“Will economic growth of a country be impeded by improved corporate environmental performances?”

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Will economic growth of a country be impeded by improved corporate environmental performances?

Abstract

Theoretically, when governments request corporations to improve their environmental performances, the corporations' output level decreases; therefore, governments are usually confronted with the dilemma of whether to pursue environmental protection or economic growth. However, if the externality from the production process is corrected, the deadweight loss of social welfare decreases, thus enhancing economic growth. In this study, a set of panel data for 36 countries between 2009 and 2012 is used to analyze the relationship between a corporation's environmental performance and economic growth. Our empirical results suggest that an increase in environmental performances operated by a corporation leads to a higher economic growth rate. These results provide evidence to rectify the comprehension that the operation of corporate environmental performances impedes economic growth. Most importantly, the results advise that governments can promote corporate environmental performance by implementing or enforcing specific policies rather than persuading through vacuous ethical motivations.

Keywords: corporate environmental performance, economic growth rate, fixed effect model, panel data, deadweight loss, externality.
JEL Classification: C33, G38, M14, Q44.

Introduction

Economic growth and environmental protection are closely related to sustainable development (Wu et al., 2013). As awareness of sustainable development and environmental protection is emphasized, the requirement for corporate environmental responsibility becomes stricter. Emphasis is placed not only on stricter regulations on environmental protection and higher environmental quality standards, but also on disclosing more information about the pollution operation, cost of indemnification, and implementation of a sustainable development policy (Ferguson et al., 2002; Al-Tuwaijri et al., 2004).

When a corporation is in the process of pursuing profit maximization (Friedman, 1970), the influence on the environment is difficult to exclude entirely (Gradus and Smulders, 1993; Smulders and Gradus, 1996; Chen et al., 2003). Theoretically, the costs of a corporation should account for the negative influence on the environment, but it is usually borne by the society as a whole. The negative influence on the environment is identified as the external cost or negative externality (Kitzmueller and Shimshack, 2012). If corporations ignore such external cost or negative externality, the welfare of society will suffer from a deadweight loss. While a corporation is required to fulfil increased environmental performance, it is similarly responsible for the internalization of an externality[1]. This means that corporations bear the external cost by themselves, which will in turn reduce the deadweight loss from the externality.

If corporations do not internalize the externality voluntarily, improvement of the environmental condition to correct the externality could rely upon policies implemented by the government, through either the production process by taxation on production or restrictions on output level (Smulders and Gradus, 1996; Ljungqvist and Uhlig, 2000; Chen et al., 2003). However, economic theory suggests that the correction in externality from the production process, whether voluntary or forced by the government, will decrease the output level of a corporation and will consistently damage the economic growth of the country. Such phenomenon indicates the existence of the dilemma of environment protection and economic growth.

Theoretically, governments could resolve the externality through taxation or limitations on production (Smulders and Gradus, 1996; Ljungqvist and Uhlig, 2000; Chen et al., 2003). If corporations voluntarily increase environmental performance, the deadweight loss in social welfare could be reduced. Additionally, while governments save costs by resolving the problem of externality, more resources will be saved to allocate to other segments of society. More people will thus benefit from the remediation behaviors of the corporation (Palmer et al., 1995; Gupta and Barman, 2009). Furthermore, while corporations improve their environmental performances, internal and external competitive advantage will emerge.

Internally, redesigning the production system enhances production efficiency and decreases produc-

[1] Carroll (1996) defines corporate social responsibility as four segments: economy, law, moral and benevolence. Economy, law and moral are responses to the social requirement; thus, they are similar to the internalization of externality. Benevolence is not entirely forced by social requirements; it is more like the welfare transfer in economic theory.

tion costs, which benefit the corporation's financial performance (Christmann, 2000; McWilliams and Siegel, 2001). Externally, increased environmental performances improve the stakeholders' attitudes towards corporations (Kanter and Brinkerhoff, 1981; Scott, 1995), enhance corporate reputation (Orlitzky et al., 2003), and accumulate moral capital (Godfrey, 2005; Peloza, 2006; Godfrey et al., 2009). When corporations voluntarily operate improved environmental performances, which could profit both themselves and macroeconomics, from the viewpoint of the allocative efficiency of resources, it is deemed a double-dividend strategy (Porter, 1991; Bento and Jacobsen, 2007; Glomma et al., 2008).

Most prior research of corporate environmental performance has focused on individual financial or operational performance for a specific corporation. Relatively fewer studies have explored the relationship between corporate environmental performance and economic growth, a typical representation of macroeconomics. In this study, we use a set of panel data to analyze the relationship between corporate environmental performance and economic growth. Our empirical results demonstrate the existence of a positive relationship between environmental performances of a corporation and the economic growth rate of a country. These results not only contribute to bridging the gap between corporate environmental performance and macroeconomics, but also, most importantly, provide evidence to rectify the comprehension that the operation of a corporate environmental performance impedes economic growth.

