption is lower in those states of the world.

The date-1 equilibrium gives familiar pricing conditions for bonds,

$$1 = E \left[m (1 + r) \right], \tag{14}$$

and for stocks,

$$Q_i = E \left[m \pi_i \right] - f_i. \tag{15}$$

In equilibrium, if there is an interior solution to μ, $Q_j \geq 0$, and the price of the marginal CSR firm, Q_G^*, obeys

$$Q_P = Q_G^*.$$

This equality determines the cut-off f_G^* by imposing that the marginal firm be indifferent between investing or not investing in CSR:

$$E \left[m \pi_G \right] - f_G^* = E \left[m \pi_P \right] - f_P. \tag{16}$$

At an interior solution for μ, because π_G is equal for all CSR firms, infra-marginal CSR firms, with $f_{Gi} < f_G^*$, have prices higher than Q_G^*. At a corner solution, $\mu = 1$ and $Q_P \leq Q_G$, for all f_G, or $\mu = 0$ and $Q_P \geq Q_G$, for all f_G.[5] Given an equilibrium threshold level f_G^*, the equilibrium mass of CSR firms is $\mu = \int_0^{f_G^*} di = f_G^*$. Existence of date-1 equilibrium for μ cannot be proved analytically. Instead, in subsection 4.3 we turn to numerical examples to construct and analyze the equilibrium.

4 Equilibrium Properties

In this section, we analyze the properties of CSR firms' risk and of the proportion of CSR firms in the industry.

[5] That the mass of firms is bounded by 1 implies the possibility of an equilibrium with $\mu = 0$ and $Q_P > Q_G > 0$. The constraint $\mu \leq 1$ can be motivated by the existence of a fixed factor of production, e.g., land. However, the results are not sensitive to this assumption.

4.1 Expected stock returns

Define the gross return to firm j as its net profits divided by the stock price, $1 + r_j \equiv (\pi_j - f_j (1 + r)) / Q_j$. Using the first order conditions (15), we get the usual pricing condition in a consumption CAPM model:

$$\begin{aligned} E(r_j - r) &= -E(m)^{-1} Cov(m, r_j) \\ &= -E(m)^{-1} Q_j^{-1} Cov(m, \pi_j). \end{aligned}$$

Systematic risk and the expected return are determined by the covariance of the stock returns with the intertemporal marginal rate of substitution in consumption. This covariance depends on how aggregate productivity affects both variables. For simplicity, denote $\alpha_j = \alpha$ if $j = G$, and $\alpha_j = 1 - \alpha$ if $j = P$. Likewise, denote $\mu_j = \mu$ if $j = G$, and $\mu_j = 1 - \mu$ if $j = P$. In the Appendix, we prove that:

Proposition 2 *Firm j's equilibrium expected stock return in excess of the risk free rate is:*

$$E(r_j - r) = \frac{\bar{p}\bar{x}(1 - \sigma_j)\frac{\alpha_j}{\mu_j}}{\bar{m}[\bar{p}\bar{x}]^{1-\gamma}(1 - \sigma_j)\frac{\alpha_j}{\mu_j}E\left[A^{(\gamma-1)\bar{\delta}}\right] - f_j} \frac{-Cov\left(A^{-\bar{\delta}}, A^{\gamma\bar{\delta}}\right)}{E\left(A^{\gamma\bar{\delta}}\right)}. \tag{17}$$

Furthermore, at an interior solution for μ, the marginal CSR firm has

$$E(r_P - r) \gtreqless E(r_G^* - r) \text{ if, and only if, } f_P - \mu \gtreqless 0.$$

The proposition gives a stark result regarding the equilibrium riskiness of CSR versus non-CSR firms, for fixed σ_G and σ_P. It is shown that the proportion of CSR firms determines the relative riskiness of CSR versus non-CSR firms: If $\mu \leq f_P$, then the marginal CSR firm has $E(r_G^* - r) \leq E(r_P - r)$. In this case, infra-marginal CSR firms also have higher prices and lower expected returns then non-CSR firms. When $\mu > f_P$, then $E(r_P - r) < E(r_G^* - r)$ and the marginal CSR firm has higher expected returns than non-CSR firms. By continuity, infra-marginal firms with fixed costs close to $f_G^* = \mu$ also have higher expected returns, but there may be firms with low enough f_{Gi} such that $E(r_P - r) > E(r_{Gi} - r)$. To a first order approximation, it can be shown that CSR firms are less risky on average if, and only it, $f_P - \mu > 0$. To see this, consider the average expected return for a CSR firm,

$$\frac{1}{\mu}\int_0^\mu E(r_j - r)\,dj = \frac{1}{\mu}\bar{p}\bar{x}(1 - \sigma_G)\frac{\alpha}{\mu}\ln\left(\frac{E(m\pi_G)}{Q_G^*}\right)\frac{-Cov\left(A^{-\bar{\delta}}, A^{\gamma\bar{\delta}}\right)}{E\left(A^{\gamma\bar{\delta}}\right)},$$

and the average expected return for a non-CSR firms,

$$\frac{1}{1-\mu}\int_{\mu}^{1} E\left(r_j - r\right) dj = \frac{\bar{p}\bar{x}\left(1-\sigma_P\right)\left(1-\alpha\right)}{\left(1-\mu\right)Q_P}\frac{-Cov\left(A^{-\bar{\delta}}, A^{\gamma\bar{\delta}}\right)}{E\left(A^{\gamma\bar{\delta}}\right)}.$$

Noting that $\ln\left(E\left(m\pi_G\right)/Q_G^*\right) = \ln\left(1+\mu/Q_G^*\right) \approx \mu/Q_G^*$, it is easy to derive,

$$\frac{\frac{1}{\mu}\int_0^{\mu} E\left(r_j - r\right) dj}{\frac{1}{1-\mu}\int_{\mu}^{1} E\left(r_j - r\right) dj} \approx \frac{\frac{(1-\sigma_G)\alpha}{\mu}}{\frac{(1-\sigma_P)(1-\alpha)}{1-\mu}}.$$

The proof of the proposition shows that the right hand side of this approximate equation is less than unity if, and only if, $f_P - \mu > 0$.

We can also ask how expected returns change to an *infinitesimally small firm* l when its demand becomes more loyal. Increased loyalty increases future profits and hence co-movement with productivity shocks. But the increase in future profits leads to a more than proportional increase in the stock price due to the presence of fixed costs of operation, i.e., an "operating leverage" effect. Overall, expected returns to firm l decrease.[6]

Systematic risk can also be measured with respect to the market return. Define the value weighted market return $1 + r_M \equiv \int \left(\pi_i - f_i\left(1+r\right)\right) di / \int Q_i di$.

Proposition 3 *Consider firm j's market* $\beta_j = Cov\left(r_j, r_M\right)/Var\left(r_M\right)$. *We have,*

$$\beta_j = \frac{1}{\mu_j}\frac{\left(1-\sigma_j\right)\alpha_j}{\left(1-\sigma_G\right)\alpha + \left(1-\sigma_P\right)\left(1-\alpha\right)}\frac{Q_G^* + \frac{1}{2}\mu^2}{Q_j}.$$

An an interior solution for μ, $\beta_P \gtreqless \beta_G^*$ *if, and only if,* $f_P - \mu \gtreqless 0$.

The proof of the proposition shows that a similar results also holds for equally weighted market returns. Again, the proportion of CSR firms determines the amount of systematic risk of CSR versus non-CSR firms. Following similar derivations as above (in particular, using the approximation $\ln\left(E\left(m\pi_G\right)/Q_G^*\right) \approx \mu/Q_G^*$), it can be shown that the average market β for CSR firms is lower than the average market β for non-CSR firms if, and only if, $\mu < f_P$.

Consider also how market β changes to an infinitesimally small firm l when its demand becomes more loyal. The same two effects discussed above are also present here. The

[6] When loyalty varies for all CSR firms, we must also consider the equilibrium effects via the values of $\bar{m}$, $\bar{p}$, $\bar{x}$ and μ. This is done in subsection 4.3.

increase in profits associated with increased loyalty leads to higher co-movement with the productivity shock, but the stock price increases more than proportionally to the increase in profits due to the operating leverage effect. Overall, firm l's market β decreases.

The riskiness of CSR firms versus non-CSR firms can be restated in terms of co-movement of profits with the productivity shocks. This is done in the next result:

Proposition 4 *Define the ratio of net profits evaluated at the marginal CSR firm:*

$$R_\pi \equiv \frac{\pi_G - f_G^* (1+r)}{\pi_P - f_P (1+r)}.$$

R_π is increasing with A if, and only if, $\mu < f_P$.

When the marginal CSR firm is less risky its profits increase in expansions (low A) but by less than profits of non-CSR firms. A similar result can be shown to arise when computing the ratio of industry profits.

The next section discusses conditions under which $\mu < f_P$.

4.2 The proportion of CSR firms

The first result establishes that the sign of $\mu - f_P$ is independent of any heterogeneity in κ_j and δ_j. To show this, note that the expenditure shares of CSR and non-CSR goods are α and $1 - \alpha$, respectively, so that

$$\mu p_G c_G = \frac{\alpha}{1-\alpha} (1-\mu) p_P c_P.$$

Because operating profits are $\pi_j = (1 - \sigma_j) p_j c_j$, the difference in profits $\pi_G - \pi_P$ is proportional to

$$\Delta \equiv (1-\sigma_G) \frac{\alpha}{\mu} - (1-\sigma_P) \frac{1-\alpha}{1-\mu}. \tag{18}$$

Inserting this result into the equilibrium condition (16) proves that the sign of $\mu - f_P$ is given only by the sign of Δ, which is independent of any heterogeneity in κ_j and δ_j. This is surprising because δ_j describes the sensitivity of firm j's labor demand to the aggregate shock for given output level and yet heterogeneity in δ_j does not affect the proportion of CSR firms in the industry. The main reason is that with fixed expenditure shares and homogeneity of operating profits to sales revenue, the sensitivity of revenues to the technology shock must in equilibrium be equal across sectors. This result is helpful in isolating the effect of demand loyalty on systematic risk studied in this paper.[7]

The next proposition further states that μ is strictly related to the expenditure share of CSR goods.

