Corporate Social Responsibility and Asset Pricing in Industry Equilibrium*

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Abstract

This paper presents an industry equilibrium model of corporate social responsibility (CSR) and its asset pricing effects. We model CSR activities as an investment in higher customer loyalty. The model has predictions for how CSR affects systematic risk and expected returns for the firms making the investment decision. In addition, we study the effects of industry CSR trends on firms that choose not to invest in CSR. The paper tests the model predictions empirically and finds evidence consistent with the following: 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. In the empirical tests, we address a potential endogeneity problem by instrumenting CSR using data on environmental and engineering disasters and on product recalls.

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1 Introduction

Corporate social responsibility (CSR) represents a growing strategic concern for corporations around the world, many of which are adopting CSR as a core management or board-level function. The Global Reporting Initiative founded in the late 1990's, embraced by the United Nations Environment Program, has provided corporations with a reporting framework on their economic, environmental, and social sustainability. The success of this initiative is visible in the widespread integration of its reporting framework within regular company annual reports.[1] Arguably, CSR's increased popularity inside boardrooms has outpaced the research needed to justify it. No longer necessarily viewed outside the profit maximizing framework, many questions still remain on how CSR policies affect the risks firms are facing and the stock market implications of those policies. In this paper, we aim to understand the asset pricing consequences of CSR adoption, but also of non-adoption in the presence of industry CSR trends.

We develop an industry equilibrium model where firms make production and CSR investment decisions and embed this model within a standard asset pricing framework. Following the work of Luo and Bhattacharya (2006, 2009) and an extensive marketing literature, we model an investment in CSR as a mechanism to acquire customer loyalty.[2] Greater customer loyalty takes the form of a less price elastic demand, which the firm uses to smooth out the effect of demand fluctuations. With this assumption, the model captures the folklore view in the marketing literature that a firm with a more loyal demand has profits that are relatively less sensitive to aggregate economic conditions than a firm with a less loyal demand. A risk averse investor will therefore, all else equal, value more highly the firm with the more loyal demand, pricing a lower systematic risk and expecting a lower return.

In the context of our model, the benefit from CSR adoption as a risk management tool is a partial equilibrium effect that contrasts with an industry-equilibrium, feedback effect. Greater customer loyalty also gives CSR adopters higher operating profits per unit

[1] In 2008, the Economist writes "The CSR industry, as we have seen, is in rude health. Company after company has been shaken into adopting a CSR policy: it is almost unthinkable today for a big global corporation to be without one."

[2] The marketing literature has pointed out that customer loyalty can arise from consumers actively seeking out CSR firms and products, and lack of loyalty may come from consumer fall out after news of ethical firm behavior below expectations (e.g., Creyer, 1997).

of revenue and leads more firms to adopt CSR policies. What follows depends on how we model the entry costs of CSR adoption. In our model, firms' entry costs vary, with some firms having lower costs of adopting CSR than others. We call this the "low hanging fruit" hypothesis. As a greater fraction of firms adopt CSR policies, however, it becomes costlier to do so for the marginal firm. These entry or adoption costs increase operating leverage, systematic risk, and expected returns.

We show that a critical parameter in determining the relative strength of these two effects, and thus the relative riskiness of CSR firms, is consumer preference for CSR goods in the form of expenditure share of CSR goods. A sufficiently low expenditure share caps the proportion of firms investing in CSR at a level that implies that the marginal CSR firm has a lower systematic risk and expected returns than non-CSR firms. Consequently, the model predicts that increased consumer spending on CSR goods is associated with higher systematic risk for the marginal CSR firm relative to non-CSR firms.

The industry equilibrium of the model also allows us to study the asset pricing effects of industry CSR trends on firms that choose not to adopt CSR. We show that when CSR firms benefit from increasingly loyal demand, the systematic risk of non-adopters decreases. This surprising model prediction arises because the firms that choose not to invest in CSR are able to extract higher operating margins given consumers' fixed expenditure shares, reducing their operating leverage, systematic risk, and expected returns.

The model makes several additional predictions. First, greater systematic risk is associated with greater co-movement of net profits with the productivity shocks, which implies that net profits of CSR firms increase less than net profits of non-CSR firms in aggregate productivity booms. Second, CSR goods sell at a premium relative to non-CSR goods. Third, 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, and CSR activities are associated with higher earnings.[3]

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

[3]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. Gillan et al. (2010) also find evidence that CSR activities are positively associated with higher earnings, while sales for CSR firms are unaffected. For evidence on prices of goods from CSR vs non-CSR companies, see e.g. Creyer (1997), Auger et al. (2003), Pelsmacker et al. (2005) and Ailawadi et al. (2011).

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 a higher CSR score. One standard deviation increase in CSR score reduces the level of systematic risk by 20% in a sample confined to U.S. firms and by 24% in an international sample, controlling for other factors.

Next, assuming that the expenditure share of CSR firms increases in economic upturns, we predict and then find evidence that CSR firms have become 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 that CSR firms become relatively riskier in the latter part of the sample, controlling for GDP growth. In addition, we also demonstrate that the ratio of CSR firm profits to non-CSR profits is countercyclical, which is predicted by the model if in fact CSR firms are less risky. These tests are conducted on a sample of U.S. firms as well as on the full sample of 34 countries, with similar results. 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, and find that our results are robust. Specifically for endogeneity, we estimate two additional model specifications. First, we follow Almeida et al. (2010) in applying the ad hoc method of Griliches and Hausman (1986) that deals with endogeneity caused by omitted variables, mutual causality and measurement error. Griliches and Hausman take first differences and use lagged level variables as instruments for the first differences. We find that the effect of firm CSR on systematic risk is robust to this treatment. Second, using a less ad hoc and more intuitive way, we create two instruments for CSR. The first instrument is based on the sample of environmental and engineering disasters. The second instrument is based on data on product recalls. We adjust these data for their relevance using hand collected data on newspaper articles before and after the incidents. We suspect these are good instruments because MSCI's construction of the CSR index relies on some of the same information while it is unlikely that firm beta is related to these exogenous incidents. We cannot reject that these instruments are exogenous and find that the instrumented CSR is negatively related with firm systematic risk as predicted, especially when using the product recalls instrument.

