

There are 4 kinds of players in the game: government, shareholder, corporate leader and the Nature. The government determines the regulation whether to retard corporate responsibility or not. The shareholder receives the dividend and enforces the government regulation. The corporate leader decides the amount of inputs and whether to act corporate social responsibility or not. The Nature determines whether or not to act social responsibility will bring about future benefit. However, through the following analysis, we'll find that there are essentially three players: government, shareholder and the Nature.

Before we develop the model, we'd better to answer and understand the following questions:

- a. What is corporate social responsibility?
- b. What drive corporate leader to intend to act socially responsible?
- c. How does corporate leader act socially responsible?
- d. How does corporate leader act in their best interest?
- e. How does government regulation make it possible for shareholder to hold corporate leader responsible for not acting in their best interest?
- f. Why does such regulation retard corporate responsibility?
- g. What's the influence on shareholder if corporate leader acts socially responsible? Why does acting social responsibility generate a possibility of lowering returns for shareholders?

Answers¹:

a. "Corporate social responsibility is the voluntary commitment by company managers to integrate social and environmental considerations in their business operations. This commitment goes beyond normal compliance with the legal, regulatory, and contractual obligations, which companies are expected to meet." ²

b. Corporate leader tends to act socially responsible because of the corresponding external benefits and internal benefits. In the perspective of external benefits, improvement on corporate image and reputation, environmental preservation and concerns on sustainable development are major drivers for corporate leader to act socially responsible. In the perspective of internal benefits, increase on company longevity and qualified workers as well as competitive advantages are major concerns for the leader to act socially responsible.³ These aspects will enhance public perception and recognition of the firm, consumer and employee's loyalty to the firm, and even enable the firm to obtain governmental subsidy and

¹ The answers are mainly based on two papers. The one is Opportunities and Options for governments to promote corporate social responsibility in Europe and Central Asia, World Bank, working paper 2005. The other one is John L. Campbell, Why Would Corporations Behave in Socially Responsible Ways? An Institutional Theory of Corporate Social Responsibility, Academy of Management Review.

² Opportunities and Options for governments to promote corporate social responsibility in Europe and Central Asia, World Bank, working paper 2005

³ This analysis is based on the survey and Figure 15, Figure 16 in the paper Opportunities and Options for governments to promote corporate social responsibility in Europe and Central Asia.

more cooperation opportunities in the future. Therefore, although to act socially responsible may bring about loss in contemporary periods, it will possibly enhance financial performance of the firm in the long run.

c. "The majority of companies (in Europe and Central Asia) invest in various social programs, mainly related to improving the well-being of their employees and developing the communities in which the firms operate. In Bulgaria about 94 percent of respondents offered social programs, related mainly to health (61 percent), education (40 percent), technical training (40 percent), and community development (33 percent)."⁴

A paper indicates the possible aspects for the firm to realize its social responsibility: the wages, benefits, and levels of workplace safety for its employee, the product quality, truth in advertising, and pricing for its consumer, the willingness to uphold contracts and honor more informal commitments for its suppliers, the attitude to government regulations and laws and investment on charity and environmental protection.⁵

d. When corporate leader act in its best interest, it usually doesn't consider the social responsibility. Here in the problem, my understanding on acting in their best interest is that the manager puts all the attention on the profit of the firm, to be more exactly, the contemporary profit. Therefore, corporate will only invest on labor's salary, device and raw materials in order to maximize its contemporary profit, without concerns on employee education and welfare, corporate reputation and so on as to the future benefit of the firm.

e. "Governments could encourage companies to participate in public schemes that set social and environmental standards, monitor compliance, promote social and environmental reporting and auditing, certify good practices, and encourage multi-stakeholder dialogue."⁶ More specifically, it can drive corporate leader to act in public interest by mandating performance in the form of law and regulation, providing financial incentives, partnering with business and endorse corporate social responsibility practices with political and public recognition.

Here in the problem the government enforces a regulation in order to force companies to contribute for public welfare. For example, the government can require them to donate certain percentage of its profit into charity, or specify the percentage of statutory welfare reserve in corporate law. For the shareholder who employs the manager, although it cares about its dividend from the profit, its bottom line is that the firm should be legally operated. Therefore, once the government carries out such regulation, the shareholder will force the

⁴ Opportunities and Options for governments to promote corporate social responsibility in Europe and Central Asia, World Bank, working paper 2005

⁵ John L. Campbell, Why Would Corporations Behave in Socially Responsible Ways? An Institutional Theory of Corporate Social Responsibility, *Academy of Management Review*, 2007, Vol. 32, No. 3, 946-967.