Proposition 5 *At an interior equilibrium for μ, the proportion of CSR firms in the industry $\mu < f_P$ if, and only if, $\alpha < \bar{\alpha}$, where*

$$\bar{\alpha} = \frac{(1-\sigma_P)\, f_P}{1-\sigma_G - f_P\,(\sigma_P - \sigma_G)}.$$

Moreover, the constant $\bar{\alpha}$ is increasing in σ_G and $\bar{\alpha} < f_P$ if, and only if, $\sigma_P > \sigma_G$.

The constant $\bar{\alpha}$ is the expenditure share at which $\mu = f_P$. Any expenditure share $\alpha < \bar{\alpha}$ leads to a proportion $\mu < f_P$. A more loyal demand for CSR firms, $\sigma_P > \sigma_G$, implies that the threshold expenditure share $\bar{\alpha} < f_P$. Intuitively, when $\sigma_P > \sigma_G$, CSR firms are able to extract higher rents for the same expenditure share α and the proportion of CSR firms grows. To cap the fraction of firms less than f_P, a sufficiently smaller expenditure share α is required in equilibrium.

Besides describing an upper bound to the equilibrium μ, this proposition allows us to characterize the risk of CSR and non-CSR firms in terms of expenditure shares.

Corollary 1 *Average expected excess return and, to a first order approximation average market β of CSR firms are lower than of non-CSR firms if, and only if, $\alpha < \bar{\alpha}$.*

Given that $\bar{\alpha}$ is increasing in σ_G, greater loyalty (lower σ_G) tightens the range of α values for which CSR firms are less risky. This is a surprising result in light of the folklore assertion of the relation between consumer loyalty and firm level risk. According to folklore, greater demand loyalty leads to lower price elasticity of demand and lower sensitivity of firms to aggregate shocks. This *partial equilibrium* effect is present in the model, too, and was discussed above when describing the effect of changing σ_j for a marginal firm. However, there is also an *industry equilibrium* effect: The lower price elasticity of demand also translates into increased profits per unit of revenue, which leads to more firms adopting

[7] Developing richer models that combine other reasons to explain variation in risk for CSR and non-CSR firms is particularly useful to quantitatively assess their individual contributions.

CSR at increasingly higher fixed costs. When adoption is wide spread enough, CSR firms may become riskier.

We now turn to comparative statics exercises conducted on a calibrated version of the model.

4.3 Comparative statics

We calibrate the model in the following manner. The time preference parameter and risk aversion are set to standard values of $\beta = 0.95$ and $\gamma = 2$. The share of consumption in CSR goods α is set to 4%, the share of organic food and beverage sales in overall food and beverage sales in 2010 in the U.S. according to the Organic Trade Association (2010). Broda and Weinstein (2006) provide estimates of elasticities of substitution for a very large number of goods. The median elasticity changes with the level of aggregation though less dramatically than the mean. We set $\sigma_P = 2/3$ to match the median elasticity across different levels of aggregation, and chose a value for σ_G that is 25% lower, i.e. $\sigma_G = 0.5$. We are interested in preforming comparative statics on α and σ_j.

On the production side, we assume that the productivity level can take two values $\tilde{A} \in \{A - \varepsilon, A + \varepsilon\}$ and define $p = \Pr\left(\tilde{A} = A - \varepsilon\right)$. Using the fact that expansions are approximately 6 times longer than recessions in post-war US data we chose $p = 6/7$. To calibrate A and ε, we set $E(A) = 1$ and the volatility of A to the annual value used in Greenwood et al. (1988) of 2.2%. We then obtain, $\varepsilon = 0.031$ and $A = 1.022$. We normalize labor supply to $L = 1$ and the elasticities of labor demand to productivity $\delta_G = \delta_P = 1$. We use estimates of price premia due to CSR-induced loyalty to calibrate the marginal production cost parameters κ_P and κ_G. We set $\kappa_P = 1$ and κ_G so that $p_G = 1.2p_P$ following estimates by Ailawadi et al. (2011) of a price premium of roughly 20%. Because $\frac{p_G}{p_P} = \frac{\sigma_P}{\sigma_G}\frac{\kappa_G}{\kappa_P}$ when $\delta_G = \delta_P$, then $\kappa_G = 0.9\kappa_P$. The fixed cost $f_P = 0.14$ is chosen to match the CSR fraction of stock market value. We take the market capitalization of the top one third firms with highest CSR ranking in our data relative to total CRSP market capitalization,

$$\frac{\int_0^\mu Q_{Gi}di}{\int_0^\mu Q_{Gi}di + (1-\mu)\,Q_P} = 0.10.$$

Finally, $W_1 = 0.885$ to match an annual real return of 5% (Cooley and Prescott, 1995). With these parameters, $\bar{\alpha} = 0.098$, quite large relative to the calibrated α, implying that

CSR firms are less risky than non-CSR firms in equilibrium. The average market β of CSR firms is 0.6 and the average market beta of non-CSR firms is 1.048. It follows that systematic risk and expected returns of CSR firms are roughly 30% lower than those of non-CSR firms.

A description of the numerical procedure used to construct equilibria is as follows. Start with an initial guess for μ. Set $f_G^* = \mu$. In equilibrium the amount of bonds issued is $\int_0^1 B_i di = \frac{1}{2}\mu^2 + (1-\mu) f_P$. Using B and μ, we derive the date-2 equilibrium quantities and prices in each state of the world (described by the pair (A, μ)). Using (13), we calculate the stochastic discount rate m. The pricing equations (14)-(15) can then be used to get the interest rate r and the stock prices Q_P and Q_G. If $Q_P > Q_G$ (<), then μ should decrease (increase) so that Q_P decreases (increases) and Q_G increases (decreases). We iterate on the value of μ until $Q_P = Q_G$. A corner solution is possible if $\mu = 0$ ($\mu = 1$) and $Q_P > Q_G$ ($Q_P < Q_G$). A unique equilibrium is guaranteed numerically by checking that $Q_P - Q_G$ is monotone in μ.

We start with comparative statics on σ_G. The result in Corollary 1 established a condition under which the average CSR firm had lower expected returns vis-a-vis the average non-CSR firms. We have also discussed the comparative statics for an infinitesimally small firm of changing its σ_l alone. Here, we describe the equilibrium effects of changing σ_G for all CSR firms, simulating an *industry-wide trend towards CSR*. The results are depicted in Figure 1. Clockwise, starting from the top left corner, the figure depicts the fraction of CSR firms μ, the equilibrium price of the marginal CSR (equal to that of non-CSR firms) Q_P, the wage rate in the two aggregate regimes w, and the expected excess returns to the marginal CSR and the non-CSR firms $E(r_j - r)$.

Decreases in σ_G (from right to left on the plots) translate into higher consumer loyalty and higher rents to CSR firms. Consequently, valuations increase and there is more adoption, i.e. μ increases. However, demand for labor and the wage rate decrease because with higher loyalty comes decreased market competition and lower quantity supplied. In addition, CSR firms have lower demand for labor and there are now more of these firms. This additional effect is weaker but also leads to lower wage rates.

Increased loyalty to CSR firms leads to lower risk for the marginal CSR firm, and for the other CSR firms.[8] This result is the combination of two effects. First, the partial equilibrium effect says that the increased loyalty leads to higher profits. The higher profits are incorporated into valuations more than proportionally due to an operating leverage effect, resulting in lower expected returns. Second, the industry equilibrium effect arises as the marginal firm changes and f_G^* increases, leading to an increase in expected returns. The first effect dominates in equilibrium, implying a negative relation between loyalty and risk.

There is another effect of changing loyalty to CSR firms. Surprisingly, as loyalty associated with CSR firms increases and risk decreases for these firms, risk in non-CSR firms also decreases. This effect is due to decreased competition in the industry which increases valuations and lowers the expected returns necessary to cover the fixed costs.

Consider now the comparative statics with respect to the expenditure share α. These are depicted in Figure 2 which shows the same equilibrium variables, in the same order, as Figure 1. A higher expenditure share increases the demand for CSR products, increases sector valuations and firm CSR adoption. Demand for labor decreases because there are more CSR firms, which produce less and also use less labor per unit produced. This leads to lower wage rates. As with changes in σ_G, there are two effects that determine how risk is affected, a partial equilibrium one and an industry equilibrium one. First, the higher expenditure share increases the profitability of CSR firms, but increases their valuations proportionately more due to fixed costs and expected returns fall. Second, the marginal CSR firm changes and has now higher f_G and higher expected returns. Numerically, the first effect dominates giving rise to a negative association between expenditure share and risk. This result for incremental changes in α is not in contradiction with the result in Corollary 1 because as α increases, risk for non-CSR firms also decreases but at a faster rate. When $\alpha > \bar{\alpha} = 0.098$, CSR firms become riskier than non-CSR firms.

4.4 Model Predictions

In this subsection, we collect the model predictions discussed above. First, we summarize the impact of an infinitesimal firm changing its level of CSR while holding all the equilibrium quantities constant.

[8] Note that the magnitude of the risk premia is quite small, but this is a known consequence of the CRRA preferences used in the model, the low calibrated risk aversion coefficient and the low calibrated volatility of the aggregate shock.

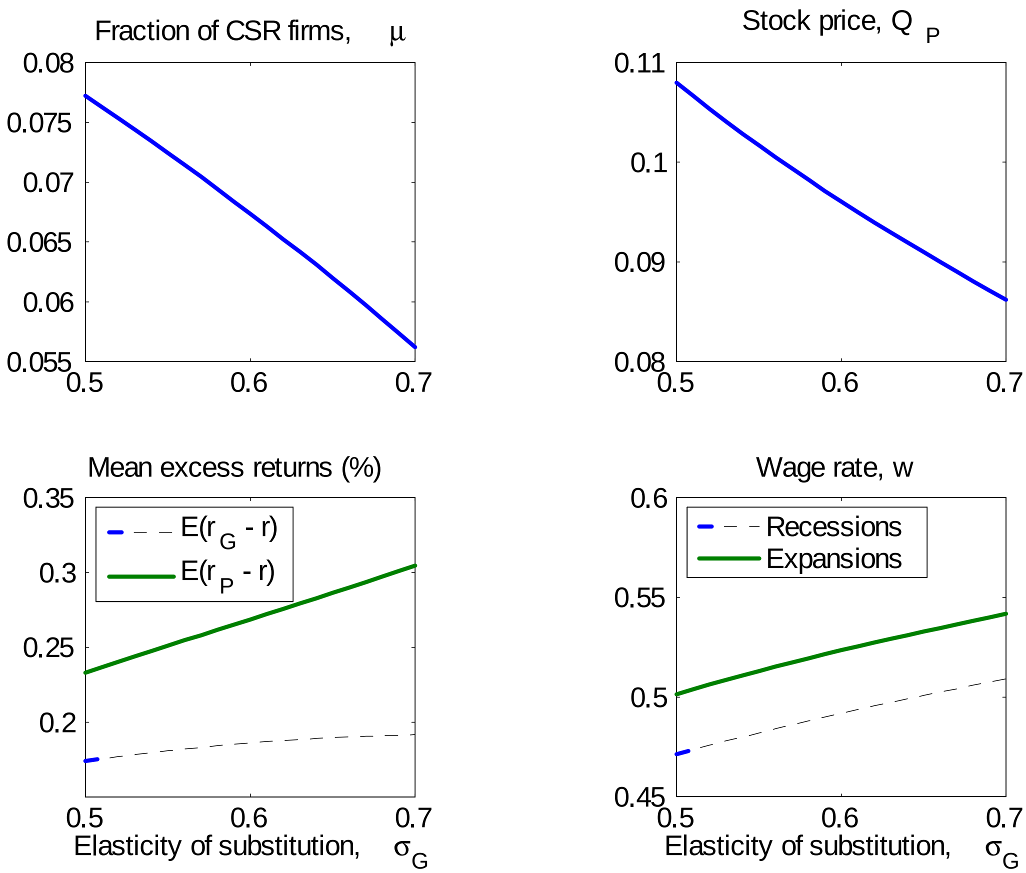

Figure 1: Equilibrium comparative statics on the elasticity of substitution σ_G.