Finally, we test the prediction that industry CSR trends affect the level of systematic risk of non-CSR firms. This constitutes a more direct test of the model and also one that we believe is less prone to endogeneity biases. We find that the level of systematic risk of the firms in the bottom quartile of CSR score in each industry co-varies negatively with the level of CSR in the whole industry. The magnitude of this effect is large and similar to the magnitude of the effect of a firm's CSR on its risk. We find a statistically significant effect in the whole sample (p-value of 0.05), but a marginally insignificant effect in the U.S. sample (p-value of 0.13), perhaps because of the smaller sample size.

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 (see Friedman, 1970, for an opposite view). For example, CSR may help firms avoid the temptations of short-termism at the expense of long-term profits (Bénabou and Tirole, 2010). Our paper fits into a line of research whereby profit maximizing CSR is a product differentiation strategy to gain competitive advantage over one's rivals (see Navarro, 1988, Webb, 1996, Bagnoli and Watts, 2003, Fisman et al., 2006, and Siegel and Vitalino, 2007). Creyer (1997), Auger et al. (2003), Pelsmacker et al. (2005) and Ailawadi et al. (2011) document consumer willingness to pay and purchase intention for social product features and Navarro (1988) and Becchetti et al. (2005) report evidence that CSR is a mechanism that affects sales.[4]

The only other paper that models the impact of CSR choices on firm risk does not take a stand on CSR as a profit maximizing activity. Heinkel et al. (2001) assume that some investors choose not to invest in non-CSR stocks (Barnea et al., 2009, endogenize this choice). This market segmentation leads to higher expected returns for non-CSR stocks, which must be held by only a fraction of the investors (as in Errunza and Losq, 1985, and Merton, 1987). In contrast, our paper builds on heterogeneous customer behavior toward firms rather than investor heterogeneity and we derive novel predictions that exploit the presence of such heterogeneity as well as of feedback industry equilibrium effects.[5]

[4] There is an ethical debate about doing well by doing good (César das Neves, 2008).

[5] The focus on customer heterogeneity is in the same spirit of Starks (2009) who discusses investors' perceptions about the importance of corporate governance versus corporate social responsibility. She argues

There is a recent empirical literature that tries to document a link between CSR and cost of equity capital. Sharfman and Fernando (2008) show that environmental performance is associated with lower cost of capital and Ghoul et al. (2010) find that firms with better CSR have lower cost of capital. Our empirical analysis is complementary to theirs in that we investigate whether the effects on the cost of capital can be attributed to changes in a firm's systematic risk (see also Oikonomou et al. 2010 and references therein). Furthermore, our analysis goes beyond their analyses in several ways. First, we use a larger sample of firms and a more comprehensive list of control variables. Second, we document that firm profitability also co-moves in the expected way with output growth. Third, we show that there is an impact of industry CSR trends on non-CSR adopters' risk.

The evidence linking CSR with expected returns is mixed. Geczy et al. (2003) show that when controlling for market risk, the cost of restricting investments to socially responsible funds is small, but that this cost is significant when size, value and momentum factors are controlled for. Renneboog et al. (2008) show that socially responsible mutual funds underperform their benchmarks though by not more than conventional mutual funds, except for a small number of countries. Hong and Kacperczyk (2009) find that sin stocks have higher expected returns after controlling for risk and Brammer et al. (2006) find similar evidence for socially least desirable stocks with UK data. Becchetti and Ciciretti (2009) provide evidence that CSR stocks have lower mean returns but no difference in buy-and-hold risk adjusted returns relative to the control sample (see also Galema et al. 2008). In contrast to this evidence, 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 if the portfolios are constructed using firms with extreme values of the social responsibility index.

This paper is also related to the literature linking a 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-

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 focuses on the role of consumers and their actions, based on their perceptions of corporate responsible policies.

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. More closely related to us is the work on brand capital and asset pricing. Rego et al. (2009) find a negative relation between a firm's brand asset value and firm risk and Belo et al. (2011) find that firms with more brand capital underperform others with less brand capital.

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. For generality, we present an extension to infinite horizon in the Appendix.

Household sector The representative investor has preferences defined over lifetime consumption

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

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

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, for green and polluting. A convenient analytical way to model differences in the elasticity of substitution across goods is to use the Dixit-Stiglitz aggregator,

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

Accordingly, $0 < \sigma_j < 1$ is the elasticity of substitution within $c_j = c_G, c_P$ goods. A lower elasticity of substitution implies lower price elasticity of demand and a more "loyal" demand. We therefore are interested in the case $\sigma_G < \sigma_P$. This mathematical formulation of loyal demand captures two important dimensions of consumer behavior: consumers that actively seek out firms they see as CSR, and consumers that respond negatively to businesses that fall below expected ethical standards (e.g. Creyer, 1997). The variable μ measures the equilibrium fraction of CSR firms in the economy. The parameter α is the share of expenditure allocated to CSR goods 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,

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

and given 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, as is usual in models with a representative agent, that the representative investor is both the seller and the buyer of stocks.

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

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

In the budget constraint, π_i is the operating profit generated by firm i and $B_i \left(1 + r\right)$ is the debt repayment by firm i so that $\pi_i - B_i \left(1 + r\right)$ is the net profit, and in this two-period model it is also a liquidating dividend.[6] W_2 denotes the 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.

