Staff Paper Series 13-01

The Difference between Observed Level and Theoretically Possible Level of CSR Investments: Analysis of CSR Slack using Stochastic Frontier Model

Eri Nakamura

Shinshu University, Department of Economics, 3-1-1 Asahi, Matsumoto, Nagano 390-8621, Japan

Tel: +81-263-37-2314

E-mail: enakamura@shinshu-u.ac.jp

The Difference between Observed Level and Theoretically Possible Level of CSR Investments: Analysis of CSR Slack using Stochastic Frontier Model

Eri Nakamura
Department of Economics, Shinshu University,
3-1-1 Asahi, Matsumoto, Nagano 390-8621, Japan.
Tel: +81-263-37-2314
Email: enakamura@shinshu-u.ac.jp

Abstract

The purpose of this study is to investigate the determinants of the slack of CSR investments using stochastic frontier model. The slack of CSR investments, which we call "CSR slack" in this paper, is the difference between the real level and the theoretically possible level of CSR investments. Our study has three contributions to the existing field. First, we propose the concept of CSR slack for measuring CSR performance. Second, we make clear the determinants of CSR slack in empirical model and show what to do for reducing CSR slack. Third, we use stochastic frontier method to calculate the theoretically possible level of CSR investments. We obtained the following three results. First, firm size is important for decreasing CSR slack, while financial performance is not related to CSR slack. Second, concentrated investment reduces CSR slack of environmental investment but increases CSR slacks of labor issues and social contribution. Third, available slack and potential slack are positively related to CSR slack, while recoverable slack is negatively related to CSR slack. We also examined the level of CSR slack of each industry and obtained the following three results. First, public utilities such as electricity, gas, shipping, and broadcasting industries have the least slacks in all kinds of CSR investment among all industries. Second, service industry has large slack of environmental investment, while it engages actively in labor issues. Third, slack of the investment for social contribution is the largest in manufacturing industry such as food, machinery, and construction industry.

Keywords: Corporate Social Responsibility; Stochastic Frontier Model; Corporate Governance; Investment Strategy; Japanese Firms

JEL Codes: M14; M21; D22

1. Introduction

Do the companies do their best for corporate socially responsible (CSR) activities? How far are their current levels of CSR investments from the theoretically possible level? And what determines the difference between these levels? We try to provide the answers to these questions in this paper. Since more stakeholders concern about CSR in recent years, companies are required to work on some CSR activities. However, managers have difficulties to make decision of how much efforts they should make for these activities. Engaging in CSR requires additional costs of companies, which results in higher price of goods and loss of customers. Even stakeholders have difficulties to decide which level of CSR investments to require of companies without harming corporate's current status. It is necessary for them to require the suitable level of CSR for the situation of each company and to conduct a company in the right direction.

The purpose of this study is to investigate the determinants of the slack of CSR investments using stochastic frontier model. The slack of CSR investments, which we call "CSR slack" in this paper, is the difference between the real level and the theoretically possible level of CSR investments. When this slack is large, the company has remaining resources to increase the level of CSR investments. The set of theoretically possible level of CSR investments, which is calculated by stochastic frontier model discussed later, is called "CSR frontier" in this paper. The issues stated in the first paragraph are now rephrased as "how much CSR slack do companies have," "how CSR frontier can be defined," and "what determines CSR slack."

Our study has three contributions to the existing field. First, we propose the concept of CSR slack. Although McWilliams and Siegel (2001) indicate that there can be an appropriate level of CSR investment, previous studies have only focused on the issue of how to promote CSR activities. How much efforts a company should make for CSR can change depending on the company's characteristics, such as the governance structure and the environment the company faces. Without considering the CSR frontier, which defines the different ideal levels for different companies, stakeholders might require too much CSR of a company that can harm corporate's status and managers might invest extra resources in CSR which should be used for the other business activities. Thus, the analysis of CSR slack, defined based on CSR frontier, is needed.

Second, we make clear the determinants of CSR slack in empirical model and show what to do for reducing CSR slack. Although determinants of CSR investments themselves are analyzed in some previous studies (e.g. Chih et al. 2010), determinants of CSR slack are rarely examined because the concept of CSR slack has not been recognized. As stated above, managers and stakeholders should act not in terms of promoting CSR activities but of reducing CSR slack. Making clear the determinants of CSR slack can provide the guidance for them.

Third, we use stochastic frontier method to calculate the theoretically possible level of CSR investments. Basically, stochastic frontier is used in the field of productivity analysis to

measure the corporate inefficiency. This method first calculates the most efficient level of each firm using production or cost function and then defines the distance between the observed level and the efficient level as inefficiency. In this study, we apply this method for the analysis of CSR slack by specifying the production function of CSR investments.

This paper is consisted of five parts after the introduction. Section 2 clarifies the theoretical background of CSR slack. Section 3 explains stochastic frontier method and builds the empirical model. Section 4 describes the data and the definition of variables. Section 5 shows the estimation results. Finally, section 6 summarizes the conclusions.

2. Theoretical Background

2.1 Previous Studies

Although the determinants of CSR slack are rarely examined because the concept of CSR frontier has not been recognized, the determinants of CSR engagement are considered in some studies. Overviewing the previous work, governance structure, company's characteristics, and environmental characteristics are the main determinants of CSR activities.