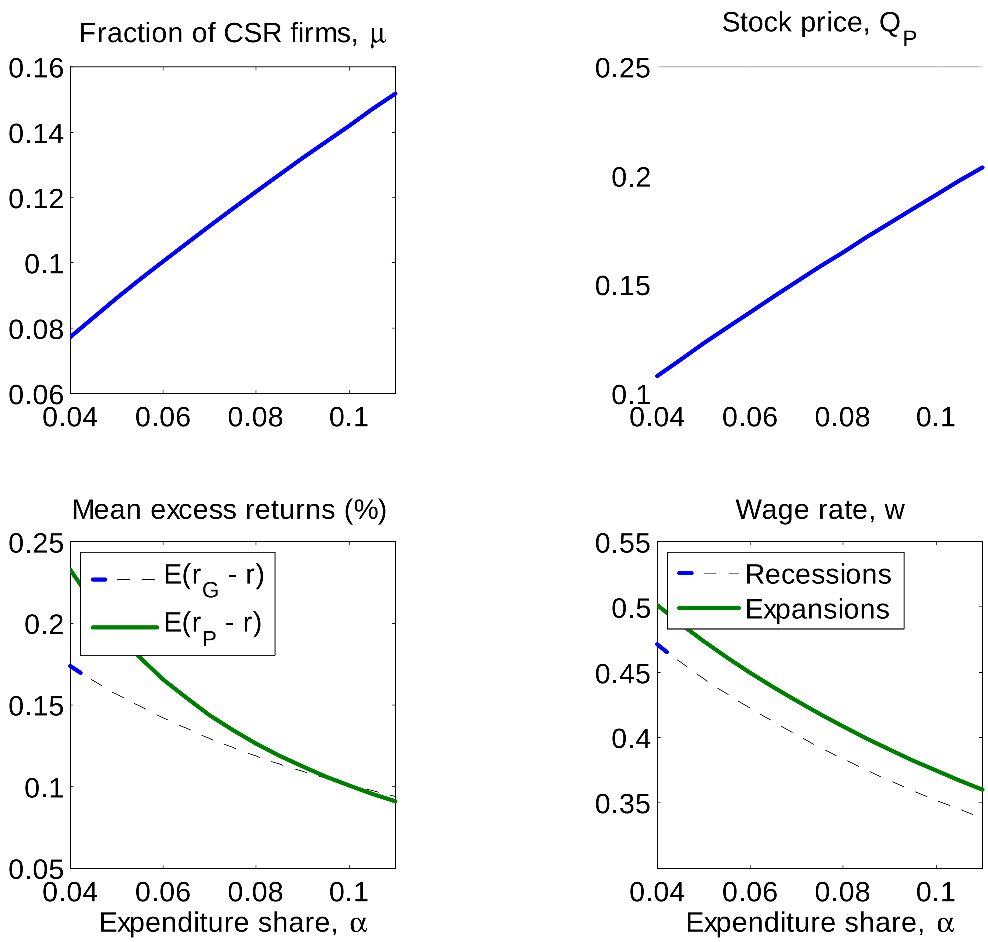

Figure 2: Equilibrium comparative statics on the expenditure share α.

Prediction 1 Increased firm-level CSR is associated with lower firm-level systematic risk.

We test this prediction using the sign and the significance of the slope coefficient on a regression of firm-level systematic risk on the firm's CSR characteristic. We also test (indirectly) the model implication stated in Corollary 1 that the risk associated with a CSR firm depends upon the expenditure share on CSR goods. As this share is likely to have increased over time, we predict that:

Prediction 2 CSR firms have become relatively riskier over time.

We test this prediction by inspecting how the slope coefficient described above changes over time.

In the model, the expenditure share of CSR goods is constant regardless of the level of aggregate productivity. However, if CSR goods have a high income elasticity, it is to be expected that the expenditure share of CSR goods goes up in expansions. Therefore, we predict that:

Prediction 3 CSR firms are relatively riskier in expansions.

We test these predictions using both market betas and expected returns. A parallel prediction to Prediction 3, stated formally in Proposition 4, describes how the ratio of CSR profits to non-CSR profits co-moves with productivity as captured by business cycle fluctuations. If CSR firms are indeed less risky than non-CSR firms, then one would expect that their profits do not increase as much as those of non-CSR firms in economic upturns. Formally:

Prediction 4 The ratio of CSR firm profits relative to non-CSR firm profits decreases in business cycle expansions.

Finally, the comparative statics on the elasticity of substitution showed the effect of industry CSR trends on the riskiness of non-CSR firms. As the level of CSR in an industry increases not only do CSR firms become less risky, but non-CSR firms also become less risky due to an industry equilibrium effect.

Prediction 5 Increased industry CSR is associated with lower risk for non-CSR firms.

5 Data Description

Firm-level CSR data are from MSCI's Environmental, Social and Governance (ESG) database, which provides coverage for main international companies that constitute the following major international stock indices: MSCI World (1,500 companies), MSCI Emerging Markets (200 companies), ASX 200 (200 companies) and FTSE 350 (275 companies).

The original sample contains 3,074 companies from 58 countries spanning the years from 2004 to 2010. In total, the sample has 9,982 firm-year observations. We drop the firms with missing observations and countries with fewer than 10 firms. The final sample contains 3,005 companies from 34 countries representing an unbalanced panel of companies with 9,795 firm-year observations. The sample is described in Table I. The most observations are from the U.S. with 910 firms and 3,094 firm-year observations, followed by the U.K. (384 firms, and 1,372 firm-year observations), Japan (365, and 1,263), Australia (274, and 734), and Canada (160, and 433). The database has relatively fewer observations from large continental European economies: France has 93 firms with 351 firm-year observations, Germany 72 and 251, and Italy 64 and 229.

The MSCI ESG database ratings are based on Intangible Value Assessment (IVA) methodology, compiled by Innovest Strategic Value Advisors. The IVA methodology aims to identify social and environmental risk factors that may affect a firm's financial performance and its management of risk. The IVA rating process follows 6 steps: (1) in-depth industry analysis, (2) collection of company data, (3) preliminary work on a ratings matrix, (4) company interview, (5) completion of the ratings matrix and (6) reality check. The rating uses various documents such as internal corporate documents, government data, popular, trade, and academic journals, relevant organizations and professionals as well as an interview of the company.

According to IVA methodology, firms are rated on four components: stakeholder capital, strategic governance, human capital, and environment. The stakeholder capital is divided into the following dimensions: regulators and policy makers, local communities/NGO's, customer relationships, alliance partners, and emerging markets. Strategic governance consists of strategic scanning capability, agility/adaptation, performance indicators/monitoring, traditional governance concerns, and international "best practice". The dimensions for human capital are: labor relations, health and safety, recruitment and retention strategies, employee motivation, innovation capacity, knowledge development and dissemination, and progressive workplace practices. The environment component is divided into board and executive oversight, risk management systems, disclosure and verification, process efficiencies ("eco-efficiency"), health and safety, new product development, and environmental and climate risk assessment.

For our analysis we use the average of the four components. We call this average score CSR. The CSR score ranges from 0 to 10 with 0 indicating worst CSR practice and 10 best. Germany has the highest average CSR score of 5.961, followed by South Africa (5.712), Japan (5.611), Sweden (5.582), and the U.K. (5.537). The U.S. has an average CSR score of 4.215, but its range is the widest (the minimum CSR score is 0 and the maximum 9.810). China has the lowest average CSR score of 2.156, followed by Malaysia (3.502), Ireland (3.548), Russia (3.581), and India (3,822).

[**Insert Table I here**]

Table II reports the distribution of companies covered by the MSCI ESG index over time for the international sample and for the U.S. sample only. The number of firms covered is the lowest for the year of 2004 (404 and 138 firms for the international and U.S. samples, respectively), then increases significantly for the year 2005 (1,777 and 512 firms). The coverage reaches its peak in year 2007 (2,195 and 676 firms), then stabilizes at a lower number for the years 2008-2010.

Table III reports the number of firms and average CSR score per industry for the entire sample of 9,795 companies. Software has the highest average CSR score of 7.031, Textiles & Apparel has the second highest score of 6.717, followed by Leisure Equipment & Products with 6.215, and Paper & Forest Products with 6.205. The industries with lowest average CSR score are Chemicals with 2.511, Insurance with 3.120, and Broadcast & Cable TV with 3.324. Perhaps surprisingly, industries such as Beverages & Tobacco, Aerospace & Defense, and Oil & Gas rank in the middle of the distribution of CSR scores, reflecting the many facets of the CSR score.

The remaining data are standard. The stock return data for all countries except the U.S. are from Datastream, and the accounting and institutional ownership data are from

Worldscope. For the U.S., the stock return data are from CRSP, the accounting data are from Compustat, and the institutional ownership data are from Spectrum. The GDP and financial development data are from World Bank's World Development Indicators, the market capitalization data are from Datastream and the rule of law index is from ICRG. All our data are denominated in U.S. dollars.