1. Theoretical background and hypothesis development

Under the production process, negative externality resulting from environmental impact is unavoidable and causes a deadweight loss in social welfare. In Figure 1, we assume that production causes external costs and that a corporation usually only bears the private cost; the output level under such a process is Q_F. The cost of producing such a specific level of output, however, should include the private cost and external cost, measured by the vertical distance between marginal social cost and marginal private cost, i.e. the distance shown as DF. The external cost could be ignored intentionally or unintentionally by a corporation. However, such cost is normally loaded by other individuals in the society. While the full cost is accounted for, the optimum output level should be Q_E. When a corporation ignores the external cost and produces Q_F, this will result the deadweight loss of social welfare, as area DEF shows in Figure 1.

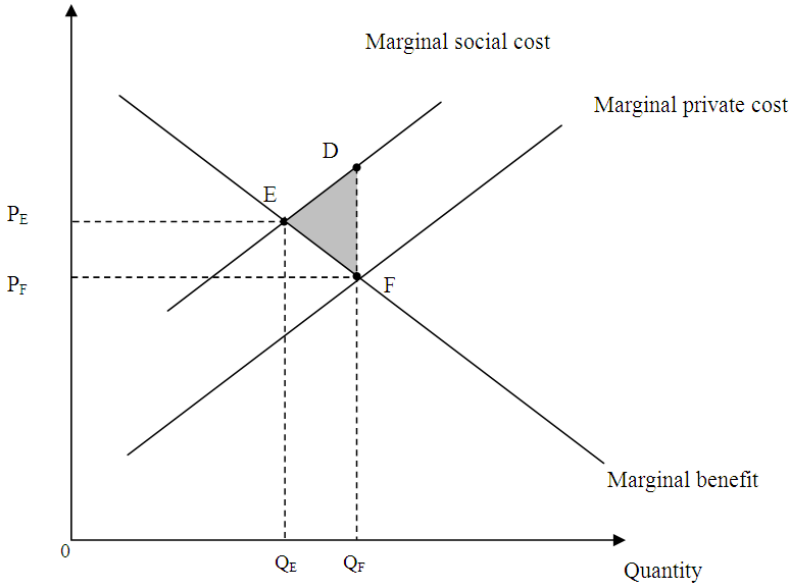

Fig. 1. The externality from corporate behavior

The deadweight loss in social welfare is the inefficiency resulting from the misallocation of resources. Many factors may cause deadweight loss including monopolies, tariffs, public good and externality such as environmental degradation discussed in this study. Reduction of the deadweight loss in social welfare is perceived to benefit economic growth (Osang and Pereira, 1996; Wälde and Wood, 2004; Fullerton and Kim, 2008).

In order to remedy the problem of negative environmental externality and reduce the deadweight loss in social welfare, the government could implement environmental policy such as tax (similar to Pigouvian tax), regulations and subsidies to force corporations to internalize the external cost (Smulders and Gradus, 1996; Parry and Bento, 2000). Alternatively, based on Coase theorem, the government could establish a market for stake-

holders to trade the pollution permits in the market. All these methods intend to drive the output level from Q_F to Q_E and reduce the deadweight loss in social welfare. Adopting a taxation policy to force the corporation to have increased environmental performance, however, may result in an inflation increase (Glueck and Schleicher, 1995; Koeppl et al., 1996) or higher CPI (Bosquet, 2000).

Regardless of whether the externality internalization is voluntary or forced by the government, better environmental quality is a concern for policymakers, which prompts them to call for improved environmental performance and correction of the environmental externality from the production process. However, the output level is then expected to decrease, and achieving high economic quality is another interest of the country's decision makers. Therefore, environmental improvement and economic growth present a dilemma for policymakers, even though in reality, environmental improvement and economic growth are not necessarily in conflict with each other. If the corporation voluntarily shoulders the external cost and operates increased and improved environmental performances, the deadweight loss could be reduced without derivative cost, and the government could make resource allocation more efficient (Gupta and Barman, 2009).

From the viewpoint of the corporation, operating increased and improved environmental performance tends to increase the operating cost, but it will create internal and external advantages. To reduce pollution emissions, the corporation can redesign its production process by changing its material utilization and energy consumption (Klassen and Whybark, 1999; King and Lenox, 2002). Although the corporation bears the cost, the new production process might increase production efficiency, lower the cost and further improve financial performance (Christmann, 2000; McWilliams and Siegel, 2001).

For society as a whole, stakeholders will be friendlier toward corporations with increased and improved environmental performances (Kanter and Brinkerhoff, 1981; Scott, 1995). Thus, the corporations could enhance their reputation (Orlitzky et al., 2003) and accumulate moral capital (Godfrey, 2005; Peloza, 2006; Godfrey et al., 2009). Furthermore, consumers would likely pay a higher price (Brown and Dacin, 1997; Creyer and Ross, 1997; Sen and Bhattacharya, 2001), have a different impression (McWilliams and Siegel, 2001) toward the corporations with increased and improved environmental performances, and prefer to continuously consume their products (Smith and Alcorn, 1991). This then ensures these corporations have better financial and operating performance (Horváthová, 2010; Chen and Delmas, 2011). According to the above arguments, voluntarily operating increased and improved environmental performances could bring corporations' better financial and operating performance, and the deadweight loss in social welfare will be reduced by eliminating externality from society's viewpoint.