Governance Structure

Many studies such as Aguilera et al. (2006), Jamali et al. (2008), Barnea and Rubin (2010), and Dam and Scholtens (2012) consider the structure of corporate governance as the determinant of CSR. Empirically, governance structure is defined as concentration of shareholding or ownership of foreign, managerial, and other specific shareholders. For example, Roberts (1992) suggests that high level of managerial ownership discourages CSR disclosure while dispersion of ownership encourages CSR disclosure. Similarly, Reverte (2009) shows that companies with concentrated ownership result in lower CSR ratings. Since CSR is sometimes considered as a useful monitoring and bonding tool, companies with dispersed ownership structure, who face more conflicts than companies with concentrated structure, invest in CSR more eagerly. Johnson and Greening (1999) define governance structure as ownership by investment management funds and public pension funds, top management equity, and outside director representation, while Prado-Lorenzo et al. (2009) define as ownership by financial institutions and dominant shareholder, government power, and creditor's power. Jia and Zang (2012) investigate managerial ownership as determinant of corporate donation. Thus, governance structure is frequently examined and defined widely in previous studies.

Company's Characteristics

Most commonly-used factors of company's characteristics are financial performance and company size. O'Riordan and Fairbrass (2008) state that success level, measured as profitability, can influence the dialogue between a company and its stakeholders. According to them, company's

internal factors including success level affect stakeholders' expectation for CSR, and the expectation affects CSR practices. Similarly, Waddock and Graves (1997) argue that financial performance enhances CSR performance since highly performing companies have large slack resources to invest in CSR. In empirical studies, Roberts (1992) and Chih et al. (2010) show that higher financial performance significantly enhances CSR, while Prado-Lorenzo et al. (2009) and Reverte (2009) concludes that profitability does not have significant effect.

Company size, mostly measured by total assets or the number of employees, is also the main determinant of CSR. In fact, many previous studies such as Aragon-Correa (1998), Askildsen et al. (2006), Zhu et al. (2008), Reverte (2009), Jia and Zang (2012), and Chih et al. (2010) show that large-sized companies result in higher CSR implementation. This is because large-sized companies have more resources for CSR and tend to be more exposed to the social expectation for CSR. In contrast, some studies such as Roberts (1992), Siegel and Vitaliano (2007), and Prado-Lorenzo et al. (2009) show the mixed results, which suggest the importance of company size as a control variable.

Environmental Characteristics

The main factors of environmental characteristics are industry competition and other industrial characteristics. Based on O'Riordan and Fairbrass (2008), the context a company faces are important determinants of CSR practices. The context includes industry structure, competitor activity, and other environmental climate. In fact, Chih et al. (2010) show that market competition has an inverse U-shaped relation with CSR activity. On the other hand, Siegel and Vitaliano (2007) suggest that the type of the products and the market tendency of profits can influence CSR. Jia and Zang (2012) include industry type and market development as determinants of corporate giving.

It is worth noting that these studies above examine not CSR slack but CSR engagement itself. This means that most studies merely consider how much companies expend in CSR instead of how far their current CSR level from the theoretical CSR frontier.

2.2 The Concept of CSR Slack

As stated above, the concept of CSR slack has not been recognized so far, since the theoretically possible level of CSR has not been considered. Nevertheless, the concept of "an appropriate level of CSR investment" stated by McWilliams and Siegel (2001) has the point in common with ours in that they recognize the theoretical level of CSR. Using the supply and demand framework, they state that the appropriate level of CSR can be defined as the intersection of the demand and supply of CSR. The demand of CSR is determined by the level of consumers' awareness of CSR engagement and the supply of CSR is determined by the cost of the provision of CSR and industry characteristics. However, they do not mention the difference between the real level and the

theoretical level of CSR, which leads to the lack of the discussion of CSR slack.

In this paper, we propose the concept of CSR slack as the comparison of the observed level with the theoretically possible level of CSR investments. First, we define the maximum level a company can invest in CSR as CSR frontier. Because this level depends on company's characteristics and industry conditions, CSR frontier is determined considering these factors. Second, the distance of the observed level from CSR frontier is defined as CSR slack. When this slack becomes larger, it means that a company has more remaining resources for CSR activities. A company with negative CSR slack invests too much in CSR compared with the level that suits for the current status of the company. Thus, the concept of CSR slack can provide different perspective from previous studies' in that it enables us to discuss whether the current CSR engagement is appropriate and how much the company should expend in CSR.

3. Model

3.1 Stochastic Frontier Method

We use stochastic frontier model for the analysis. This method is frequently used in the area of productivity analysis to estimate firm inefficiency. Basically, stochastic frontier model first estimate the most efficient level of each firm by cost or production function and then compare it with the real cost or production level. The distance between the most efficient level and the real level is firm inefficiency. Stochastic frontier model can also analyze the determinants of firm inefficiency by specifying the model reflecting that the mean of inefficiency is influenced by various factors.

In this paper, we apply stochastic frontier model to the analysis of CSR investments as follows. First, we calculate the theoretically possible level of CSR investments of each company by specifying the production function of CSR investments. This production function can consider that the ideal level of CSR investments varies depending on company's condition and its environment. Second, we compare this theoretically possible level with the real CSR investments level and define the distance between them as CSR slack. Third, we construct the model reflecting that the mean of CSR slack changes depending on some factors. This enables us to decide what factors determine the level of CSR slack, in addition to what kinds of companies are doing their best for CSR and what kinds of companies are required of more CSR investments.