[Insert Tables II and III here]

6 Empirical Results

6.1 Empirical Strategy

In order to estimate β, we run the following time-series regression for every stock i in year t using weekly data:

$$r_{i,s} - r_s = h_i + \beta_i^1 \left(r_{M,s} - r_s\right) + \beta_i^2 \left(r_{M,s-1} - r_{s-1}\right) + h_i^1 SMB_s + h_i^2 HML_s + \varepsilon_{i,s},$$

where $r_{i,s}$ is the weekly return for stock i at week s, r_s is the one-month T-Bill rate at time s transformed into a weekly rate, $r_{M,s}$ is the return on the CRSP value-weighted index at time s, and SMB_s and HML_s are the Fama-French factors at time s. For the international sample, we run the time-series regression using the return on MSCI world index at time s instead of the return on the CRSP index and exclude the Fama-French factors. For consistency, we re-estimate the betas for the U.S. using this method when using the international sample. The minimum number of observations across all regressions is 50.

The value of systematic risk used in subsequent analysis in both the U.S. and international samples is,

$$\hat{\beta}_{i,t} = \frac{1}{2}\left(\hat{\beta}_{i,t}^1 + \hat{\beta}_{i,t}^2\right),$$

where $\hat{\beta}_{i,t}$ is the estimated β for stock i at year t. Separately, in further analysis, we also use the Fama-French 3-factor model on weekly return data to calculate the annual expected stock returns for each firm i and year t.

Once we have estimated $\hat{\beta}_{i,t}$, we run the following regression using yearly data to evaluate the predictions from the model:

$$\hat{\beta}_{i,t} = F_i + Y_t + \delta X_{i,t-1} + \omega Z_{t-1} + \theta CSR_{it} + \eta_{i,t},$$

where F_i is a fixed effect for firm i, Y_t is a fixed effect for year t, X is a vector of firm-level control variables lagged one year, Z represents country-level control variables at time $t-1$, and CSR_{it} is the average CSR score for firm i at time t. In firm-level regressions, we do not include industry fixed effects as these are likely to be absorbed by the firm fixed effects due to little switching of firms between industries. In industry-level regressions we replace the firm fixed effect by an industry fixed effect. We run a similar regression using expected returns as the dependent variable. We report clustered standard errors (see Petersen, 2009) in all our cross sectional tests, clustered by firms or by industries (for firm- and industry-level regressions, respectively).

The firm characteristics used as controls (X) are: leverage, measured as long-term debt to total assets; investment, measured as the ratio of capital expenditures to total assets; cash, measured as cash and cash equivalents to total assets; sales growth defined as percentage change in year-to-year sales; size, measured as the log of assets; earnings variability, measured as standard deviation of net income over past five years; log of age; diversification, measured as number of three-digit SIC code industries the firm operates in; dividends, measured as annual dividends per share; R&D expenses over total assets; and institutional ownership, measured as percentage of shares held by ten largest institutions. Leverage, sales growth, size, earnings variability, and dividends have been shown to affect systematic risk by Beaver, Kettler and Scholes (1970). McAlister, Srinivasan, and Kim (2007) show that R&D and age have an impact on systematic risk. Melicher and Rush (1973) show that conglomerate firms have higher β's than stand-alone firms. Palazzo (2011) shows that firms with higher levels of cash holdings display higher systematic risk.

The country-level control variables (Z) are: GDP per capita, measured as GDP per capita in 1995 dollars; financial market development, measured as stock market capitalization relative to GDP; and rule of law, which constitutes an assessment of laws and traditions in a country. The reason for these country-level variables is that Morck et al. (2000) have shown that emerging markets, with less developed financial markets and less respect for the rule of law, have more synchronous stock price movements than more developed countries.

6.2 Results

Table IV presents the results for the U.S. sample. The first column of Table IV presents our baseline specification and a test of Prediction 1. The level of systematic risk is significantly lower for firms with higher CSR score (coefficient of -0.213 with a p-value of 0.00). The magnitude of the effect is close to the difference in mean systematic risk between the firms in the top quartile of CSR score and the firms in the bottom quartile of 0.281, which is significant at 1% (untabulated). Economically, this effect is also significant. One standard deviation increase in the CSR score (equal to 0.860) decreases beta by $0.183 = 0.860 \times 0.213$ which is a 20% decrease relative to the sample mean of systematic risk of 0.896.

[Insert Table IV here]

The control variables mostly display the expected signs. Leverage, cash, sales growth, and R&D all lead to higher systematic risk, whereas CAPEX, size and age are associated with lower systematic risk (consistent with results in Beaver et al., 1970, McAlister et al., 2007, and Palazzo, 2011, among others). The other controls are not consistently significant across the various specifications.

The second and third columns of Table IV test Predictions 2 and 3, respectively. To test Prediction 2 we interact the CSR score with a dummy that takes the value of 1 for the years 2008, 2009 and 2010. Because we wish to make sure the effect is attributed to time and not to business cycle fluctuations, we also control for GDP growth. The regression results show that firms with high CSR score still enjoy a lower level of systematic risk, but that consistent with Prediction 2, the sensitivity of systematic risk is lower in the second half of the sample (-0.308 in the first half compared to -0.195 in the second half of the sample). Splitting the sample in 2007 yields similar results (untabulated). The third column of Table IV considers the effect of GDP growth alone and shows that, consistent with Prediction 3, systematic risk is particularly low for firms with high CSR score in business cycle downturns (GDP growth interacted with firm CSR score is 0.299, significant at $< 0.1\%$ level).

To test Prediction 4 we construct, for each industry and for each year, the simple average of net income of the firms in the top quartile CSR score and divide it by the simple average of net income of the firms in the bottom quartile CSR score. This variable is a proxy for the ratio of CSR profits to non-CSR profits. Column 4 of Table IV shows that the correlation of this variable and GDP growth is negative (coefficient of -0.180) and statistically significant at 5% level after controlling for industry fixed effects. Consistent with Prediction 4, the profits of firms with high CSR score do not grow as fast relative to those with low CSR score during business cycle expansions.

Finally, we test Prediction 5 in column 5 of Table IV. We regress the median level of systematic risk of the bottom quartile CSR score firms for each industry on the industry's CSR score and on the usual controls (at the industry level). We find that the sign of the sensitivity of systematic risk of non-CSR firms to industry CSR is negative as expected, but the coefficient is not significant (p-value of 0.13). The results using the mean CSR score are similar and available upon request.

Table V documents the empirical evidence on the model's predictions using the international sample. The results are qualitatively similar, though the magnitude of the effects in some cases is decreased. In addition to the usual controls, we add real GDP per capita, financial market development and rule of law as country-level control variables. Column 1 of Table V, shows the sensitivity of firm systematic risk to CSR score. With a coefficient of -0.178, a one standard deviation increase in the CSR score (equal to 1.114) decreases beta by $0.198 = 1.114 \times 0.178$, which is a 24% decrease relative to the sample mean of systematic risk of 0.820. With regard to country control variables, firms are less risky in more financially developed countries and in countries with better legal systems.

[Insert Table V here]

Next we test using the U.S. sample whether the same predictions regarding systematic risk also apply to expected returns. In the regressions, we control for firm-level systematic risk because it is not expected that CSR score subsumes all of systematic risk. To the extent that the relation between CSR and systematic risk is nonlinear, we also do not expect that the inclusion of beta as a control variable removes all of the explanatory power of CSR. We find that the effect of CSR score on expected returns is negative and significant (coefficient of -0.087 and p-value of 0.01) in the baseline specification consistent with Prediction 1. We also find in column 2 that the sensitivity of expected returns to CSR score increased in the second half of the sample consistent with Prediction 2 (the 2008-2010 time-dummy interacted with CSR is 0.010, significant at the 5% level). Finally, columns 2 and 3 show that expected returns are higher for firms with high CSR score in expansions, though this effect is economically small and significant only at the 10% level. The results with the international sample are very similar and are given in Table VII.

[**Insert Tables VI and VII here**]

One concern with our analysis is that of endogeneity, particularly so for our test of Prediction 1. Hong et al. (2011) show that financially constrained firms are less likely to spend resources on CSR and when these firms' financial constraints are relaxed, spending on CSR also increases. Thus (exogenous) firm characteristics lead to CSR, not the other way around. In our case it could be that firms with low levels of systematic risk have more resources to spend on CSR or have less growth options, so that they can afford to dedicate more resources to CSR. Firms with low level of systematic risk may even have certain management styles, or cater to certain groups of investors, or are in industries that are more prone to develop more aggressive CSR policies. To alleviate this concern, we use the method in Almeida et al. (2010) that addresses endogeneity caused by omitted variables, mutual causality and measurement error. Specifically, we take first differences and use lagged level variables as instruments for the first differences. The results are reported in Table VIII for the U.S. sample and in Table IX for the international sample. We find that the effect of firm CSR on systematic risk is robust to this treatment.

[**Insert Tables VIII and IX here**]

To conclude, we discuss some additional robustness tests. While we do not include these tests in the paper, they are available upon request. We have analyzed which of the components of the aggregate CSR score are most influential in our results. The tests indicate that the environmental and human capital components display very similar results to those shown above. The results are somewhat weaker for the governance component of the index. We have also re-run the tests using the international sample, but excluding from it the U.S. firms. Again, our results are robust to this data selection procedure.

7 Conclusion

This paper offers an asset pricing model to analyze how firms' choices of corporate social responsibility affect their systematic risk. Following the profit maximizing view of CSR, we model the benefit of corporate social responsibility as generating a more loyal demand for the firm and analyze the trade-offs associated with the adoption of CSR. We show that CSR reduces firm systematic risk and implies that firm profits are less correlated with the business cycle for CSR firms than for non-CSR firms. We also show that trends in industry adoption of CSR reduce non-adopters' systematic risk as well. Using a large database of CSR characteristics from MSCI ESG, we test the model predictions and find evidence consistent with the model.

Our theory and evidence point to consumers as important agents in influencing firm policies and their risk profiles. This is different from other asset pricing theories as well as corporate finance theories that deal with the effects of corporate social responsibility. Our approach is in line with survey evidence that consumers, not investors, are more concerned about firms' CSR policies, in contrast to firms' corporate governance choices, where investor preferences matter more.