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

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. Firm i faces a fixed cost of f_{Gi} if it chooses to invest in the CSR technology or a cost f_P if it chooses the non-CSR technology. 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 assumption that $\min(f_{Gi}) < f_P$, which we label as the "low hanging fruit" assumption can be motivated in a variety of ways. First, entry costs can be lower for CSR firms in some industries. For example, organic farming may have lower fixed costs relative to conventional farming. Second, commitment to CSR may influence employee attitude towards the firm, which may lead to cost savings. Third, younger firms, using newer and cleaner technologies, may have lower costs in promoting additional green measures and targets relative to older firms that may be more likely to use older and more polluting technologies. Importantly, in our model, the average costs in CSR versus non-CSR technologies is not assumed, but rather is an equilibrium outcome.

The model does not assume that a higher fixed cost leads 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 CSR adoption 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:

$$\pi_i = \max_{x_i} \{p_i(x_i)\, x_i - wl_i\}, \tag{4}$$

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

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

Production of one unit of output costs $A^{\eta_i}\kappa_i$ units of labor input, where η_i measures the sensitivity of firm i's technology to the productivity shock A. CSR firms may be better at retaining employees and $\eta_G < \eta_P$, but a lower sensitivity to productivity shocks is not necessary for our results. CSR goods may also be viewed as more resource intensive, $\kappa_G > \kappa_P$, but the direction of cost is irrelevant for our main qualitative 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 which is solved for in the date-1 equilibrium.

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 good c_l is

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

There is a similar condition for each non-CSR good. Multiplying both sides of each first order condition by the respective c_j and integrating over the relevant range gives

$$\alpha C_2^{1-\gamma} = \lambda \int_0^{\mu} p_i c_i di, \tag{7}$$

and

$$(1 - \alpha) C_2^{1-\gamma} = \lambda \int_{\mu}^{1} p_j c_j dj. \tag{8}$$

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,

$$c_l = \alpha \frac{p_l^{\frac{1}{\sigma_G - 1}}}{\int_0^\mu p_i^{\frac{\sigma_G}{\sigma_G - 1}} di} W_2, \tag{9}$$

$$c_k = (1-\alpha) \frac{p_k^{\frac{1}{\sigma_P - 1}}}{\int_\mu^1 p_i^{\frac{\sigma_P}{\sigma_P - 1}} di} W_2, \tag{10}$$

for CSR and non-CSR goods, respectively. 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 (7) and (8) 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:

$$\sigma_G p_l = w A^{\eta_l} \kappa_l,$$

$$\sigma_P p_k = w A^{\eta_k} \kappa_k.$$

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,

$$\pi_j = (1 - \sigma_j)\, p_j x_j. \tag{11}$$

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,*

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

consumption,

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

wage rate,

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

operating profits,

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

and marginal utility of wealth,

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

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

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 η_l where the weights are the expenditure shares. Prices of goods increase or decrease depending on which types of goods are more sensitive to the productivity shock, as given by $\eta_G - \eta_P$. When $\eta_G - \eta_P < 0$, the production of non-CSR goods increases in expansions as unit labor costs decrease more 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 $\eta_G - \eta_P > 0$. 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:

$$m \equiv \delta \left(\frac{C_2}{C_1} \right)^{-\gamma} = \bar{m} \left[\bar{p}\bar{x} \right]^{-\gamma} A^{\gamma\bar{\eta}}, \tag{12}$$

where $\bar{m} = \delta \left(W_1 - B \right)^{\gamma}$. 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 has familiar pricing conditions for bonds,

$$1 = E \left[m \left(1 + r \right) \right], \tag{13}$$

and for stocks,

$$Q_i = E \left[m\pi_i \right] - f_i. \tag{14}$$

In equilibrium, if there is an interior solution to μ, then $Q_j \geq 0$, and the price of the marginal CSR adopter, 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:

$$E \left[m\pi_G \right] - f_G^* = E \left[m\pi_P \right] - f_P. \tag{15}$$

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.[7] 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 4.4, 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. For simplicity, in what follows, we use the notation $\alpha_j = \alpha$ if $j = G$, and $\alpha_j = 1 - \alpha$ if $j = P$. Likewise, $\mu_j = \mu$ if $j = G$, and $\mu_j = 1 - \mu$ if $j = P$.

4.1 Profitability and aggregate shocks

We start by describing the properties of net profits in response to aggregate shocks. Consider the elasticity of net profits to the aggregate shock for a generic firm j,

$$\frac{d \ln \left(\pi_j - f_j \left(1 + r\right)\right)}{d \ln A} = \frac{-\bar{\eta} \bar{p} \bar{x} \left(1 - \sigma_j\right) \frac{\alpha_j}{\mu_j} A^{-\bar{\eta}}}{\bar{p} \bar{x} \left(1 - \sigma_j\right) \frac{\alpha_j}{\mu_j} A^{-\bar{\eta}} - f_j \left(1 + r\right)}.$$

This is a measure of a firm's operating leverage. Note that the elasticity is negative because in downturns, when A is large, net profits decrease.

How sensitive a firm is to aggregate shocks depends on the degree of customer loyalty. The partial derivative of operating leverage (in absolute value) with respect to σ_j is positive, implying that a firm with a more customer loyal demand (lower σ_j) has profits that are less sensitive to aggregate shocks. The intuition for the result is that a more loyal demand generates greater profit margins for the firm, which dilute the effect of the fixed costs and lower the firm's operating leverage. This result captures the folklore view that a less price elastic demand gives the firm the ability to smooth out aggregate fluctuations better.