3.2 Determinants of CSR investments and CSR Slack

Stochastic frontier model with the conditional mean requires us to specify the determinants of CSR investments and CSR slack individually. In our model, governance structure, company's characteristics, and industry characteristics are used as explanatory factors of CSR investments. And company's characteristics, organizational slack, and industry characteristics are used as explanatory factors of CSR slack. Although company's characteristics and industry characteristics are used both

as determinants of CSR investments and CSR slack, the different variables are specified in empirical model, as shown in next section.

First, governance structure reflects the pressure of stakeholders. As Henriques and Sadorsky (1999) states, CSR is mostly implemented as a result of the pressure of stakeholders. Especially, owners take an important role by monitoring and use of "voice" and "exit." Moreover, owners tend to concern merely about observed CSR activities but overlook the appropriate level of the investments, since few of them know the appropriate level of the company due to a lack of information. This means that governance structure should be used as a determinant of CSR investment itself instead of CSR slack.

Second, company's characteristics such as financial performance and company size are included in the model. As stated in section 2.1, these characteristics are frequently considered as determinants of CSR investments. Moreover, company's characteristics are examined to decide what should be done to reduce CSR slack. When which factors determine CSR slack is made clear, a company can manage these characteristics while industry characteristics are difficult for a single company to change.

Third, as O'Riordan and Fairbrass (2008) state, CSR implementation is influenced by the industry characteristics the company faces. Industry characteristics not only affect the stakeholder's expectation for CSR but also determine the decision-making of managers for investments. In fact, many previous studies such as Barnea and Rubin (2010) and Chih et al. (2010) include these factors in the empirical model of CSR investments. Industry characteristics are used also as determinants of CSR slack to control the difference between industries.

Lastly, organizational slack is used as the determinant of CSR slack. Organizational slack is the extra resources of a company, which is the important determinant of CSR (Waddock and Graves 1997; Bansal 2005; Reverte 2009). According to Sharma (2000), slack resources influence the CSR management by increasing the latitude of managerial action and broadening the managers' discretion. Organizational slack is the different concept from CSR slack in that the former covers the extra resources of a company while the latter focuses on CSR activities. When a company has large organizational slack, it can use organizational slack to reduce CSR slack. Since this variable is also the factors which managers can change, it is examined as a determinant of CSR slack.

In summary, our model is shown as equations (1) and (2).

$$CSR = f(GOV, CHAR, IND) + \mu. \quad (1)$$

In equation (1), *CSR* is CSR investments, μ is CSR slack, *GOV* is governance structure, *CHAR* is company's characteristics and *IND* is industry characteristics. *CSR* is observed level of CSR investments and *f(GOV, CHAR, IND)* is the CSR frontier. Thus, μ is the difference between observed

level and theoretically possible level of CSR investments. Using the conditional mean approach, μ has the structure of $Nt(\boldsymbol{A'X}, \sigma^2_\mu)$, where $\boldsymbol{A'X}$ is defined as follows.

$$\boldsymbol{A'X} = g(CHAR, SLACK, IND). \quad (2)$$

Nt is truncated normal distribution, $\boldsymbol{A'X}$ is the mean of μ, σ^2_μ is the variance of μ, and *SLACK* is organizational slack. $\boldsymbol{X}$ is the vectors of determinants of the mean of CSR slack and $\boldsymbol{A}$ is the parameter vector. Equation (2) shows that the mean of CSR slack is determined by *CHAR*, *SLACK*, and *IND*.

3.3 Empirical Model

Based on equations (1) and (2), we obtain the following empirical model shown in equations (3) and (4).

$$\begin{aligned} log(CSR_i) = {} & \beta_0 + \beta_1 log(GOV_{CON}) + \beta_2 log(GOV_{FOR}) + \beta_3 log(GOV_{FIN}) + \beta_4 log(GOV_{MAN}) \\ & + \beta_5 log(GOV_{FUN}) + \beta_6 log(GOV_{IND}) + \beta_7 GOV_{KEI} + \beta_8 log(CHAR_{SALES}) \\ & + \beta_9 log(CHAR_{BOARD}) + \beta_{10} log(CHAR_{AGE}) + \beta_{11} IND_{MAN} + \mu_i + \varepsilon_{,i} \\ & \text{where } i = ENV, LABOR, SOCIAL. \end{aligned} \quad (3)$$

Equation (3) is the Cobb-Douglas production function of CSR investments. CSR_i include three types of CSR investments. CSR_{ENV} is the investment for the natural environment such as the facilities to reduce the toxic wastes. CSR_{LABOR} is the investment for labor issues such as the systems for work-life balance. CSR_{SOCIAL} is the investment for social issues such as the promotion of art, sports, education, and culture. μ_i is CSR slack and ε_i is the error term.

GOV include the concentration level of shareholding (GOV_{CON}), foreign ownership (GOV_{FOR}), ownership by financial institutions (GOV_{FIN}), ownership by top management (GOV_{MAN}), ownership by investment funds (GOV_{FUN}), ownership by individuals (GOV_{IND}), and pressure by keiretsu group (GOV_{KEI}). The last one, GOV_{KEI}, is the control variable for Japanese governance system. As Gerlach (1992) states, the block of companies called keiretsu group has a significant effect on ownership and directorship. Thus, a company belonging to keiretsu group might be under the different governance system compared to a company which does not belong to keiretsu group.

CHAR include company size defined as sales ($CHAR_{SALES}$), board size ($CHAR_{BOARD}$), and company age ($CHAR_{AGE}$). *IND* includes the manufacturing industry dummy (IND_{MAN}). We do not take the logarithm of GOV_{KEI} and IND_{MAN}, since these two are dummy variables.