Our results have important practical capital budgeting and policy implications. Beta is the major parameter used in estimating cost of equity. Given our results, we expect CSR companies to have lower cost of equity than non-CSR firms. In addition, projects that increase firms' reputation for CSR should be discounted with lower cost of equity, compared to otherwise similar projects. Thus, for example, investments in green energy should be discounted with a lower cost of equity than investments in more polluting sources of energy.

Appendices

The Appendix contains proofs of the propositions in the paper and also an infinite horizon version of the model.

A Proofs

Proof of Proposition 1. Consider the date-2 investor optimization problem:

$$\max_{c_l} \frac{C_2^{1-\gamma}}{1-\gamma},$$

subject to the budget constraint,

$$W_2 = \int_0^1 p_i c_i di. \tag{A.1}$$

Letting λ_2 be the Lagrange multiplier associated with equation (A.1). The first order sufficient and necessary conditions for an interior solution are equations (A.1) and

$$\begin{aligned} \alpha C_2^{-\gamma} \left(\int_0^\mu c_i^{\sigma_G} di\right)^{\frac{\alpha}{\sigma_G}-1} \left(\int_\mu^1 c_i^{\sigma_P} di\right)^{\frac{1-\alpha}{\sigma_P}} c_l^{\sigma_G - 1} &= \lambda_2 p_l, \qquad \text{all } 0 \le l \le \mu, \\ (1-\alpha) C_2^{-\gamma} \left(\int_0^\mu c_i^{\sigma_G} di\right)^{\frac{\alpha}{\sigma_G}} \left(\int_\mu^1 c_j^{\sigma_P} dj\right)^{\frac{1-\alpha}{\sigma_P}-1} c_k^{\sigma_P - 1} &= \lambda_2 p_k, \qquad \text{all } \mu \le k \le 1. \end{aligned}$$

Multiplying both sides of the equations above by the respective consumption level and integrating over the relevant range gives

$$\alpha C_2^{1-\gamma} = \lambda_2 \int_0^\mu p_i c_i di,$$

$$(1-\alpha) C_2^{1-\gamma} = \lambda_2 \int_\mu^1 p_j c_j dj.$$

Eliminating λ_2 we see that α is the expenditure share of CSR goods:

$$\int_0^\mu p_i c_i di = \frac{\alpha}{1-\alpha} \int_\mu^1 p_j c_j dj.$$

Also, $C_2^{1-\gamma} = \lambda_2 W_2$. Take the ratio of two conditions for $0 \le i, l \le \mu$ to get

$$c_i = \left(\frac{p_i}{p_l}\right)^{\frac{1}{\sigma_G - 1}} c_l, \tag{A.2}$$

and the ratio of two conditions for $\mu \le j, k \le 1$ to get

$$c_j = \left(\frac{p_j}{p_k}\right)^{\frac{1}{\sigma_P - 1}} c_k. \tag{A.3}$$

Replacing (A.2) and (A.3) back in the first order conditions

$$\begin{aligned}
\alpha C_2^{-\gamma}\left(\int_0^\mu p_i^{\frac{\sigma_G}{\sigma_G-1}}di\right)^{\frac{\alpha}{\sigma_G}-1}\left(\int_\mu^1 p_i^{\frac{\sigma_P}{\sigma_P-1}}\right)^{\frac{1-\alpha}{\sigma_P}} p_l^{\frac{1-\alpha}{\sigma_G-1}} c_l^{\alpha-1} p_k^{-\frac{1-\alpha}{\sigma_P-1}} c_k^{1-\alpha} &= \lambda_2 \\
(1-\alpha)\, C_2^{-\gamma}\left(\int_0^\mu p_i^{\frac{\sigma_G}{\sigma_G-1}}\right)^{\frac{\alpha}{\sigma_G}}\left(\int_\mu^1 p_j^{\frac{\sigma_P}{\sigma_P-1}}dj\right)^{\frac{1-\alpha-\sigma_P}{\sigma_P}} p_l^{-\frac{\alpha}{\sigma_G-1}} c_l^{\alpha} p_k^{\frac{\alpha}{\sigma_P-1}} c_k^{-\alpha} &= \lambda_2.
\end{aligned}$$

The ratio of these two equations yields:

$$\frac{\alpha\left(\int_\mu^1 p_i^{\frac{\sigma_P}{\sigma_P-1}}\right)}{(1-\alpha)\left(\int_0^\mu p_i^{\frac{\sigma_G}{\sigma_G-1}}\right)}\frac{p_l^{\frac{1}{\sigma_G-1}}}{p_k^{\frac{1}{\sigma_P-1}}}c_k = c_l.$$

Replacing all in the budget constraint:

$$\begin{aligned}
W_2 &= \int p_i c_i \\
&= \int_0^\mu p_i\left(\frac{p_i}{p_l}\right)^{\frac{1}{\sigma_G-1}} c_l di + \int_\mu^1 p_j\left(\frac{p_j}{p_k}\right)^{\frac{1}{\sigma_P-1}} c_k dj \\
&= \frac{1}{1-\alpha}\left(\int_\mu^1 p_i^{\frac{\sigma_P}{\sigma_P-1}}\right)\frac{c_k}{p_k^{\frac{1}{\sigma_P-1}}},
\end{aligned}$$

from which we get the demand functions:

$$c_k = (1-\alpha)\frac{p_k^{\frac{1}{\sigma_P-1}}}{\int_\mu^1 p_i^{\frac{\sigma_P}{\sigma_P-1}}di}W_2,$$

and

$$c_l = \alpha\frac{p_l^{\frac{1}{\sigma_G-1}}}{\int_0^\mu p_i^{\frac{\sigma_G}{\sigma_G-1}}di}W_2.$$

Turn now to the firms' problems. Using the demand functions from the investor's problem, the first order necessary and sufficient conditions for firms are:

$$\begin{aligned}
\sigma_G p_j x_j &= w A^{\delta_G}\kappa_G x_j \\
\sigma_P p_k x_k &= w A^{\delta_P}\kappa_P x_k,
\end{aligned}$$

so that profits are

$$\pi_j = (1-\sigma_j)\, p_j x_j.$$

By Walras' law, the equilibrium requires a price normalization. We normalize prices such that the price level of the aggregate consumption good equals 1. Define $P = \min_{c_l \in \{c_l : C_2 = 1\}} \int_0^1 p_l c_l dl$. It can be shown that the solution yields

$$P = \alpha^{-\alpha} (1-\alpha)^{-(1-\alpha)} \left(\int_0^{\mu} p_i^{\frac{\sigma_G}{\sigma_G - 1}} di \right)^{-\alpha \frac{1-\sigma_G}{\sigma_G}} \left(\int_{\mu}^{1} p_k^{\frac{\sigma_P}{\sigma_P - 1}} dk \right)^{-(1-\alpha)\frac{1-\sigma_P}{\sigma_P}}.$$

If $P = 1$, and setting $p_k = p_P$ for all $k \in [\mu, 1]$ and $p_l = p_G$ for all $k \in [0, \mu]$, then

$$p_P = \left(\alpha \mu^{\frac{1-\sigma_G}{\sigma_G}} \right)^{\alpha} \left((1-\alpha)(1-\mu)^{\frac{1-\sigma_P}{\sigma_P}} \right)^{(1-\alpha)} \left(\frac{p_G}{p_P} \right)^{-\alpha}.$$

From the firms' problem

$$\frac{p_P}{p_G} = \frac{\sigma_G}{\sigma_P} \frac{A^{\delta_P} \kappa_P}{A^{\delta_G} \kappa_G}$$

and we arrive at

$$\begin{aligned} p_P &= \bar{p} A^{-\alpha(\delta_G - \delta_P)}, \\ p_G &= \frac{\sigma_P}{\sigma_G} \frac{\kappa_G}{\kappa_P} \bar{p} A^{(1-\alpha)(\delta_G - \delta_P)}, \end{aligned}$$

where

$$\bar{p} = \left(\alpha \mu^{\frac{1-\sigma_G}{\sigma_G}} \right)^{\alpha} \left((1-\alpha)(1-\mu)^{\frac{1-\sigma_P}{\sigma_P}} \right)^{(1-\alpha)} \left(\frac{\sigma_P}{\sigma_G} \frac{\kappa_G}{\kappa_P} \right)^{-\alpha}.$$

By construction this solution obeys $P = 1$.

Now we solve the labor market clearing condition. From the investor's problem:

$$\begin{aligned} c_G &= \frac{\alpha(1-\mu)}{(1-\alpha)\mu} \frac{p_P}{p_G} c_P & \text{(A.4)} \\ &= \frac{\alpha(1-\mu)}{(1-\alpha)\mu} \frac{\sigma_G}{\sigma_P} \frac{A^{\delta_P} \kappa_P}{A^{\delta_G} \kappa_G} c_P. & \text{(A.5)} \end{aligned}$$

Replacing in labor market clearing condition, $\int_0^1 l_i di = L$, or

$$\mu A^{\delta_G} \kappa_G c_G + (1-\mu) A^{\delta_P} \kappa_P c_P = L,$$

gives

$$\begin{aligned} c_P &= \bar{x} \frac{1-\alpha}{1-\mu} A^{-\delta_P} & \text{(A.6)} \\ c_G &= \bar{x} \frac{\sigma_G}{\sigma_P} \frac{\alpha \kappa_P}{\mu \kappa_G} A^{-\delta_G}, & \text{(A.7)} \end{aligned}$$

where

$$\bar{x} = \frac{L\sigma_P/\kappa_P}{\alpha\sigma_G + (1-\alpha)\,\sigma_P}.$$

We then use one of the first order conditions from the firms' problem to get the wage rate,

$$w = \bar{p}\frac{\sigma_P}{\kappa_P}A^{-\bar{\delta}},$$

where $\bar{\delta} = (1-\alpha)\,\delta_P + \alpha\delta_G$. Profits are

$$\pi_G = \bar{p}\bar{x}\,(1-\sigma_G)\,\frac{\alpha}{\mu}A^{-\bar{\delta}},$$

for CSR firms and for non-CSR firms,

$$\pi_P = \bar{p}\bar{x}\,(1-\sigma_P)\,\frac{1-\alpha}{1-\mu}A^{-\bar{\delta}}.$$

Finally, under our price normalization, $C_2 = W_2$, and

$$\lambda_2 = C_2^{-\gamma} = [\bar{p}\bar{x}]^{-\gamma}\,A^{\gamma\bar{\delta}}.$$