⁶ Opportunities and Options for governments to promote corporate social responsibility in Europe and Central Asia, World Bank, working paper 2005

manager to obey it, otherwise, it will fire the manager which leads sufficiently large loss to the manager. Through this way, the government makes it possible for shareholder to hold corporate leader not act in its best interest.

f. Because such regulation limits or reduces the corporate profit, then it declines resources for corporate leader to act social responsibility. This hinders the incentive of the manager to voluntarily act social responsibility. Here in the problem, I assume that the manager will act socially responsible if the government imposes a retarding regulation.

g. If the manager decides to act socially responsible, then the contemporary profit will declines thus the dividend for the shareholder will declines correspondingly. This is because the manager set aside some part of the profit into investment on public welfare which limits the profit available for dividend. However, such investment will possibly bring about higher public recognition and perception for the firm and consumer's as well as employee's loyalty to the firm, thus will generate future benefits in the long run. This possibility varies depending on different cultural background and society status.

Now, let's come back to the problem and make it more concrete.

In order to make this problem simpler, I add some assumptions here:

- a. there's no corporate tax
- b. there's no agent-principle problem, i.e. we can use the profit as a representation of the manager's payoff
- c. this is short-term problem, i.e., the manager can only change the amount of variable inputs
- d. the product market and the inputs market are both complete competitive markets, i.e., the prices are exogenous to the firm
- e. this is a 2-period game
- f. the dividend ratio is unchanged during the game
- g. both of the government and the manager are risk neutral

The government regulation is to specify the percentage of statutory welfare reserve in the profit, i.e., it extracts certain percentage of corporate profit to enhance public welfare. The production function of the firm is in the form of Cobb-Douglas. However, since it is short-term problem, the manager only decides on the amount on variable inputs to maximize the profits. The manager has two choices when s/he decides the amount of inputs. One is to simply act in its best interest, i.e., maximize the contemporary profit. The other is to act its social responsibility in the first period and then act in its best interest in the second period. For example, it sets aside some percentage of the profit in the first period aiming to enhance employee welfare and provide professional education to its employee. The corporate leader is willing to do so due to the corresponding but uncertain benefits in the second. However, if the government decides to retard, then the corporate manager will not voluntarily act its social responsibility. Because the dividend ratio is unchanged, what the shareholder really cares is now perfectly in line with that of the manager. Thus the essential

effect of the shareholder here is to enforce the government regulation in order to make firm legally operated. In this sense, this game can be simplified into 3-player game.

Before setting up the game for this problem, let's first discuss and clarify some notations.

u_t : the payoff of the government in the t^{th} stage, $t = 1, 2$

π_t : the payoff of the manager in the t^{th} stage, $t = 1, 2$

t : the percentage of statutory welfare reserve if the government retards corporate responsibility

α : the percentage of the corporate profit invested in employee's welfare, and

$$\alpha \in (0, \min(\frac{\delta}{1-\delta}, 1))$$

r : discount rate

μ : the probability that the investment on employee's welfare successfully decreases production cost

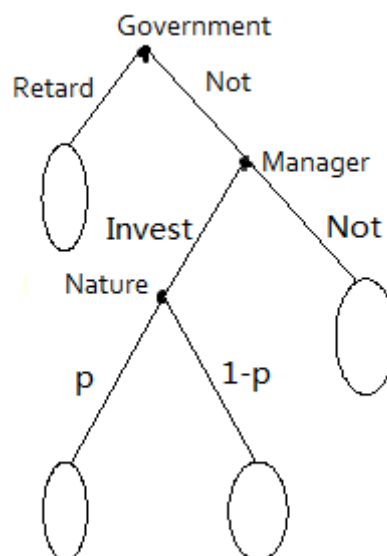
B : the positive externality in the 2^{nd} stage if the manager invests in employee's welfare in the 1^{st} stage

P : the price of the product

w : the price of inputs

$f(L) = L^\delta$: the production function, $\delta \in (0, 1)$

The game processes as follows: In the first period, the government first decides whether to retard corporate responsibility or not, and this information is public known; second, the shareholder enforces the government regulation and the manager decides the amount of inputs and whether to invest in employee's welfare or not, then both the government and the manager receive the payoffs in the first period. In the second, because it is known that the government can't change its regulation regularly, the government continues its regulation as in the first period; also the nature will determine whether or not the investment on employee's welfare in the first period successfully decreases production cost in this period. Next, the manager decides the amount of inputs. Notice that although both players obtain the payoff twice, if we use present value of its total payoff, then the game can be simply represented in the following extended form.