Next, based on equation (2), we specify the model of CSR slack, which is expressed as μ with the structure of $Nt(\boldsymbol{A'X}, \sigma^2_\mu)$.

$$\boldsymbol{A'X} = \alpha_0 + \alpha_1 CHAR_{ROA} + \alpha_2 CHAR_{CSRSD} + \alpha_3 log(CHAR_{SIZE}) + \alpha_4 SLACK_{AVA} + \alpha_5 SLACK_{POT} + \alpha_6 SLACK_{REC} + \alpha_7 IND_{HHI}. \quad (4)$$

$CHAR_{ROA}$ is profitability, $CHAR_{CSRSD}$ is the level of concentration of CSR investments, and $CHAR_{SIZE}$ is company size defined as total assets. We take a logarithm of $CHAR_{SIZE}$ because this variable takes a large value compared to the other variables. $CHAR_{CSRSD}$ reflects the CSR strategy of whether a company concentrates on a specific CSR activity or diversifies into various activities. $SLACK_{AVA}$ is available slack, $SLACK_{POT}$ is potential slack, and $SLACK_{REC}$ is recoverable slack, and IND_{HHI} is monopoly level of the industry. We define organizational slack in three types based on Bourgeois and Singh (1983). Available slack is the resources which can be used immediately for business activities, e.c. current assets. Potential slack is the abilities to obtain resources from outside, e.c. borrowing capacity. Recoverable slack is the resources which can be obtained by reducing the costs, e.c. overhead costs and inefficiency. We estimate equations (3) and (4) simultaneously by maximum likelihood method.

4. Data and Variables

Sample for the analysis is 188 Japanese companies from all industries listed in Tokyo Stock Exchange in 2010. Data is derived from *NEEDS Financial Quest*, the Japanese database of financial statements provided by Nikkei Digital Media, and *CSR Data*, the Japanese database of CSR information provided by Toyo Keizai.

The definitions and summary statistics of variables are shown in Table 1.

< Table 1 here >

We define *CSR* as the expenditure for each CSR activity which can available from *CSR Data*. CSR_{ENV} and CSR_{SOCIAL} are the raw value, while CSR_{LABOR} is the estimated value. Since we cannot obtain the expenditure for labor issues from *CSR Data* directly, we defined the multiplication of the number of employees taking parental leave by annual salary as the proxy variable of CSR_{LABOR}. Because the company working on labor issues tends to provide the enhanced system of parental leave, this proxy variable is considered to have high correlation with the level of entire efforts for labor issues. Thus, we consider this proxy variable is appropriate as CSR_{LABOR}.

GOV_{CON}, GOV_{FOR}, GOV_{FIN}, GOV_{MAN}, GOV_{FUN}, and GOV_{IND} are defined respectively as stock held by top ten shareholders, foreign shareholders, financial institutions, top management, investment funds, and individuals to total stock. GOV_{KEI} is the dummy variable which takes a value of one when a company has a parent company, otherwise zero. As Ahmadjian and Lincoln (2001)

state, keiretsu group is mostly constructed around a large manufacturing company. Thus, a company under a parental company is influenced by the pressure of keiretsu group.

In equation (3), $CHAR_{SALES}$ and is defined as sales, $CHAR_{BOARD}$ is defined as the number of board members, and $CHAR_{AGE}$ is defined as the years from company establishment. In equation (4), $CHAR_{ROA}$ is defined as return on assets. $CHAR_{CSRSD}$ is the standard deviation of CSR investments in a company. When the investment is diversified into various CSR activities, the standard deviation of CSR investments, $CHAR_{CSRSD}$, is small. In contrast, when the investment is concentrated on a specific CSR activity, $CHAR_{CSRSD}$ is large.

The definition of organizational slack follows Bourgeois and Singh (1983). $SLACK_{AVA}$ is the current ratio, $SLACK_{POT}$ is the debt-to-equity ratio, and $SLACK_{REC}$ is the ratio of selling, general and administrative expenses (SG&A) to sales. This definition is frequently used in previous studies such as Bromiley (1991) and Cheng and Kesner (1997).

IND_{MAN} is a dummy variable which takes a value of one if a company belongs to manufacturing industry, otherwise zero. IND_{HHI} is the Herfindahl-Hirschman Index based on sales. We use one digit level of *Nikkei Industrial Classification* for IND_{MAN} and five digit level for IND_{HHI}. Although there might be industrial differences which cannot control by manufacturing industry dummy, the reason why we do not use more segmentalized industrial dummies is for the estimation. Since we estimate our stochastic frontier model by maximum likelihood method, the model with too many explanatory variables does not converge. Moreover, too many industrial dummies absorb the residual, which we define as CSR slack. Thus, in order for the convergence and feasible estimation of CSR slack, we include manufacturing industry dummy to control the industrial differences.

5. Results

5.1 Production Functions of Each CSR

The estimation results are summarized in Table 2.

< Table 2 here >

μ_E is the slack of investment for the natural environment, μ_L is the slack of investment for labor issues, and μ_S is the slack of investment for social contribution. Model 1 is the model with only *GOV* and *IND*, and Model 2 is the full model shown in equations (3) and (4). We cannot obtain the result of Model 2 of CSR_{SOCIAL} because the estimation does not converge. For robustness test, we estimated the models which exclude the explanatory variables of *CSR* one by one, and obtained the similar results shown in Table 2. Thus, we consider that the results in Table 2 are robust among explanatory variables.