The next proposition contrasts this partial equilibrium result with the industry equilibrium result that describes the co-movement of profits of CSR versus non-CSR firms with the productivity shocks.

[7] 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.

Proposition 2 *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, $\mu < f_P$.

For a sufficiently small size of the CSR market, $\mu < f_P$, the profits of CSR firms decrease in recessions (high A) but by less than the profits of non-CSR firms, and R_π increases.

4.2 Expected stock returns

To see how the results on profits translate to expected returns and risk, define the gross return to firm j as its net profits, or liquidating dividend, divided by the stock price, $1 + r_j \equiv (\pi_j - f_j (1+r)) / Q_j$. Using the first order conditions (14), 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 excess return are determined by the covariance of the stock return with the intertemporal marginal rate of substitution. This covariance depends on how aggregate productivity affects both variables. In the Appendix, we prove that:

Proposition 3 *Firm j's equilibrium expected stock return in excess of the risk free rate is:*

$$E(r_j - r) = \frac{\bar{p}\bar{x}(1-\sigma_j)\frac{\alpha_j}{\mu_j}}{\bar{m}[\bar{p}\bar{x}]^{1-\gamma}(1-\sigma_j)\frac{\alpha_j}{\mu_j}E\left[A^{(\gamma-1)\bar{\eta}}\right] - f_j} \frac{-Cov(A^{-\bar{\eta}}, A^{\gamma\bar{\eta}})}{E(A^{\gamma\bar{\eta}})}. \tag{16}$$

The excess return is increasing in σ_j. 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 an expression for firm j's excess expected return. The partial derivative of expected returns with respect to σ_j describes the impact of changes in demand loyalty for an infinitesimally small firm. Holding all else equal, $E(r_j - r)$ is increasing with σ_j. Intuitively, increased loyalty was shown before to reduce the sensitivity of net profits to aggregate shocks. A risk averse consumer is willing to pay more for a stock that pays relatively more in states of high marginal utility. The higher price must be associated with a lower expected return. Thus, the model translates the folklore view regarding how net profits change over the business cycle for firms with more loyal demand to a statement about expected returns and risk.

The increase in stock price for firms that choose a more loyal demand produces a feedback equilibrium effect via an increase in μ. The proposition gives a stark result regarding the equilibrium riskiness of CSR versus non-CSR firms. 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 than 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 if, $f_P - \mu > 0$. To see this, consider the average expected return for a CSR firm,

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

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

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

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

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

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

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

Proposition 4 *Consider firm j's market* $\beta_j = Cov(r_j, r_M)/Var(r_M)$. *We have,*

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

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

The same effects previously discussed regarding expected returns also explain why market β decreases for an infinitesimally small firm when its demand becomes more loyal, but that 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 $\ln(E(m\pi_G)/Q_G^*) \approx \mu/Q_G^*$), it can be shown that the equilibrium average market β for CSR firms is lower than the average market β for non-CSR firms if, and only if, $\mu < f_P$.

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

4.3 The proportion of CSR adopters

The first result establishes that the sign, but not the magnitude, of $\mu - f_P$ is independent of any heterogeneity in κ_j and η_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

$$\Delta \equiv (1-\sigma_G)\frac{\alpha}{\mu} - (1-\sigma_P)\frac{1-\alpha}{1-\mu}. \tag{17}$$

Inserting this result into the equilibrium condition (15) 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 η_j. This is surprising because η_j describes the sensitivity of firm j's labor demand to the aggregate shock for given output level and yet heterogeneity in η_j does not affect the proportion of CSR firms in the industry relative to f_P or their relative riskness. 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 types of consumption goods. This result is helpful in isolating the effect of demand loyalty on systematic risk studied in this paper.[8]

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

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 adopters 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 at 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 are lower for CSR firms than for non-CSR firms if, and only if, $\alpha < \bar{\alpha}$.*

A sufficiently large spending share in CSR goods is associated with higher risk for CSR firms than for non-CSR firms. We now turn to comparative statics exercises conducted on a calibrated version of the model.

4.4 Comparative statics

We calibrate the model in the following manner. The time preference parameter and risk aversion are set to standard values of $\delta = 0.99$ 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 industry aggregation, though less dramatically than the mean. We set $\sigma_P = 2/3$ to match the median elasticity across different levels of aggregation, and choose 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 choose $p = 1/7$. 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 $A = 0.978$. We normalize labor supply to $L = 1$ and the elasticities of labor demand to productivity $\eta_G = \eta_P = 1$. 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 $\eta_G = \eta_P$, then $\kappa_G = 0.9\kappa_P$. The fixed cost $f_P = 0.24$ is chosen to match the CSR fraction of stock market value in our data. We take the market capitalization of the top one third firms with highest CSR ranking in our data relative to total CRSP market capitalization,

$$\frac{\int_0^\mu Q_{Gi} di}{\int_0^\mu Q_{Gi} di + (1 - \mu) Q_P} = 0.35.$$

Finally, $W_1 = 0.96$ to match an annual real return of 5% (Cooley and Prescott, 1995). With these parameters, $\bar{\alpha} = 0.17$, 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 0.55 and the average market beta of non-CSR firms is 1.10.

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 (12), we calculate the stochastic discount rate m. The pricing equations (13)-(14) then give 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 establishes a condition under which the average CSR firm has lower expected returns vis-a-vis the average non-CSR firms. Here, we describe the equilibrium effects of changing σ_G for all CSR firms, simulating an industry-wide trend towards greater consumer recognition of 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 non-CSR firms (equal to that of the marginal CSR firm due to entry) Q_P, the wage rate, w, in the two productivity states, and the expected excess returns to the marginal CSR and the non-CSR firms $E\left(r_j - r\right)$.