■

Proof of Proposition 2. The investor's stochastic discount factor is,

$$m = \bar{m}\,[\bar{p}\bar{x}]^{-\gamma}\,A^{\gamma\bar{\delta}}.$$

Then, we have

$$\begin{aligned} Cov\,(m,\pi_j) &= Cov\left(\bar{m}\,[\bar{p}\bar{x}]^{-\gamma}\,A^{\gamma\bar{\delta}}, \bar{p}\bar{x}\,(1-\sigma_j)\,\frac{\alpha_j}{\mu_j}A^{-\bar{\delta}}\right) \\ &= \bar{m}\,[\bar{p}\bar{x}]^{1-\gamma}\,(1-\sigma_j)\,\frac{\alpha_j}{\mu_j}Cov\left(A^{\gamma\bar{\delta}}, A^{-\bar{\delta}}\right). \end{aligned}$$

Stock prices are

$$\begin{aligned} Q_j &= E\,[m\pi_j] - f_j \\ &= \bar{m}\,[\bar{p}\bar{x}]^{1-\gamma}\,(1-\sigma_j)\,\frac{\alpha_j}{\mu_j}E\left[A^{-(1-\gamma)\bar{\delta}}\right] - f_j. \end{aligned} \tag{A.8}$$

substituting in the various terms, expected stock excess returns for firm j are

$$E\,(r_j - r) = \frac{\bar{p}\bar{x}\,(1-\sigma_j)\,\frac{\alpha_j}{\mu_j}}{\bar{m}\,[\bar{p}\bar{x}]^{1-\gamma}\,(1-\sigma_j)\,\frac{\alpha_j}{\mu_j}E\left[A^{-(1-\gamma)\bar{\delta}}\right] - f_j}\,\frac{-Cov\left(A^{\gamma\bar{\delta}}, A^{-\bar{\delta}}\right)}{E\left(A^{\gamma\bar{\delta}}\right)}.$$

For any CSR firm, the ratio of expected excess returns to that of a non-CSR firm is:

$$\frac{E\left(r_G - r\right)}{E\left(r_P - r\right)} = \frac{\left(1-\sigma_G\right)\frac{\alpha}{\mu}}{\left(1-\sigma_P\right)\frac{1-\alpha}{1-\mu}}\frac{Q_P}{Q_G}.$$

The the marginal CSR firm:

$$\frac{E\left(r_G^* - r\right)}{E\left(r_P - r\right)} = 1 + \frac{\Delta}{\left(1-\sigma_P\right)\frac{1-\alpha}{1-\mu}},$$

where

$$\Delta \equiv \left(1-\sigma_G\right)\frac{\alpha}{\mu} - \left(1-\sigma_P\right)\frac{1-\alpha}{1-\mu}.$$

Also, at an interior solution, the price of the marginal CSR firm is $Q_G^* = Q_P$, or,

$$\bar{m}\left[\bar{p}\bar{x}\right]^{1-\gamma} E\left[A^{-(1-\gamma)\bar{\delta}}\right]\Delta = f_G^* - f_P. \tag{A.9}$$

Therefore, because $\mu = f_G^*$ in equilibrium,

$$E\left(r_P - r\right) \gtreqless E\left(r_G^* - r\right) \text{ if, and only if, } f_P - \mu \gtreqless 0.$$

■

Proof of Proposition 3. Use the definition of $\beta_j = \frac{Cov(r_j, r_M)}{Var(r_M)}$ to get

$$\begin{aligned}
\beta_j &= \frac{\bar{p}\bar{x}\left(1-\sigma_j\right)\frac{\alpha_j}{\mu_j}}{Q_j}\left[\frac{\int \bar{p}\bar{x}\left(1-\sigma_i\right)\frac{\alpha_i}{\mu_i}di}{\int Q_i di}\right]^{-1} \\
&= \frac{1}{\mu_j}\frac{\left(1-\sigma_j\right)\alpha_j}{\left(1-\sigma_G\right)\alpha + \left(1-\sigma_P\right)\left(1-\alpha\right)}\frac{Q_G^* + \frac{1}{2}\mu^2}{Q_j}.
\end{aligned}$$

With equally weighted market return,

$$\begin{aligned}
\beta_j &= \frac{Cov\left(r_j, \int r_i di\right)}{Var\left(\int r_i di\right)} \\
&= \frac{\left(1-\sigma_j\right)\frac{\alpha_j}{\mu_j}}{Q_j}\left[\int \frac{\left(1-\sigma_i\right)\frac{\alpha_i}{\mu_i}}{Q_i}di\right]^{-1} \\
&= \frac{1}{Q_j}\frac{\left(1-\sigma_j\right)\frac{\alpha_j}{\mu_j}}{\left(1-\sigma_G\right)\frac{\alpha}{\mu}\int_0^\mu \frac{1}{E[m\pi_G]-f_i}di + \left(1-\mu\right)\frac{\left(1-\sigma_P\right)\frac{1-\alpha}{1-\mu}}{Q_P}} \\
&= \frac{1}{Q_j}\frac{\left(1-\sigma_j\right)\frac{\alpha_j}{\mu_j}}{\left(1-\sigma_G\right)\frac{\alpha}{\mu}\ln\left(\frac{E[m\pi_G]}{Q_G^*}\right) + \frac{\left(1-\sigma_P\right)\left(1-\alpha\right)}{Q_P}}.
\end{aligned}$$

For the marginal CSR firm, $Q_G^* = Q_P$, so $\beta_G^* < \beta_P$ if, and only if, $\Delta < 0$, or $\mu < f_P$. ■

Proof of Proposition 4. Write R_π using the equilibrium values of π_j and noting that $\mu = f_G^*$:

$$R_\pi = \frac{(1-\sigma_G)\frac{\alpha}{\mu}\bar{p}\bar{x}A^{-\bar{\delta}} - \mu(1+r)}{(1-\sigma_P)\frac{1-\alpha}{1-\mu}\bar{p}\bar{x}A^{-\bar{\delta}} - f_P(1+r)}.$$

Taking the derivative with respect to $A^{-\bar{\delta}}$:

$$\begin{aligned}
\frac{dR_\pi}{dA^{-\bar{\delta}}} &= (1+r)\,\bar{p}\bar{x}\frac{-(1-\sigma_G)\frac{\alpha}{\mu}f_P + \mu(1-\sigma_P)\frac{1-\alpha}{1-\mu}}{\left[(1-\sigma_P)\frac{1-\alpha}{1-\mu}\bar{p}\bar{x}A^{-\bar{\delta}} - f_P(1+r)\right]^2} \\
&\propto -(1-\sigma_G)\frac{\alpha}{\mu}f_P + \mu(1-\sigma_P)\frac{1-\alpha}{1-\mu} \\
&= (1-\sigma_G)\frac{\alpha}{\mu}(\mu - f_P) - \mu\Delta \\
&= \left\{(1-\sigma_G)\frac{\alpha}{\mu}\bar{m}\,[\bar{p}\bar{x}]^{1-\gamma}\,E\left[A^{-(1-\gamma)\bar{\delta}}\right] - \mu\right\}\Delta \\
&= Q_G^*\Delta.
\end{aligned}$$

The third line uses the definition of Δ and combines the terms with $(1-\sigma_G)\frac{\alpha}{\mu}$. The fourth line uses equation (A.9) to eliminate $\mu - f_P$ and the last line uses the equilibrium value of Q_G^* in equation (A.8). It follows that $\frac{dR_\pi}{dA^{-\bar{\delta}}} \gtreqless 0$ if, and only if, $\Delta \gtreqless 0$. ■

Proof of Proposition 5. First, note that $\Delta > 0$ if, and only if,

$$\frac{(1-\sigma_G)\,\alpha}{1-\sigma_P+(\sigma_P-\sigma_G)\,\alpha} > \mu.$$

The left hand side of the inequality is strictly increasing in α varying between 0 and 1. Define $\bar{\alpha}$ implicitly as

$$\frac{(1-\sigma_G)\,\bar{\alpha}}{1-\sigma_P+(\sigma_P-\sigma_G)\,\bar{\alpha}} = f_P.$$

Let $\alpha < \bar{\alpha}$ and assume by way of contradiction that $\mu > f_P$. Then, by definition of $\bar{\alpha}$,

$$f_P > \frac{(1-\sigma_G)\,\alpha}{1-\sigma_P+(\sigma_P-\sigma_G)\,\alpha}.$$

But, $\mu > f_P$, or equivalently, $\Delta > 0$, implies that the right hand side of this inequality is larger than μ, which is a contradiction. Now, let $\mu < f_P$. Then,

$$\frac{(1-\sigma_G)\,\alpha}{1-\sigma_P+(\sigma_P-\sigma_G)\,\alpha} < \mu < f_P = \frac{(1-\sigma_G)\,\bar{\alpha}}{1-\sigma_P+(\sigma_P-\sigma_G)\,\bar{\alpha}}.$$

The inequalities implies $\alpha < \bar{\alpha}$. ■

B Infinite Horizon Model

Consider an infinite horizon version of the model where investors chose a consumption path to

$$\max E\left[\sum_{t=0}^{\infty}\beta^t\frac{C_t^{1-\gamma}}{1-\gamma}\right],$$

subject to the period budget constraints,

$$C_t+\int D_{t+1i}Q_{ti}di\leq\int D_{it}\left(Q_{ti}+\pi_{ti}-\iota_i\right)di+\int\iota_i di+w_tL,$$

for all t. We use the same notation as before except for ι_i which is the coupon paid on a console bond issued by firm i at time 0 to cover the initial fixed investment. We assume for simplicity that the growth rate of productivity shocks is a lognormal variable i.i.d. through time, with $E\left[\ln\left(A_{t+1}/A_t\right)\right]=\eta$, $Var\left[\ln\left(A_{t+1}/A_t\right)\right]=v$.