The upper parts of the Table 2 show the results of production function of each CSR, that is,

the results of equation (3). Focusing on the variables which have at least 10% significance, the coefficients of corporate governance are mostly positive excluding the ownership of investment funds. This is consistent with previous studies such as Johnson and Greening (1999) which show that shareholders take an important role in CSR. The reason why the investment funds discourage CSR is stated in Aguilera et al. (2006). Since investment funds are pressured by their customers to maximize the investment return, fund managers attach a higher value to business activities which lead immediately to the profit than to CSR activities. However, as the coefficients of GOV_{FUN} are positive in the models with CSR_{LABOR} as a dependent variable, investment funds are concerned about labor issues. This might be because labor issues are not recognized as a part of CSR but as a part of human resource strategy.

Since the coefficient of $CHAR_{SALES}$ is positive and significant in Model 2, larger-sized companies engage in CSR more eagerly. This is consistent with previous studies such as Aragon-Correa (1998) and Zhu et al. (2008) which show that company size is positively related to CSR activity. Larger companies have more resources to handle environmental issues and they are more pressured to meet the social expectations for CSR (Zhu et al. 2008).

The result that the coefficient of IND_{MAN} is significant in the models of CSR_{ENV} shows that manufacturing companies invest more in environmental activity than the companies in service industries. This is reasonable because most of the environmental investment in Japan is the facility investment to reduce toxic wastes from factories. However, since the coefficients are not significant in the models of CSR_{LABOR} and CSR_{SOCIAL}, there is no significant difference of the investments in labor issues and social contribution between manufacturing and service industries. We deem the estimated function reasonable and decide to discuss the determinants of CSR slack based on these functions hereafter.

5.2 Determinants of CSR Slack

The lower parts of the Table 2 show the results of simultaneous estimation of equation (4). We find that the determinants of CSR slack are sometimes different from those of CSR investments. First, financial performance ($CHAR_{ROA}$) is not related to CSR slack in all models. While Roberts (1992) and Chih et al. (2010) show that financial performance significantly increases CSR engagement, this variable is not important for CSR slack. Rather, firm size ($CHAR_{SIZE}$) is important for decreasing CSR slack. There are two theoretical backgrounds why company size is related to CSR, according to Zhu et al. (2008). First, large companies have more resources to collect information about the CSR level required by the society. However, considering that our result that profitability is not a significant determinant of CSR slack, the amount of resources in a company is not a main source for the relation between company size and CSR slack. The second theoretical background is related to company's visibility. That is, large companies are big names and thus they

are pressured to engage in CSR by stakeholders. Some previous studies such as Henriques and Sadorsky (1999) show the important role of social exposure in CSR management. Summarizing the result of $CHAR_{ROA}$ and $CHAR_{SIZE}$, the assumption that a company invests in CSR only when it has plenty of resources is not true, but rather it invests in CSR to meet the social expectation for CSR.

The result also shows that concentrated investment in CSR reduces CSR slack of environmental investment but increases CSR slacks of labor issues and social contribution. This suggests that a large part of the resources for CSR are invested in environmental issues rather than labor issues or social contribution. For many companies in Japan, environmental protection efforts seem to have a high proportion of CSR.

Among the coefficients of organizational slacks, available slack and potential slack are positively related to CSR slack, while recoverable slack is negatively related to CSR slack. The reason why the results of three organizational slacks are not consistent is related to the characteristic of each organizational slack. Available slack is excess resource which can be used immediately for business activity. Potential slack is also excess resource which can be obtained from borrowing. In contrast, recoverable slack is excess cost, which is recognized by managers as the inefficiency to be reduced. When a company has a plenty of resources, managers face the soft-budget constraints (Majumdar 1998). Even if they make an inefficient decision, plentiful resources can cover the loss. Thus, excess resources can cause CSR slacks. In contrast, excess cost works as the pressure for reducing inefficiency, which leads to re-examination and rationalization of investment plan. Managers are required to collect information on CSR level required by the society and the company's condition, and thus managers can make efficient decisions of CSR.

Although some previous studies such as Chih et al. (2010) show the importance of environmental condition of a firm in CSR, our result suggests that market competition does not have a significant effect on CSR slack.

5.3 Level of CSR Slack

CSR slacks categorized by industry are shown in Table 3.

< Table 3 here >

Since the Model 2 of CSR_{SOCIAL} does not converge, we use CSR slacks calculated by the result of Model 1 for the discussion here. Table 3 shows that CSR slacks are largely different depending on industry. Focusing on the means of slacks, public utilities such as electricity, gas, shipping, and broadcasting industries have the least slacks in all kinds of CSR investment among all industries. Since public utilities are large and well-known companies, they are exposed to high-level public attention and thus under more pressured to become a good model of implementing CSR

activity. This is consistent with previous studies such as Al-Tuwaijri et al. (2004) and Bansal (2005), who state that companies under high public attention tend to engage in CSR. Moreover, as public utilities are sometimes affected by governmental policy through regulation and governmental ownership, these companies are more likely to reflect the political intention of promoting CSR. Thus, it is natural that CSR slacks of public utilities are least among all industries.

Service industry has large slack of environmental investment, while it engages actively in labor issues. This might be because environmental investment in Japan is mostly for the facilities to reduce toxic wastes in plants, which are not relatively important for service industry. Rather, working on labor issues is more important for labor-intensive industry to obtain excellent human resources. In contrast, service industry has available capacity for social contribution.