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 of CSR, 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.

Increased loyalty to CSR firms leads to lower risk for the marginal CSR firm, and for the other CSR firms.[9] 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 lead to lower operating leverage, 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.

Non-adopters are also affected by changing loyalty toward CSR firms because of industry equilibrium effects. 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 among non-CSR firms that increases valuations and lowers the expected returns necessary to cover the fixed costs for these firms.

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 valuations and firm CSR adoption. Demand for labor decreases because there are more

[9]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.

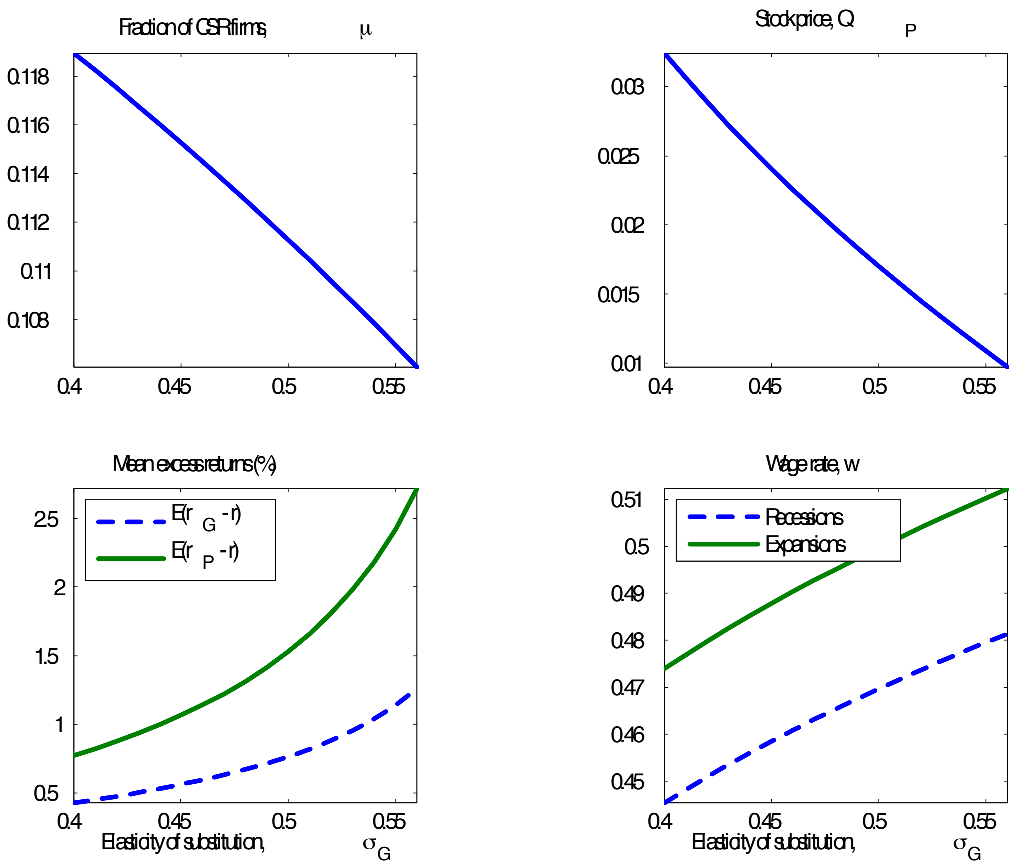

Figure 1: Equilibrium comparative statics on the elasticity of substitution σ_G.