With a representative investor, equilibrium stock holdings are $D_{it}=1$ for all i and t. From the budget constraint we get,

$$C_t=\int\pi_{ti}di+w_tL.$$

Because $W_t=C_t$, the static production problem faced by firms and the static problem of allocating consumption across all c_j goods is as before and the solution given in Proposition 1. Hence,

$$C_t=\bar{p}\bar{x}A_t^{-\bar{\delta}}.$$

The Euler equation pricing the stock of a generic firm j is,

$$\begin{aligned}Q_{tj}&=\beta E\left[\left(\frac{C_{t+t}}{C_t}\right)^{-\gamma}\left(Q_{t+1j}+\pi_{t+1j}-\iota_j\right)\right]\\&=\beta E\left[\left(\frac{A_{t+1}}{A_t}\right)^{\gamma\bar{\delta}}\left(Q_{t+1j}+\bar{p}\bar{x}\left(1-\sigma_j\right)\frac{\alpha_j}{\mu_j}A_{t+1}^{-\bar{\delta}}-\iota_j\right)\right].\end{aligned}$$

Iterating forward and imposing a no bubbles solution obtains,

$$Q_{tj}=\bar{p}\bar{x}\left(1-\sigma_j\right)\frac{\alpha_j}{\mu_j}A_t^{-\gamma\bar{\delta}}E_t\left[\sum_{s=1}^{\infty}\beta^sA_{t+s}^{(\gamma-1)\bar{\delta}}\right]-\iota_j\psi_t,$$

where

$$\psi_t=E_t\left[\sum_{s=1}^{\infty}\beta^s\left(\frac{A_{t+s}}{A_t}\right)^{\gamma\bar{\delta}}\right].$$

Using the lognormality assumption and letting $\theta = \eta + \frac{1}{2}\gamma\bar{\delta}v$:

$$\psi_t = \frac{\beta \exp^{\gamma\bar{\delta}\theta}}{1 - \beta \exp^{\gamma\bar{\delta}\theta}},$$

where we have assumed that $\beta \exp^{\gamma\bar{\delta}\theta} < 1$ so bond prices are bounded. Without loss we drop the time subscript from ψ. Furthermore,

$$Q_{tj} = \bar{p}\bar{x}\left(1 - \sigma_j\right)\frac{\alpha_j}{\mu_j} A_t^{-\bar{\delta}} \frac{\beta \exp^{(\gamma-1)\bar{\delta}\left(\theta - \frac{1}{2}\bar{\delta}v\right)}}{1 - \beta \exp^{(\gamma-1)\bar{\delta}\left(\theta - \frac{1}{2}\bar{\delta}v\right)}} - \iota_j \psi.$$

The assumption that $\beta \exp^{\gamma\bar{\delta}\theta} < 1$ guarantees that equity prices (and life-time utility) are bounded provided risk aversion is not too low.

The initial proceeds from issuing the console cover the fixed investment. With a console that is fairly priced we have:

$$f_j = \iota_j E_0 \left[\sum_{s=1}^{\infty} \beta^s \left(\frac{A_s}{A_0}\right)^{\gamma\bar{\delta}}\right] = \iota_j \psi.$$

Thus, $\iota_j = f_j/\psi$.

Firm adoption decisions are assumed to be made only once at time 0. An interior solution for μ is such that $Q_G^* = Q_P$ at time 0. Having solved for the equilibrium fraction μ, we can calculate the realized return to firm j at time $t+1$:

$$\begin{aligned} r_{t+1j} &= \frac{Q_{t+1j} + \pi_{t+1j} - \iota_j}{Q_{tj}} - 1 \\ &= \frac{\frac{\bar{p}\bar{x}(1-\sigma_j)\frac{\alpha_j}{\mu_j}A_t^{-\bar{\delta}}}{1-\beta\exp^{(\gamma-1)\bar{\delta}\left(\theta-\frac{1}{2}\bar{\delta}v\right)}}\left[\left(\frac{A_{t+1}}{A_t}\right)^{-\bar{\delta}} - \beta\exp^{(\gamma-1)\bar{\delta}\left(\theta-\frac{1}{2}\bar{\delta}v\right)}\right] - \iota_j}{Q_{tj}}. \end{aligned}$$

Calculating directly, firm j's expected return is,

$$E_t\left[r_{t+1j}\right] = \frac{\bar{p}\bar{x}\left(1-\sigma_j\right)\frac{\alpha_j}{\mu_j}A_t^{-\bar{\delta}}\Theta - \iota_j}{Q_t},$$

where Θ is a term that collects the impact of assumptions regarding the distribution of productivity shocks on expected returns and is a function of $\bar{\delta}$, β, γ, η and v. The model of expected returns is analytically very similar to the static model in the main text and similar predictions arise from changes in σ_l to a small firm l.

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Table I: Summary statistics by country

This table reports summary statistics by country for the sample of international firms covered in MSCI ESG Database. The sample years are from 2004 through 2010. Corporate Social Responsibility (CSR) score is based on the average of four indexes: stakeholder capital, strategic governance, human capital, and environment.

country	firms	firm-years	average CSR	min CSR	max CSR
Australia	274	734	4.788	0.000	9.208
Austria	16	50	4.734	0.682	7.623
Belgium	22	78	4.702	1.814	9.530
Bermuda	46	137	3.909	0.500	8.456
Brazil	32	70	5.315	2.523	9.200
Canada	160	433	4.985	0.503	9.840
Cayman Islands	16	41	3.995	1.795	6.500
China	31	56	2.156	0.279	5.220
Denmark	23	81	5.197	2.951	8.417
Finland	31	94	5.487	2.392	8.500
France	93	351	5.264	1.555	9.240
Germany	72	251	5.961	2.010	9.000
Greece	15	61	4.001	2.160	8.820
Hong Kong	38	143	4.284	0.741	9.010
India	23	46	3.822	1.600	7.767
Ireland	16	58	3.548	0.612	7.620
Italy	64	229	3.900	0.000	8.495
Japan	365	1,263	5.611	0.200	9.304
Korea, South	26	67	4.701	0.893	8.800
Malaysia	14	27	3.502	1.387	5.600
Mexico	16	31	4.763	1.356	6.710
Netherlands	34	132	5.208	0.100	9.080
New Zealand	16	36	3.976	1.404	7.800
Norway	19	61	5.489	1.373	9.160
Portugal	12	47	4.323	1.197	7.400
Russia	25	36	3.581	1.300	6.610
Singapore	27	87	4.146	0.706	9.440
South Africa	16	35	5.712	2.580	8.196
Spain	49	190	5.207	0.597	9.600
Sweden	46	171	5.582	2.380	9.228
Switzerland	58	191	5.462	0.075	8.720
Taiwan	16	42	4.459	1.000	7.584
United Kingdom	384	1372	5.537	0.498	9.700
United States	910	3,094	4.215	0.000	9.810
Average			4.633		
Total	3,005	9,795			

Table II: Summary statistics by year

This table reports the number of companies by year for the sample of international firms covered in MSCI ESG Database. The sample years are from 2004 through 2010. Corporate Social Responsibility (CSR) score is based on the average of four indexes: stakeholder capital, strategic governance, human capital, and environment.

year	**international sample**	**US sample**
2004	404	138
2005	1,777	512
2006	2,156	581
2007	2,195	676
2008	1,082	400
2009	1,212	382
2010	969	405
Total	9,795	3,094

Table III: Summary statistics by industry.

This table reports summary statistics by industry for the sample of international firms covered in MSCI ESG Database. The sample years are from 2004 through 2010. Corporate Social Responsibility (CSR) score is based on the average of four indexes: stakeholder capital, strategic governance, human capital, and environment.

Industry	n	average CSR	industry	n	average CSR
Advertising	19	4.049	Insurance	67	3.120
Aerospace & Defense	48	5.863	Integrated Telecommunication Services	40	3.398
Airlines	41	6.145	Leisure Equipment & Products	23	6.215
Automobiles	56	4.310	Marine Transport	18	3.911
Banks	328	4.708	Media	27	3.803
Beverages & Tobacco	63	4.645	Metals & Mining	65	3.741
Biotechnology	23	4.799	Movies & Entertainment	12	4.624
Broadcasting & Cable TV	36	3.324	Multi-Line Insurance & Brokerage	49	4.652
Building Products	64	5.537	Oil&Gas	98	5.446
Business Services	15	4.080	Paper & Forest Products	41	6.205
Chemicals	119	2.511	Pharmaceuticals	77	5.084
Commercial Services & Supplies	43	4.074	Property & Casualty Insurance	19	4.362
Communications Equipment	71	4.410	Public Services	19	3.843
Computers & Peripherals	38	5.293	Publishing	41	5.607
Construction & Engineering	78	4.595	Real Estate	102	4.656
Containers & Packaging	21	4.245	Retail	119	4.289
Electrical Equipment	124	3.562	Road & Rail Transport	59	4.871
Energy Equipment & Services	53	3.883	Semiconductor Equipment & Products	67	5.817
Food & Drug Retailing	77	5.498	Software	76	7.031
Health Care Equipment & Supplies	102	4.272	Steel	46	3.829
Homebuilding	36	3.481	Surface Transport	25	3.832
Hotels Restaurants & Leisure	79	5.439	Telecom	36	4.130
Household & Personal Products	60	5.985	Textiles & Apparel	42	6.717
Human Resource & Employment Services	10	4.992	Transportation Infrastructure	17	4.139
Industrial Machinery	102	3.948	Utilities	114	3.529

Table IV: The relation between corporate social responsibility and risk using the sample of U.S. companies.

The coefficients significant at the 10% level (based on a two-tailed test) or higher are in bold face. Standard errors are clustered by firms to adjust them for heteroskedasticity and time-series correlation.

Dependent variable	beta	beta	beta	ratio of profits	beta of non-CSR firms
Independent variables	**1**	**2**	**3**	**4**	**5**
Firm or industry CSR	**-0.213**	**-0.308**	**-0.587**	-	-0.117
	(0.00)	(0.00)	(0.00)		(0.13)
2008-2010 dummy	-	**0.010**	-	-	-
		(0.01)			
2008-2010 dummy × firm CSR	-	**0.113**	-	-	-
		(0.00)			
GDP growth	-	**0.086**	**0.118**	**-0.180**	-
		(0.00)	(0.00)	(0.03)	
GDP growth × firm CSR	-	**0.124**	**0.299**	-	-
		(0.00)	(0.00)		
Leverage	**0.102**	**0.129**	**0.111**	-	**0.104**
	(0.00)	(0.00)	(0.00)		(0.00)
Capex/TA	**-0.190**	**-0.198**	**-0.204**	-	**-0.213**
	(0.00)	(0.00)	(0.00)		(0.00)
Cash/TA	**0.016**	**0.018**	**0.024**	-	**0.015**
	(0.10)	(0.06)	(0.05)		(0.10)
Sales growth	**3.682**	**3.440**	**2.914**	-	**2.929**
	(0.00)	(0.00)	(0.00)		(0.00)
Size	**-0.014**	**-0.011**	**-0.014**	-	**-0.017**
	(0.00)	(0.00)	(0.00)		(0.00)
Earnings variability	-0.025	-0.035	-0.042	-	-0.040
	(0.14)	(0.26)	(0.13)		(0.12)
Age	**-0.028**	**-0.020**	**-0.021**	-	**-0.021**
	(0.00)	(0.00)	(0.00)		(0.00)
Diversification	0.001	0.001	**0.002**	-	**0.002**
	(0.14)	(0.18)	(0.10)		(0.10)
Dividends	0.014	0.010	0.035	-	0.023
	(0.21)	(0.25)	(0.17)		(0.19)
R&D	**0.144**	**0.146**	**0.142**	-	**0.140**
	(0.00)	(0.00)	(0.00)		(0.00)
Institutional ownership	-0.120	**-0.118**	**-0.134**	-	**-0.135**
	(0.16)	(0.10)	(0.07)		(0.08)
firm fixed effects	included	included	included	no	no
industry fixed effects	no	no	no	included	included
year fixed effects	included	no	no	no	Included
Regression R^2-adj.	0.284	0.323	0.297	0.456	0.381
Number of observations	3,094	3,094	3,094	244	244

Table V: The relation between corporate social responsibility and risk using the sample of international companies and U.S. companies.