Slack of the investment for social contribution is the largest in manufacturing industry such as food and machinery and construction industry. This might come from the importance of investments for the natural environment and labor issues in these industries. For manufacturing and construction industries, which have relatively high opportunities to emit wastes, working on the natural environment can be effective way to enhance the valuation of stakeholders.

5.4 Discussion

In order to enhance CSR investments themselves, governance pressure seems to be important. Especially, large shareholders, foreign shareholders, financial institutions, individual shareholders, and keiretsu group take an important role of monitoring CSR activity. Investment funds are interested in labor issues, while they are not concerned on environmental issues and social contribution. Moreover, the support system for small and medium companies to implement CSR is needed, since the companies who work on CSR positively are large ones. In addition, the incentive system for manufacturing industry to work on labor issues and social contribution is also needed, since they are concerned on environmental investments but not concerned on the investments for labor issues and social contribution.

In order to reduce CSR slack, increasing social expectation rather than company's inner resources is important. While our study shows that industry competition is not an important determinant of CSR slack, the pressure of external pressure arising from company's visibility can reduce CSR slack. Moreover, since CSR investment tends to be biased toward environmental investment, a company should allocate actively the resources for the investments in labor issues and social contribution. Managing organizational slack is also necessary in that holding too much available and potential slack leads to high CSR slack. Although efforts for improving efficiency are required for many companies, it is worth noting that recoverable slack provides a feeling of tension to decision-makers of CSR management.

6. Conclusions

We investigate the determinants of the slack of CSR investments using stochastic frontier model and obtained the following three results. First, firm size is important for decreasing CSR slack, while financial performance is not related to CSR slack. Second, concentrated investment reduces CSR slack of environmental investment but increases CSR slacks of labor issues and social contribution. Third, available slack and potential slack are positively related to CSR slack, while recoverable slack is negatively related to CSR slack.

We also examined the level of CSR slack of each industry and obtained the following three results. First, public utilities such as electricity, gas, shipping, and broadcasting industries have the least slacks in all kinds of CSR investment among all industries. Second, service industry has large slack of environmental investment, while it engages actively in labor issues. Third, slack of the investment for social contribution is the largest in manufacturing industry such as food, machinery, and construction industry.

In summary, governance pressure seems to be important to enhance CSR investments themselves. Especially, large shareholders, foreign shareholders, financial institutions, individual shareholders, and keiretsu group take an important role of monitoring CSR activity. Moreover, increasing social expectation rather than company's inner resources is important to reduce CSR slack. While our study shows that industry competition is not an important determinant of CSR slack, the pressure of external pressure arising from company's visibility can reduce CSR slack.

Some issues are left for the future study. Especially, specifying more robust production functions of CSR investments should be discussed. While our model bases on corporate governance structure, there can be other factors which are important for CSR. When using stochastic frontier method in the area of productivity analysis, empirical model can be theoretically specified using traditional production or cost function. However, since this method has not been applied for the other areas, there are no conventional models for CSR investments in stochastic frontier method. The development in the theory of CSR investments and the application of the theory for the empirical study is necessary for the future.

References

Aguilera, R.V., C.A. Williams, J.M. Conley, and D.E. Rupp (2006) "Corporate Governance and Social Responsibility: a Comparative Analysis of the UK and the US," *Corporate Governance: An International Review*, 14(3): pp.147-158.

Ahmadjian, C.L. and J.R. Lincoln (2001) "Keiretsu, Governance, and Learning: Case Studies in Change from the Japanese Automotive Industry," *Organization Science*, 12(6): pp.683-701.

Al-Tuwaijri, S.A., T. E.Christensen, and K.E. Hughes II "The Relations among Environmental Disclosure, Environmental Performance, and Economic Performance: A Simultaneous Equations

Approach," *Accounting, Organizations and Society*, 29: pp.447-471.

Aragon-Correa, J. A. (1998) "Strategic Proactivity and Firm Approach to the Natural Environment," Academy of Management Journal, 41(5): pp.556-567.

Askildsen, J.E., U. Jirjahn, S.C. Smith (2006) "Works Councils and Environmental Investment: Theory and Evidence from German Panel Data," *Journal of Economic Behavior and Organization*, 60: pp.346-372.

Bansal, P. (2005) "Evolving Sustainably: A Longitudinal Study of Corporate Sustainable Development," *Strategic Management Journal*, 26: pp.197-218.

Barnea, A. and A. Rubin (2010) "Corporate Social Responsibility as a Conflict between Shareholders," *Journal of Business Ethics*, 97: pp.71-86.

Bourgeois, L.J. III and J.V. Singh (1983) "Organizational Slack and Political Behavior among Top Management Teams," *Academy of Management Proceedings*: pp.43-47.

Bromiley, P. (1991) "Testing a Causal Model of Corporate Risk Taking and Performance," *Academy of Management Journal*, 34(1): pp.37-59.

Cheng, J.L.C. and I.F. Kesner (1997) "Organizational Slack and Response to Environmental Shifts: The Impact of Resource Allocation Patterns," *Journal of Management*, 23(1): pp.1-18.

Chih, H.L., H.H. CHih, and T.Y. Chen (2010) "On the Determinants of Corporate Social Responsibility: International Evidence on the Financial Industry," *Journal of Business Ethics*, 93: pp.115-135.

Dam, L. and B. Scholtens (2012) "Does Ownership Type Matter for Corporate Social Responsibility?" *Corporate Governance: An International Review*, 20(3): pp.233-252.