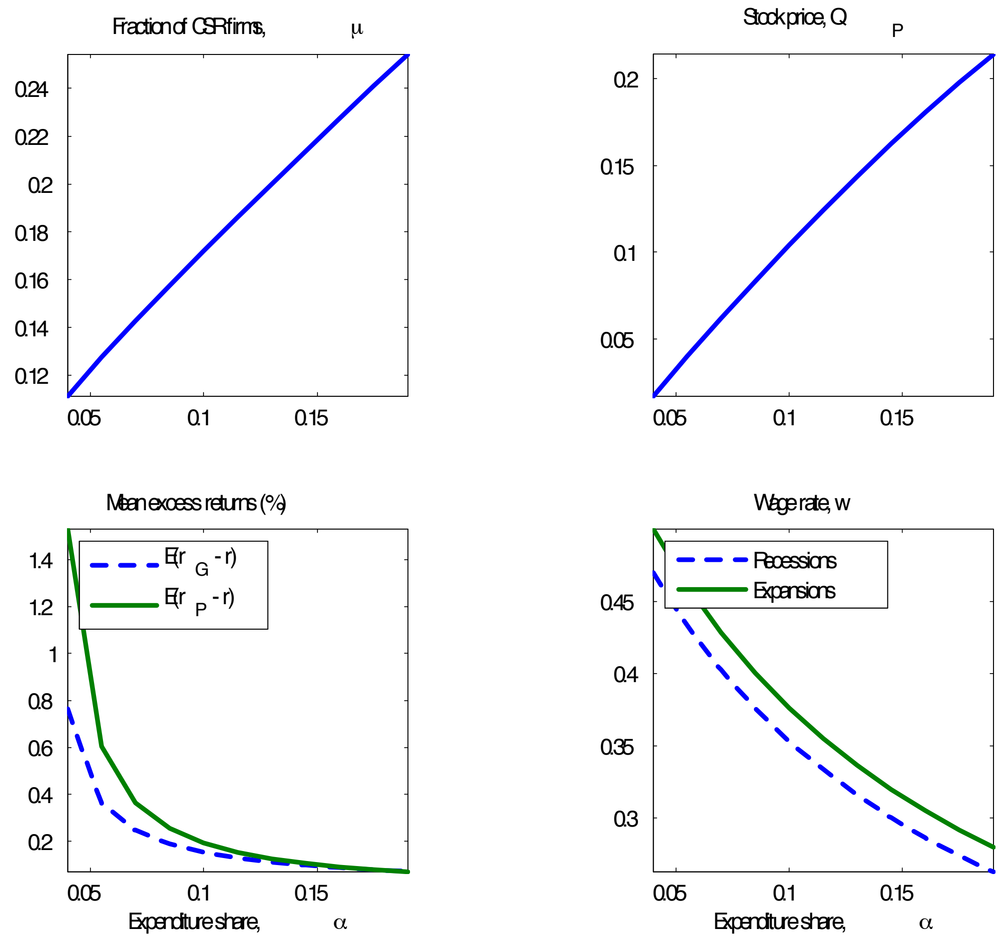

Figure 2: Equilibrium comparative statics on the expenditure share α.

CSR firms that 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, decreasing operating leverage and expected returns. Second, the marginal CSR firm changes and has now higher f_G, higher leverage and higher expected returns. Numerically, the first effect dominates, giving rise to a negative association between expenditure share and risk. For $\alpha > \bar{\alpha} = 0.17$, CSR firms become riskier than non-CSR firms (see Corollary 1).

4.5 Model Predictions

In this subsection, we collect the model predictions discussed above. We state the predictions in terms of CSR as opposed to customer loyalty for lack of firm-level proxies of customer loyalty and rely on the marketing literature for having established a direct link between customer loyalty and CSR (Creyer 1997, Auger et al., 2003, Pelsmacker et al., 2005, among others). The first prediction summarizes the impact of an infinitesimal firm changing its level of CSR while holding the equilibrium quantities constant.

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.

The direction of association between firm-level CSR and systematic risk in Prediction 1 presumes that the expenditure share in CSR goods is not too large. We 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, and CSR become more expensive, 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 expected that the expenditure share of CSR goods will go up in expansions. Therefore, we predict that:

Prediction 3 CSR firms are relatively riskier in expansions.

We test the three predictions above using both market betas and expected returns. A parallel prediction to Prediction 3, stated formally in Proposition 2, 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 we 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 country supplying most observations is 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 firms, and 1,263 firm-year observations), Australia (274 firms, and 734 firm-year observations), and Canada (160 firms, and 433 firm-year observations). The database has relatively fewer observations from large continental European economies: France has 93 firms with 351 firm-year observations, Germany 72 firms and 251 firm-year observations, and Italy 64 firms and 229 firm-year observations.

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:

$$r_{i,s} - r_s = h_i + \beta_i^1 \left(r_{M,s} - r_s \right) + \beta_i^2 \left(r_{M,s-1} - r_{s-1} \right) + h_i^1 SMB_s + h_i^2 HML_s + \varepsilon_{i,s}, \quad (18)$$

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.[10] 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, when using the international sample, we re-estimate the betas for the U.S. excluding the Fama-French factors. 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,

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

where $\hat{\beta}_{i,t}$ is the estimated β for stock i at year t. We use the predicted weekly return data from estimating equation (18) to calculate the annual expected excess stock returns for each firm i and year t. Expected return data are used to construct additional tests as described above.

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

$$\hat{\beta}_{i,t} = F_i + Y_t + \omega_X X_{i,t-1} + \omega_Z Z_{t-1} + \theta CSR_{it} + u_{i,t},$$

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 cross-sectional tests, clustered by firms or by industries (for firm- and industry-level regressions, respectively).

[10] SMB is the difference between the return on a portfolio of small firms and the return on a portfolio of large firms based on market equity. HML is the difference between the return to a portfolio of high book-to-market firms and a portfolio of low book-to-market firms. Book equity is the book value of stockholders' equity, plus balance sheet deferred taxes and investment tax credit (if available), minus the book value of preferred stock. Depending on availability, redemption, liquidation, or par value (in that order) were used to estimate the book value of preferred stock.

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 the 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, as Morck et al. (2000) have shown, emerging markets, with less developed financial markets and lower rule of law index, 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 want 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 (coefficient of 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 mean net income of the firms in the top quartile CSR score divided by the mean 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 as those of firms with low CSR score during business cycle expansions. Using median net income produces similar results (untabulated).

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. In the international sample, the median level of systematic risk of the bottom quartile CSR score firms for each industry is lower in industries with higher mean industry CSR score. This effect is economically large and carries a p-value of 0.05. 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 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 (e.g., Geczy et al. 2003, Hong and Kacperczyk 2009). 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. The discussion also implies that a finding of significance for CSR score is not necessarily an indication of mispricing.[11]

Using the U.S. sample, 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.

[11]Note too that in the model systematic risk is cast in terms of the covariance between stock returns and the stochastic discount factor whereas in the empirical implementation it is cast in terms of the covariance between firm and market returns.

[Insert Tables VI and VII here]

In addition to the results presented above, 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 our tests using the international sample, but excluding from it the U.S. firms. The results are robust to this data selection procedure. These additional results are available upon request.

6.3 Endogeneity in the CSR-Risk Relation

One concern with our analysis is that of endogeneity, particularly so for our test of Prediction 1. One cause of endogeneity, as stated by Waddock and Graves (1997), is the slack hypothesis. Hong et al. (2011) present evidence showing that financially constrained firms are less likely to spend resources on CSR and that when these firms' financial constraints are relaxed, spending on CSR also increases. Thus (exogenous) firm characteristics may 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 developing more aggressive CSR policies.