Players: government, manager, Nature

Actions: government $\in \{0, t\}$, manager $\in \{(L_1, \alpha, L_2), (L_1, 0, L_2) \mid L_1, L_2 \in IR^l\}$,

Nature $\in \{\mu \mid \mu \in [0,1]\}$

Information: complete information

Payoffs: government $u = u_1^* + \frac{1}{1+r} u_2^*$, manager $\pi = \pi_1^* + \frac{1}{1+r} \pi_2^*$

Let's calculate the payoffs of both the government and the manager:

a. If government decides to retard:

$$\pi_t = (1 - t)(P(L) - wL) = (1 - t)(PL^\delta - wL),$$

in order to maximize it, we apply Langrange equation here and by the First Order Condition and Second Order

$$\text{Condition we have: } L^* = \left(\frac{w}{\delta P}\right)^{\frac{1}{\delta-1}}, \pi_t^* = (1 - t)\left(P\left(\frac{w}{\delta P}\right)^{\frac{\delta}{\delta-1}} - w\left(\frac{w}{\delta P}\right)^{\frac{1}{\delta-1}}\right)$$

$$u_t = t\pi_t, \text{ thus } u_t^* = t\pi_t^* = t\left(P\left(\frac{w}{\delta P}\right)^{\frac{\delta}{\delta-1}} - w\left(\frac{w}{\delta P}\right)^{\frac{1}{\delta-1}}\right)$$

Therefore, the total payoffs of both the government and the manager are,

$$\pi^a = \pi_1^* + \frac{1}{1+r}\pi_2^* = (1 - t)\left(P\left(\frac{w}{\delta P}\right)^{\frac{\delta}{\delta-1}} - w\left(\frac{w}{\delta P}\right)^{\frac{1}{\delta-1}}\right)\left(1 + \frac{1}{1+r}\right)$$

$$u^a = u_1^* + \frac{1}{1+r}u_2^* = t\left(P\left(\frac{w}{\delta P}\right)^{\frac{\delta}{\delta-1}} - w\left(\frac{w}{\delta P}\right)^{\frac{1}{\delta-1}}\right)\left(1 + \frac{1}{1+r}\right)$$

b. If government decides not to retard and the manager decides not to act socially responsible:

By the First Order Condition and Second Order Condition of Langrange equation we have:

$$\pi_t^* = \left(P\left(\frac{w}{\delta P}\right)^{\frac{\delta}{\delta-1}} - w\left(\frac{w}{\delta P}\right)^{\frac{1}{\delta-1}}\right), u_t^* = 0$$

Therefore, the total payoffs of both the government and the manager are,

$$\pi^b = \pi_1^* + \frac{1}{1+r}\pi_2^* = \left(P\left(\frac{w}{\delta P}\right)^{\frac{\delta}{\delta-1}} - w\left(\frac{w}{\delta P}\right)^{\frac{1}{\delta-1}}\right)\left(1 + \frac{1}{1+r}\right)$$

$$u^b = u_1^* + \frac{1}{1+r}u_2^* = 0$$

c. If government decides not to retard, the manager decides to act socially responsible and the Nature decides that investment on employee's welfare doesn't successfully decrease production cost:

By the First Order Condition and Second Order Condition of Langrange equation we have:

$$\pi_1^* = (1 - \alpha) \left(P \left(\frac{W}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{W}{\delta P} \right)^{\frac{1}{\delta-1}} \right), \pi_2^* = \left(P \left(\frac{W}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{W}{\delta P} \right)^{\frac{1}{\delta-1}} \right)$$

$$u_1^* = \alpha \left(P \left(\frac{W}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{W}{\delta P} \right)^{\frac{1}{\delta-1}} \right), u_2^* = 0$$

Therefore, the total payoffs of both the government and the manager are,

$$\pi^c = \pi_1^* + \frac{1}{1+r} \pi_2^* = (1 - \alpha) \left(P \left(\frac{W}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{W}{\delta P} \right)^{\frac{1}{\delta-1}} \right) + \frac{1}{1+r} \left(P \left(\frac{W}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{W}{\delta P} \right)^{\frac{1}{\delta-1}} \right)$$

$$u^c = u_1^* + \frac{1}{1+r} u_2^* = \alpha \left(P \left(\frac{W}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{W}{\delta P} \right)^{\frac{1}{\delta-1}} \right)$$

d. If government decides not to retard, the manager decides to act socially responsible and the Nature decides that investment on employee's welfare successfully decreases production cost:

By the First Order Condition and Second Order Condition of Langrange equation we have:

$$\pi_1^* = (1 - \alpha) \left(P \left(\frac{W}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{W}{\delta P} \right)^{\frac{1}{\delta-1}} \right), \pi_2^* = \left(P \left(\frac{W'}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{W'}{\delta P} \right)^{\frac{1}{\delta-1}} \right) \text{ where}$$

$W' = w - a$ and $a = \beta \frac{\alpha \pi_1^*}{L_1^*} = \alpha \beta w \left(\frac{1}{\delta} - 1 \right)$, i.e., the investment successfully increases the production efficiency of inputs, $\beta > 0$.

$$u_1^* = \alpha \left(P \left(\frac{W}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{W}{\delta P} \right)^{\frac{1}{\delta-1}} \right), u_2^* = B$$

Therefore, the total payoffs of both the government and the manager are,

$$\begin{aligned} \pi^d &= \pi_1^* + \frac{1}{1+r} \pi_2^* \\ &= (1 - \alpha) \left(P \left(\frac{W}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{W}{\delta P} \right)^{\frac{1}{\delta-1}} \right) + \frac{1}{1+r} \left(P \left(\frac{W-a}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{W-a}{\delta P} \right)^{\frac{1}{\delta-1}} \right) \end{aligned}$$

$$u^d = u_1^* + \frac{1}{1+r} u_2^* = \alpha \left(P \left(\frac{W}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{W}{\delta P} \right)^{\frac{1}{\delta-1}} \right) + \frac{1}{1+r} B$$

Thus, the expected payoffs of both the government and the manager when the government decides not to retard, the manager decides to act socially responsible are,

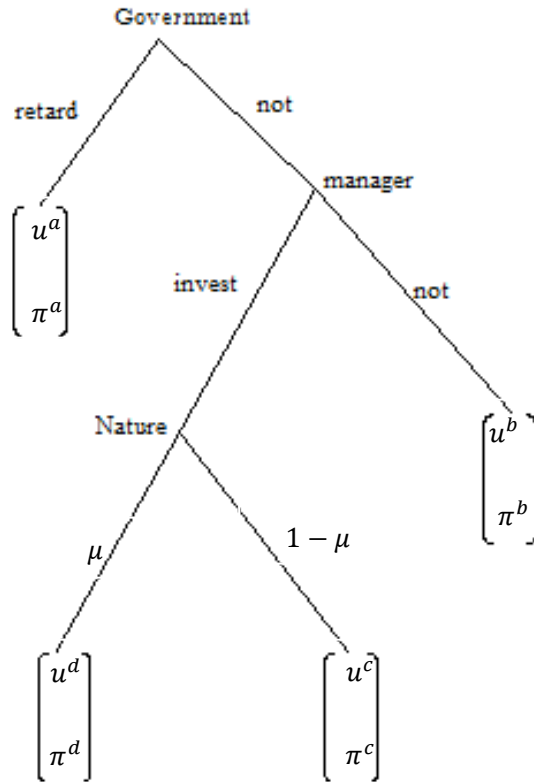
$$E(\pi) = \mu \pi^d + (1 - \mu) \pi^c$$

$$= (1 - \alpha) \left(P \left(\frac{W}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{W}{\delta P} \right)^{\frac{1}{\delta-1}} \right)$$

$$+ \frac{1}{1+r} \left(\mu \left(P \left(\frac{w-a}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{w-a}{\delta P} \right)^{\frac{1}{\delta-1}} \right) + (1-\mu) \left(P \left(\frac{w}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{w}{\delta P} \right)^{\frac{1}{\delta-1}} \right) \right)$$

$$E(u) = \alpha \left(P \left(\frac{w}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{w}{\delta P} \right)^{\frac{1}{\delta-1}} \right) + \frac{1}{1+r} \mu B$$

Then, we can fill in the extended form of this game:



Because $u^a > u^b$, then if the government expects that the manager doesn't act socially responsible, it will choose to retard. If the government expects that the manager acts socially responsible, its decision depends on $E(u)$ and u^a . The equilibria are:

Case 1: if $E(u) > u^a$ and $E(\pi) > \pi^a$, then the equilibrium is that the government doesn't retard and the manager acts socially responsible.

Case 2: if $E(u) \leq u^a$, then the equilibrium is that the government retards and the manager doesn't act socially responsible.

Let's discuss the case when the government doesn't retard and the manager acts socially responsible.