Gerlach, M.L. (1992) "The Japanese Corporate Network: A Blockmodel Analysis," *Administrative Science Quarterly*, 37: pp. 105-139.

Henriques, I. and P. Sadorsky (1999) "The Relationship between Environmental Commitment and Managerial Perceptions of Stakeholder Importance," *Academy of Management Journal*, 42(1): pp.87-99.

Jamali, D., A.M. Safieddine, and M. Rabbath (2008) "Corporate Governance and Corporate Social Responsibility Synergies and Interrelationships," *Corporate Governance: An International Review*, 16(5): pp.443-459.

Jia, M. and Z. Zang (2012) "Managerial Ownership and Corporate Social Performance: Evidence from Privately Owned Chinese Firms' Response to the Sichuan Earthquake," *Corporate Social Responsibility and Environmental Management*, forthcoming.

Johnson, R.A. and D.W. Greening (1999) "The Effects of Corporate Governance and Institutional Ownership Types on Corporate Social Performance," *Academy of Management Journal*, 42(5): pp. 564-576.

Majumdar, S.K. (1998) "Slack in the State-Owned Enterprise: An Evaluation of the Impact of

Soft-Budget Constraints," *International Journal of Industrial Organization*, 16: pp.377-394.

McWilliams, A. and D. Siegel (2001) "Corporate Social Responsibility: A Theory of the Firm Perspective," *Academy of Management Review*, 26(1): pp.117-127.

O'Riordan, L. and J. Fairbrass (2008) "Corporate Social Responsibility (CSR): Models and Theories in Stakeholder Dialogue," *Journal of Business Ethics*, 83: pp.745-758.

Prado-Lorenzo, J.M., I. Gallego-Alvarez, and I.M. Garcia-Sanchez (2009) "Stakeholder Engagement and Corporate Social Responsibility Reporting: the Ownership Structure Effect," *Corporate Social Responsibility and Environmental Management*, 16: pp.94-107.

Reverte, C. (2009) "Determinants of Corporate Social Responsibility Disclosure Ratings by Spanish Listed Firms," *Journal of Business Ethics*, 88: pp.351-366.

Roberts, R.W. (1992) "Determinants of Corporate Social Responsibility Disclosure: An Application of Stakeholder Theory," *Accounting, Organizations and Society*, 17(6): pp.595-612.

Sharma, S. (2000) "Managerial Interpretations and Organizational Context as Predictors of Corporate Choice of Environmental Strategy," *Academy of Management Journal*, 43(4): pp.681-697.

Siegel, D.S. and D.F. Vitaliano (2007) "An Empirical Analysis of the Strategic Use of Corporate Social Responsibility," *Journal of Economics and Management Strategy*, 16(3): pp.773-792.

Waddock, S.A. and S.B. Graves (1997) "The Corporate Social Performance-Financial Performance Link," *Strategic Management Journal*, 18(4): pp.303-319.

Zhu, Q., J. Sarkis, K.H. Lai, and Y. Geng (2008) "The Role of Organizational Size in the Adaption of Green Supply Chain Management Practices in China," *Corporate Social Responsibility and Environmental Management*, 15: pp.322-337.

Table 1 Summary Statistics and Definition of Variables

Variable	Definition	Mean	Std. Dev.	Min	Max
CSR_{ENV}	Expenditure for environmental protection (million yen)	7473.963	21357.450	5.000	207400.000
CSR_{LABOR}	Expenditure for labor issues (million yen)	520.682	930.598	5.669	8312.812
CSR_{SOCIAL}	Expenditure for social contribution (million yen)	478.346	1262.042	0.000	12100.000
GOV_{CON}	Stock held by top ten shareholders/total stock	0.446	0.152	0.192	0.846
GOV_{FOR}	Stock held by foreign shareholders/total stock	0.191	0.111	0.001	0.459
GOV_{FIN}	Stock held by financial institutions/total stock	0.318	0.116	0.040	0.548
GOV_{MAN}	Stock held by top management/total stock	0.010	0.027	0.000	0.216
GOV_{FUN}	Stock held by investment funds/total stock	0.054	0.032	0.001	0.188
GOV_{IND}	Stock held by individuals/total stock	0.229	0.120	0.030	0.611
GOV_{KEI}	Dummy variable for keiretsu (if a company has a parent company, the variable equals 1, otherwise 0)	0.138	0.346	0.000	1.000
$CHAR_{SALES}$	sales (million yen)	532782.400	1104183.000	1633.000	8597872.000
$CHAR_{BOARD}$	The number of board members	24.3883	13.40098	0	86
$CHAR_{AGE}$	Years from company establishment	67.75532	22.66906	4	125
$CHAR_{ROA}$	Profitability (return/assets)	0.009	0.042	-0.188	0.134
$CHAR_{CSRSD}$	The level of concentration of CSR investments	0.415	0.120	0.052	0.573
$CHAR_{SIZE}$	Total assets (million yen)	733739.000	1245924.000	6455.000	10400000.000

$SLACK_{AVA}$	Available slack (current ratio)	1.824	1.173	0.068	8.511
$SLACK_{POT}$	Potential slack (debt-to-equity ratio)	1.428	1.439	0.066	11.332
$SLACK_{REC}$	Recoverable slack (SG&A/sales)	0.239	0.199	0.009	1.489
IND_{MAN}	Manufacturing industry dummy (if a company belongs to manufacturing industry, the variable equals 1, otherwise 0)	0.729	0.446	0.000	1.000
IND_{HHI}	Herfindahl-Hirschman Index based on sales	0.196	0.160	0.021	0.927

(Note) The number of the observations is 188 in all variables.