To alleviate this concern, we proceed in a variety of ways. First, we control for a long list of variables that capture some of these effects. For example, when we control for cash to assets, we control for the slack hypothesis. Second, we follow Almeida et al. (2010) in applying the method in Griliches and Hausman (1986) 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]

Third, we try to deal with endogeneity is a less ad hoc and more intuitive way. We create two instruments for CSR. Because of data availability, we focus on the U.S. sample. The first instrument is based on the sample of environmental and engineering disasters. We expect that the perception of CSR decreases subsequent to a natural disaster, such as, an oil spill, leading to a negative relation between this variable and CSR. The second instrument is based on data on product recalls. Firms that recall a product are expected to score lower on CSR. Both instruments are adjusted for how important they are based on newspaper articles. The adjustment guarantees that the disasters and product recalls are not expected, and that disasters and product recalls that are more important receive larger weights. We expect these to be good instruments because construction of the CSR index relies on some of the same information while it is unlikely that firm beta causes disasters or product recalls.

For the first instrument, *Industry disasters*, we obtain data on environmental and engineering disasters using information from the Center for Research on the Epidemiology of Disasters and newspaper articles from the Lexis-Nexis database. The type of disasters we consider include oil spills, train (and other transportation) crashes, bridge collapses, nuclear leaks, factory malfunctions, industrial accidents (fires and explosions). Except for the oil spills, we include only those disasters that resulted is at least 1 death (the sample average is 29 deaths and the maximum is 50 deaths). The sample includes 54 disasters from 2004 through 2010. We assign each disaster to an industry and use this industry variable as an instrument for firm CSR. To remove the effect of anticipated shocks, we weight each disaster by the increase in media coverage 20 days after the event compared to 20 days before the event. This procedure also assigns a larger weight to more important disasters. Media coverage is based on hand collected data on the number of newspaper articles from Lexis-Nexis.

The second instrument, *Product recalls*, is based on product recalls reported in the U.S. Consumer Product Safety Commission during the years from 2004 through 2010. The advantage of this instrument is that it is constructed at the firm-level, increasing the power of our tests. For the sample of 910 U.S. firms, we identify 816 product recalls for 178 companies. Again, to remove the effect of anticipated shocks and to assign a greater weight to more important recalls, we weight each recall by the increase in media coverage 20 days after the event compared to 20 days before the event. This instrument is firm specific and hence it is likely to be a better instrument relative to *Industry disasters* which is an industry instrument.

We run a series of specification tests to check whether the endogeneity concern is justified and whether our instruments are exogenous. First, we run the Hausman (1978) test of endogeneity. The null hypothesis in this test is that OLS and IV estimation produce similar coefficients. Under the null, it does not matter which method we use. The alternative hypothesis is that IV coefficients are different from OLS coefficients and IV is preferable to OLS. The test is conducted by regressing the endogenous CSR variable on the exogenous variables and then using the residuals from this regression in the first-stage regression. If the residual is significant, endogeneity is a concern. We find that with *Industry disasters*, the F-statistic is 4.07 (p-value of 0.01) and with *Product recalls*, the F-statistic is 2.07 (p-value of 0.04), suggesting the presence of some endogeneity especially with the first instrument. Second, we run a test of the relevance of the instruments. The first stage regression of CSR on *Industry disasters*, or of CSR on *Product recalls*, and other exogenous variables produce F-statistics of joint significance larger than 10, indicating that the instruments are non-weak and relevant. Third, Hansen's (1982) J-test of overidentifying restrictions allows us to test for the exogeneity of the instruments. To perform the test, we first collect IV regression residuals and then use them as dependent variables in regressions with the instruments and control variables. The independent variables turn out to be jointly insignificant rejecting the null that *Industry disasters* and *Product recalls* are endogenous.

[**Insert Table X here**]

We run two-stage IV estimation. In the first stage, we regress CSR ranking on lagged values of instruments and all the exogenous variables. In the second stage, we use the fitted values of CSR as an independent regressor to explain firm systematic risk. The results are reported in Table X. In specification 1 that uses *Industry disasters* as instrument, the regression coefficient on the instrumented CSR variable remains negative but it is only marginally significant (p-value of 0.11). In specification 2 that uses *Product recalls* as instrument, the coefficient on CSR is negative and significant at 1% level. Note, too, that when *Product recalls* are used, consistent with the Hausman test, the IV estimated coefficient does not change significantly compared to the OLS estimated coefficient.

Overall, while there is some evidence of endogeneity in the CSR-risk relation, our tests suggest that instrumented CSR is significantly related in a negative way with firm systematic risk.

7 Conclusion

This paper presents an asset pricing model embedded in an industry equilibrium 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 industry adoption of CSR impacts systematic risk for firms that choose not to adopt CSR. 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. However, our approach is in line with survey evidence that consumers, not investors, are more concerned about the CSR policies of firms, in contrast to the corporate governance choices of firms, where investor preferences appear to matter more.

Our results have important practical capital budgeting and policy implications. Beta is the major parameter used in estimating the 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 extension 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:

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

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

$$\frac{p_P}{p_G} = \frac{\sigma_G}{\sigma_P} \frac{A^{\eta_P} \kappa_P}{A^{\eta_G} \kappa_G}$$

and we arrive at

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

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:

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

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

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

gives

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

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,

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

where $\bar{\eta} = (1-\alpha)\,\eta_P + \alpha\eta_G$. Profits are

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

for CSR firms and for non-CSR firms,

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

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

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

■

Proof of Proposition 2. Write R_π using the equilibrium values of π_j and noting that $\mu = f_G^*$:

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

Before continuing, note that stock prices are

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

Letting

$$\Delta \equiv (1-\sigma_G)\,\frac{\alpha}{\mu} - (1-\sigma_P)\,\frac{1-\alpha}{1-\mu},$$

it is easy to show that, at an interior solution, the price of the marginal CSR firm is $Q_G^* = Q_P$, or,