The coefficients significant at the 10% level (based on a two-tailed test) or higher are in bold face. Standard errors are clustered by firms to adjust them for heteroskedasticity and time-series correlation.

Dependent variable	beta	beta	beta	ratio of profits	beta of non-CSR firms
Independent variables	**1**	**2**	**3**	**4**	**5**
Firm or industry CSR	**-0.178**	**-0.280**	**-0.498**	-	**-0.176**
	(0.00)	(0.00)	(0.00)		(0.05)
2008-2010 dummy	-	**0.011**	-	-	-
		(0.01)			
2008-2010 dummy × firm CSR	-	**0.095**	-	-	-
		(0.00)			
GDP growth	-	**0.084**	**0.202**	**-0.116**	-
		(0.00)	(0.00)	(0.03)	
GDP growth × firm CSR	-	**0.080**	**0.204**	-	-
		(0.00)	(0.00)		
Real GDP / capita	1.112	1.2204	1.245	-	0.855
	(0.23)	(0.20)	(0.19)		(0.20)
Fin. market development	**-0.815**	**-0.681**	**-0.722**	-	**-0.523**
	(0.00)	(0.00)	(0.00)		(0.00)
Rule of law	**-0.021**	**-0.022**	**-0.024**	-	**-0.017**
	(0.01)	(0.00)	(0.00)		(0.00)
Leverage	**0.116**	**0.129**	**0.134**	-	**0.111**
	(0.00)	(0.00)	(0.00)		(0.00)
Capex/TA	**-0.217**	**-0.246**	**-0.257**	-	**-0.218**
	(0.00)	(0.00)	(0.00)		(0.00)
Cash/TA	**0.019**	**0.017**	**0.018**	-	**0.021**
	(0.10)	(0.10)	(0.10)		(0.07)
Sales growth	**3.617**	**3.602**	**2.217**	-	**2.122**
	(0.00)	(0.00)	(0.00)		(0.00)
Size	**-0.012**	**-0.010**	**-0.014**	-	**-0.017**
	(0.00)	(0.00)	(0.00)		(0.00)
Earnings variability	-0.020	-0.034	-0.040	-	-0.041
	(0.16)	(0.28)	(0.14)		(0.11)
Age	**-0.020**	**-0.017**	**-0.028**	-	**-0.022**
	(0.00)	(0.00)	(0.00)		(0.00)
Diversification	**0.002**	**0.004**	**0.002**	-	**0.002**
	(0.10)	(0.05)	(0.10)		(0.10)
Dividends	0.019	0.012	0.007	-	**0.012**
	(0.21)	(0.22)	(0.23)		(0.10)
R&D	**0.143**	**0.147**	**0.146**	-	**0.149**
	(0.00)	(0.00)	(0.00)		(0.00)
Institutional ownership	-0.117	-0.120	**-0.147**	-	**-0.141**
	(0.17)	(0.14)	(0.05)		(0.10)
firm fixed effects	included	included	included	no	no
industry fixed effects	no	no	no	included	included
year fixed effects	included	no	no	no	Included
Regression R^2-adj.	0.241	0.281	0.255	0.361	0.314
Number of observations	9,795	9,795	9,795	682	682

Table VI: The relation between expected returns and corporate social responsibility using the sample of U.S. companies.

The coefficients significant at the 10% level (based on a two-tailed test) or higher are in bold face. Standard errors are clustered by firms to adjust them for heteroskedasticity and time-series correlation.

Dependent variable	**expected return**	**expected return**	**expected return**
Independent variables	**1**	**2**	**3**
Firm CSR	**-0.087**	**-0.093**	**-0.097**
	(0.01)	(0.01)	(0.01)
2008-2010 dummy	-	**-0.051**	-
		(0.01)	
2008-2010 dummy × firm CSR	-	**0.010**	-
		(0.05)	
GDP growth	-	**0.061**	**0.023**
		(0.00)	(0.00)
GDP growth × firm CSR	-	**0.006**	**0.008**
		(0.10)	(0.08)
Beta	**0.030**	**0.029**	**0.026**
	(0.00)	(0.00)	(0.00)
Book-to-market	**0.207**	**0.211**	**0.209**
	(0.00)	(0.00)	(0.00)
Leverage	**0.119**	**0.202**	**0.215**
	(0.00)	(0.00)	(0.00)
firm fixed effects	included	included	included
year fixed effects	included	no	no
Regression R^2-adj.	0.409	0.417	0.411
Number of observations	3,094	3,094	3,094

Table VII: The relation between expected returns and corporate social responsibility using the sample of international and U.S. companies.

The coefficients significant at the 10% level (based on a two-tailed test) or higher are in bold face. Standard errors are clustered by firms to adjust them for heteroskedasticity and time-series correlation.

Dependent variable	**expected return**	**expected return**	**expected return**
Independent variables	**1**	**2**	**3**
Firm CSR	**-0.090**	**-0.112**	**-0.114**
	(0.03)	(0.00)	(0.00)
2008-2010 dummy	-	**-0.060**	-
		(0.00)	
2008-2010 dummy × firm CSR	-	**0.014**	-
		(0.01)	
GDP growth	-	**0.053**	**0.031**
		(0.00)	(0.00)
GDP growth × firm CSR	-	0.007	**0.005**
		(0.15)	(0.10)
Beta	**0.025**	**0.027**	**0.024**
	(0.00)	(0.00)	(0.00)
Book-to-market	**0.300**	**0.314**	**0.308**
	(0.00)	(0.00)	(0.00)
Leverage	**0.128**	**0.214**	**0.222**
	(0.00)	(0.00)	(0.00)
firm fixed effects	included	included	included
year fixed effects	included	no	no
Regression R^2-adj.	0.388	0.392	0.390
Number of observations	9,795	9,795	9,795

Table VIII: Addressing endogeneity between corporate social responsibility and risk using the sample of U.S. firms.

To address endogeneity concerns, we follow methodology described in Almeida et al. (2010). We take the first difference of every variable and use the first lag of the level of every independent variable as instruments for contemporaneous differences in the independent variables. The coefficients significant at the 10% level (based on a two-tailed test) or higher are in bold face. R^2 is not reported because it has no statistical meaning in the context of Instrumental Variable estimation.

Dependent variable	**∆beta**	**∆beta**
Independent variables	**1**	**2**
∆Firm CSR	**-0.118**	**-0.390**
	(0.00)	(0.00)
∆GDP growth	-	**0.028**
		(0.05)
∆(GDP growth × firm CSR)	-	**0.135**
		(0.01)
∆Leverage	**0.007**	**0.006**
	(0.00)	(0.00)
∆Capex/TA	**-0.039**	**-0.036**
	(0.00)	(0.00)
∆Cash/TA	0.045	0.064
	(0.21)	(0.28)
∆Sales growth	**0.837**	**0.629**
	(0.00)	(0.00)
∆Size	**-0.017**	**-0.018**
	(0.00)	(0.00)
∆Earnings variability	**-0.027**	**-0.040**
	(0.10)	(0.10)
∆Age	**-0.015**	**-0.012**
	(0.00)	(0.00)
∆Diversification	0.001	0.001
	(0.28)	(0.25)
∆Dividends	0.049	0.061
	(0.20)	(0.11)
∆R&D	0.011	**0.037**
	(0.16)	(0.00)
∆Institutional ownership	**-0.093**	**-0.173**
	(0.10)	(0.00)
Year fixed effects	included	no
Number of observations	2,012	2,012

Table IX: Addressing endogeneity between corporate social responsibility and risk using the sample of U.S. and international firms.

To address endogeneity concerns, we follow methodology described in Almeida et al. (2010). We take the first difference of every variable and use the first lag of the level of every independent variable as instruments for contemporaneous differences in the independent variables. The coefficients significant at the 10% level (based on a two-tailed test) or higher are in bold face. R^2 is not reported because it has no statistical meaning in the context of Instrumental Variable estimation.

Dependent variable	**∆beta**	**∆beta**
Independent variables	**1**	**2**
∆Firm CSR	**-0.126**	**-0.250**
	(0.00)	(0.00)
∆GDP growth	-	**0.017**
		(0.05)
∆(GDP growth × firm CSR)	-	**0.120**
		(0.03)
∆GDP per capita	0.019	0.023
	(0.16)	(0.22)
∆Financial markets development	**-0.109**	**-0.151**
	(0.10)	(0.10)
∆Rule of law	0.052	0.040
	(0.19)	(0.30)
∆Leverage	**0.004**	**0.005**
	(0.00)	(0.00)
∆Capex/TA	**-0.045**	**-0.041**
	(0.00)	(0.00)
∆Cash/TA	0.052	0.050
	(0.40)	(0.49)
∆Sales growth	**0.314**	**0.428**
	(0.00)	(0.00)
∆Size	**-0.015**	**-0.016**
	(0.00)	(0.00)
∆Earnings variability	-0.039	-0.042
	(0.15)	(0.18)
∆Age	**-0.014**	**-0.017**
	(0.00)	(0.00)
∆Diversification	0.001	0.001
	(0.21)	(0.35)
∆Dividends	0.050	0.069
	(0.18)	(0.17)
∆R&D	0.032	**0.048**
	(0.14)	(0.10)
∆Institutional ownership	-0.080	-0.074
	(0.14)	(0.17)
year fixed effects	included	no
number of observations	6,645	6,645