For the government: $E(u) > u^a$

$$\rightarrow \alpha \left(P \left(\frac{w}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{w}{\delta P} \right)^{\frac{1}{\delta-1}} \right) + \frac{1}{1+r} \mu B > t \left(P \left(\frac{w}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{w}{\delta P} \right)^{\frac{1}{\delta-1}} \right) \left(1 + \frac{1}{1+r} \right)$$

$$\rightarrow (\alpha - t) \left(P \left(\frac{w}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{w}{\delta P} \right)^{\frac{1}{\delta-1}} \right) > \frac{1}{1+r} \left(t \left(P \left(\frac{w}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{w}{\delta P} \right)^{\frac{1}{\delta-1}} \right) - \mu B \right)$$

$$\rightarrow (\alpha - t) > \frac{1}{1+r} \left(t - \mu \frac{B}{\left(P \left(\frac{w}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{w}{\delta P} \right)^{\frac{1}{\delta-1}} \right)} \right)$$

$$\rightarrow \alpha > t + \frac{1}{1+r} \left(t - \mu \frac{B}{\left(P \left(\frac{w}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{w}{\delta P} \right)^{\frac{1}{\delta-1}} \right)} \right) \quad (*)$$

Now we see α is negatively related with B , w and μ , and is positively related with t . Assume here that B is a linear function of investment, $B = \theta \alpha \left(P \left(\frac{w}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{w}{\delta P} \right)^{\frac{1}{\delta-1}} \right)$

Therefore, (*) becomes $\alpha > t + \frac{1}{1+r} (t - \mu \theta \alpha)$ (**)

For the manager: $E(\pi) > \pi^b$

$$\begin{aligned} \rightarrow (1 - \alpha) \left(P \left(\frac{w}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{w}{\delta P} \right)^{\frac{1}{\delta-1}} \right) \\ + \frac{1}{1+r} \left(\mu \left(P \left(\frac{w-a}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{w-a}{\delta P} \right)^{\frac{1}{\delta-1}} \right) + (1 - \mu) \left(P \left(\frac{w}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{w}{\delta P} \right)^{\frac{1}{\delta-1}} \right) \right) > \\ \left(P \left(\frac{w}{\delta P} \right)^{\frac{\delta}{\delta-1}} - w \left(\frac{w}{\delta P} \right)^{\frac{1}{\delta-1}} \right) \left(1 + \frac{1}{1+r} \right) \\ \rightarrow \frac{P(w-a)^{\frac{\delta}{\delta-1}} - w(w-a)^{\frac{1}{\delta-1}}}{Pw^{\frac{\delta}{\delta-1}} - w^{\frac{1}{\delta-1}}} > 1 + \frac{\alpha(1+r)}{\mu} \text{ where } a = \alpha \beta w \left(\frac{1}{\delta} - 1 \right) \quad (***) \end{aligned}$$

To sum up, the government will choose not to retard and the manager will decide to act socially responsible if and only if (**) and (***) are satisfied. Otherwise, the equilibrium will change.

Let's see the inequalities (**): $\alpha > t + \frac{1}{1+r} (t - \mu \theta \alpha)$

If r decreases, then α has to be higher. Because the opportunity of capital declines, the government prefers the corporate to invest more in public welfare. If μ increases, then the threshold of α will be lower. μ is determined exogenously, for example, the public awareness on corporate social responsibility and the public appreciation as well as

gratefulness for corporate investment on public welfare schemes. If the public awareness on corporate social responsibility is high, then μ is larger, the threshold of α will decline accordingly. If θ goes up, then the threshold of α will also decline. θ is similar to μ because it is also determined exogenously by the factors such as the public awareness and appreciation. However, there is some difference for θ because it also relates with different investment and cultural background. The manager can act socially responsible in variable ways such as investment on environmental protection program, public infrastructure program and public health program. For example, here we discuss that the corporate investment on employee's welfare program. Different programs have different positive externality and distinctive attitude by the public, which are also relevant to the status of society and cultural background. For example, the investment on railroad will be public supported and also generate higher positive externality in developing countries, thus θ for such program in such countries is high. However, in the developed countries which value on environmental protection, θ is comparatively lower.

Now, let's extend the game to more stages, suppose the game is n-stage game. If μ is relatively high, then the manager tends to implement its social responsibility consistently because it is highly possible that the production cost will sequentially decline by its scheme which leads to increasingly higher total payoff for the manager. By the same token, the total payoff for the government will also sequentially increase because the manager will highly possibly enhance the investment on its social responsibility. Therefore, the government is more willing to not to retard. However, if μ is relatively low, then it hurts the confidence of the manager to act socially responsible. Because the manager's action on its social responsibility doesn't turn out to be public accepted and benefits in the long run, then the manager reluctantly invests on its social responsibility. In another word, the manager tends to act in its best interest instead of social responsibility in a long run. Thus, the government in this case will prefer to enforce retarding regulation.