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

Now take the derivative of R_π with respect to $A^{-\bar{\eta}}$:

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

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 $\frac{dR_\pi}{dA^{-\bar{\eta}}} \gtrless 0$ if, and only if, $\Delta \gtrless 0$. From (A.9), and noting that $\mu = f_G^*$ in equilibrium, then $\Delta \gtrless 0$ if and only if $f_P - \mu \lesseqgtr 0$. ■

Proof of Proposition 3. The investor's stochastic discount factor is,

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

Then, we have

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

Using equation (A.9), and substituting in the various terms, expected stock excess returns for firm j are

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

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

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

The the marginal CSR firm:

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

Therefore,

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

■

Proof of Proposition 4. 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 5. First, note that $\Delta > 0$ if, and only if,

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

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

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

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

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

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,

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

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

B Infinite Horizon Model

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

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

subject to the period budget constraints,

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

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 $E\left[\ln\left(A_{t+1}/A_t\right)\right] = g$, $Var\left[\ln\left(A_{t+1}/A_t\right)\right] = v$.

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

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

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,

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

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

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

Iterating forward and imposing a no bubbles solution obtains,

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

where

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

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

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

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

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

The assumption that $\delta \exp^{\gamma\bar{\eta}\theta} < 1$ 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:

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

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 $t+1$:

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

Calculating directly, firm j's expected return is,

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

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 $\bar{\eta}$, δ, γ, g 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 indices: 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 indices: stakeholder capital, strategic governance, human capital, and environment.

Year	International sample	U.S. 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 indices: 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**	-	**0.1109**
	(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	**ΔBeta**	**ΔBeta**
Independent variables	**1**	**2**
ΔFirm CSR	**-0.118**	**-0.390**
	(0.00)	(0.00)
ΔGDP growth	-	**0.028**
		(0.05)
Δ(GDP growth × firm CSR)	-	**0.135**
		(0.01)
ΔLeverage	**0.007**	**0.006**
	(0.00)	(0.00)
ΔCapex/TA	**-0.039**	**-0.036**
	(0.00)	(0.00)
ΔCash/TA	0.045	0.064
	(0.21)	(0.28)
ΔSales growth	**0.837**	**0.629**
	(0.00)	(0.00)
ΔSize	**-0.017**	**-0.018**
	(0.00)	(0.00)
ΔEarnings variability	**-0.027**	**-0.040**
	(0.10)	(0.10)
ΔAge	**-0.015**	**-0.012**
	(0.00)	(0.00)
ΔDiversification	0.001	0.001
	(0.28)	(0.25)
ΔDividends	0.049	0.061
	(0.20)	(0.11)
ΔR&D	0.011	**0.037**
	(0.16)	(0.00)
ΔInstitutional 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	**ΔBeta**	**ΔBeta**
Independent variables	**1**	**2**
ΔFirm CSR	**-0.126**	**-0.250**
	(0.00)	(0.00)
ΔGDP growth	-	**0.017**
		(0.05)
Δ(GDP growth × firm CSR)	-	**0.120**
		(0.03)
ΔGDP per capita	0.019	0.023
	(0.16)	(0.22)
ΔFinancial markets development	**-0.109**	**-0.151**
	(0.10)	(0.10)
ΔRule of law	0.052	0.040
	(0.19)	(0.30)
ΔLeverage	**0.004**	**0.005**
	(0.00)	(0.00)
ΔCapex/TA	**-0.045**	**-0.041**
	(0.00)	(0.00)
ΔCash/TA	0.052	0.050
	(0.40)	(0.49)
ΔSales growth	**0.314**	**0.428**
	(0.00)	(0.00)
ΔSize	**-0.015**	**-0.016**
	(0.00)	(0.00)
ΔEarnings variability	-0.039	-0.042
	(0.15)	(0.18)
ΔAge	**-0.014**	**-0.017**
	(0.00)	(0.00)
ΔDiversification	0.001	0.001
	(0.21)	(0.35)
ΔDividends	0.050	0.069
	(0.18)	(0.17)
ΔR&D	0.032	**0.048**
	(0.14)	(0.10)
ΔInstitutional ownership	-0.080	-0.074
	(0.14)	(0.17)
Year fixed effects	included	no
Number of observations	6,645	6,645

Table X: IV estimation to address endogeneity between corporate social responsibility and systematic risk using the sample of U.S. companies and data on environmental and engineering disasters and on product recalls.

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 for heteroskedasticity and time-series correlation. R^2 is not reported because it has no statistical meaning in the context of Instrumental Variable estimation.

Dependent variable	**Beta**	**Beta**
Instrument	**Industry disasters**	**Firm product recalls**
Independent variables	**1**	**2**
Instrumented firm CSR	-0.117	**-0.284**
	(0.11)	(0.01)
Leverage	**0.096**	**0.025**
	(0.00)	(0.00)
Capex/TA	**-0.118**	**-0.180**
	(0.00)	(0.00)
Cash/TA	**0.012**	0.030
	(0.10)	(0.14)
Sales growth	**4.888**	**4.824**
	(0.00)	(0.00)
Size	**-0.032**	**-0.091**
	(0.00)	(0.00)
Earnings variability	-0.030	-0.087
	(0.12)	(0.16)
Age	**-0.021**	**-0.062**
	(0.00)	(0.00)
Diversification	0.003	-0.006
	(0.26)	(0.26)
Dividends	0.021	0.055
	(0.45)	(0.37)
R&D	**0.202**	**0.139**
	(0.00)	(0.00)
Institutional ownership	-0.006	-0.047
	(0.30)	(0.20)
Firm fixed effects	included	included
Year fixed effects	included	Included
Number of observations	3,094	3,094