Table 2 Estimation Results

Dependent Variable	CSR_{ENV}						CSR_{LABOR}						CSR_{SOCIAL}					
	Model 1			Model 2			Model 1			Model 2			Model 1			Model 2		
	Coef.		(Std. Err.)	Coef.		(Std. Err.)	Coef.		(Std. Err.)	Coef.		(Std. Err.)	Coef.		(Std. Err.)	Coef.		(Std. Err.)
$log(GOV_{CON})$	0.809	**	(0.368)	0.727	*	0.374	1.105	***	(0.347)	1.023	***	0.363	1.313	***	(0.372)	not converge		
$log(GOV_{FOR})$	0.309	**	(0.126)	0.336	**	0.135	-0.003		(0.110)	0.035		0.131	0.044		(0.203)			
$log(GOV_{FIN})$	0.690	***	(0.220)	0.584	**	0.229	0.242		(0.216)	0.197		0.228	0.684	**	(0.313)			
$log(GOV_{MAN})$	-0.023		(0.051)	-0.031		0.050	0.026		(0.048)	0.027		0.048	-0.025		(0.069)			
$log(GOV_{FUN})$	-0.207	*	(0.124)	-0.146		0.132	0.196	*	(0.119)	0.255	**	0.130	-0.551	***	(0.199)			
$log(GOV_{IND})$	0.654	***	(0.199)	0.570	***	0.200	0.718	***	(0.125)	0.769	***	0.189	1.079	***	(0.265)			
GOV_{KEI}	0.659	**	(0.275)	0.610	**	0.276	0.381		(0.250)	0.423		0.268	0.100		(0.434)			
$log(CHAR_{SALES})$				0.255	***	0.014				0.166	**	0.081						
$log(CHAR_{BOARD})$				0.072		0.177				0.231		0.174						
$log(CHAR_{AGE})$				0.175		0.146				-0.092		0.146						
IND_{MAN}	0.634	***	(0.164)	0.637	***	0.166	0.222		(0.139)	0.230		0.162	0.197		(0.238)			
constant	13.844	***	(0.957)	8.842	***	1.310	12.220	***	(0.895)	9.010	***	1.793	10.868	***	(0.932)			
Dependent Variable	μ_E			μ_E			μ_L			μ_L			μ_S			μ_S		
$CHAR_{ROA}$	-1.762		(1.623)	-1.245		1.629	-1.455		(1.539)	-1.979		1.639	-2.354		(2.933)			
$CHAR_{CSRSD}$	-7.742	***	(0.567)	-8.167	***	0.568	2.090	***	(0.551)	1.934	***	0.616	2.836	***	(0.969)			
$log(CHAR_{SIZE})$	-1.002	***	(0.089)	-0.739	***	0.100	-0.986	***	(0.085)	-0.815	***	0.123	-1.731	***	(0.127)			
$SLACK_{AVA}$	0.326	***	(0.061)	0.319	***	0.067	0.172	***	(0.058)	0.151	**	0.067	0.212	**	(0.100)			
$SLACK_{POT}$	0.054		(0.055)	0.039		0.055	0.152	***	(0.051)	0.136	**	0.055	0.304	***	(0.087)			
$SLACK_{REC}$	-1.650	***	(0.358)	-2.243	***	0.390	-1.504	***	(0.355)	-2.082	***	0.497	-2.194	***	(0.637)			

IND_{HHI}	-0.289		(0.436)	-0.329		0.438	-0.040		(0.404)	0.006		0.427	-0.635		(0.720)	
constant	20.243	***	(1.311)	16.464	***	1.478	15.321	***	(1.250)	12.352	***	1.756	25.414	***	(1.675)	
N			188			181			188			181			181	-
Log likelihood			-236.384			-221.873			-225.072			-216.260			-297.727	-

(Notes)

(1) Numbers in parentheses are standard error.

(2) Significant at 1% (***), 5% (**) and 10% (*).

Table 3 Summary Statistics of CSR Slacks by Industry

	μ_E					μ_L					μ_S				
industry	N	Mean	S.D.	Min	Max	N	Mean	S.D.	Min	Max	N	Mean	S.D.	Min	Max
food, textile, chemistry	50	4.424	1.322	1.241	7.191	50	4.058	1.361	2.021	6.609	49	4.778	2.405	0.280	9.294
steel, marine, mining	3	4.393	1.866	2.663	6.371	3	3.887	0.745	3.113	4.599	3	3.741	1.904	1.542	4.847
machinery, electric equipment, car building	85	4.759	1.850	0.000	8.472	85	3.887	1.627	0.000	7.426	82	5.183	2.443	0.000	9.589
construction	14	3.487	1.797	1.151	7.417	14	3.692	1.365	1.436	5.833	13	5.465	2.186	2.653	10.046
service, finance, retailing	26	5.152	1.950	1.905	9.794	26	3.755	1.618	0.732	8.642	24	4.601	2.553	0.702	9.541
public utility	10	3.113	1.308	0.840	5.063	10	3.079	1.761	0.000	5.368	10	2.319	1.604	0.000	5.520
Total	188	4.536	1.766	0.000	9.794	188	3.857	1.535	0.000	8.642	181	4.835	2.452	0.000	10.046