Most of the existing researches focus on the effect of the corporation's environmental performance on its corporate performance. To the best of our knowledge, few studies have explored the effect of corporate environmental performance on macroeconomics. Although better corporate environmental performance is expected to reduce the deadweight loss in social welfare and bring growth in macroeconomics, there is no empirical evidence to support such arguments. To testify the hypothesis proposed in this study, we collected data for major corporations from several countries to test the relationship between corporate environmental performance and macroeconomics, and we expect the relationship to be positive.

Hypothesis: Corporate environmental performance is positively related to macroeconomic conditions, measured in growth rate of real GDP per capita.

2. Specification of empirical models and estimation methods

2.1. Sources of data. We collected environmental performance data from the ASSET4 database. The ASSET4 database includes ratings of corporate social responsibility for enterprises in 114 countries. The appraisal items include community, employees, environment and governance. However, if insufficient corporations are being appraised in a country, including that country in the sample might not provide adequate representation because of the loss of competition for the appraised corporations. Accordingly, countries with less than 30 rated corporations are excluded to avoid the possible problem of insufficient sample representativeness. Under such criterion, 36 countries were retained for the following analyses[1]. Corporate financial data were collected from the Datastream database. All other macroeconomic indicators were collected from the International Financial Statistics (IFS) of the International Monetary Fund (IMF), Financial Structure and Economic Development Database (FSEDD), World Development Index (WDI) and World Bank Atlas. Since data in ASSET4 are available from 2009, our sample period includes data ranging from 2009 to 2012.

Following the discussion of the theory and literatures stated above, it is known that a corporation

[1] These countries include the US, Canada, Mexico, Brazil, Bermuda and Chile in America; the UK, Russia, Spain, the Netherlands, Sweden, Switzerland, France, German, Italy, Norway, Poland, Greece, Finland, Denmark, Austria and Belgium in Europe; Israel and Turkey in the Middle East; China, Japan, Hong Kong, South Korea, Taiwan, India, Malaysia, Singapore, Indonesia and Thailand in Asia; South Africa and Australia.

might operate increased environmental performance to internalize the externality. This will bring about the reduction of deadweight loss and eliminate negative externality from production activities of a corporation. In the empirical test, we adopt a two-stage estimation to control the bias from the endogenous problem. Firstly, the estimation is conducted to examine the factors that affect the theoretical rating of the environmental performance value of each corporation. The theoretical rating of environmental performance value of each corporation for each country is computed to represent of the degree of internalisation of the externality accordingly. Secondly, we then estimate the relationship between theoretical rating of the environmental performance value of each corporation and the macroeconomic indicators, measured in growth rate of real GDP per capita.

2.2. Estimation of value of corporate environmental performance. In the first stage of the estimation, the relationship between the theoretical rating of corporate environmental performance value and corporate financial variables is conducted. According to affordability theory (Schuler and Cording, 2006) and slack resources theory (Waddock and Graves, 1997), the affordable cost of environmental responsibility is relative to corporate financial performance and surplus resources. Therefore, corporate environmental performance, or the extent of the external cost internalization, is a function of corporate financial indicators. Following Waddock and Graves (1997), Schuler and Cording (2006), Godfrey et al. (2009) and Guenster et al. (2011), we use the Pearson correlation coefficient to exclude financial variables whose correlation coefficients are greater than 50%. Finally, we select sales, market-to-book value and debt-to-asset ratio to estimate the theoretical rating of corporate environmental performance value.

Since the record values in ASSET4 are all positive, which is a type of data censored at zero, tobit regression is employed to estimate the theoretical rating of the corporate environmental performance value in the first stage estimation, formulated as equation (1).

$$CEP_{ij}^{t} = \alpha_0 + \alpha_1 SALE_{ij}^{t} + \alpha_2 MB_{ij}^{t} + \alpha_3 DAR_{ij}^{t} + \varepsilon_{ij}, \quad (1)$$

In equation (1), *i* means the corporation, *j* means the country, and *t* indicates the sample year. The theoretical rating of environmental performance value is CEP_{ij}^{t}. The total sale on a log scale is $SALE_{ij}^{t}$. The market-to-book ratio is MB_{ij}^{t}. The debt-to-assets ratio is DAR_{ij}^{t} and ε_{ij} is the residual.

The endogenous problem implies some factors might have been omitted that simultaneously influence corporate environmental performance and economic indicators. Once the effect of omitted factors is included in ε_i and estimated corporate environmental performance does not include the residual, endogenous problems will then be excluded.

2.3. The effect of corporate environmental performance on economic growth. The second stage of the estimation is to portray the relationship between the theoretical rating of corporate environmental performance value and economic growth. The average estimated theoretical rating of environmental performance value from the first stage for each country is computed. In addition to corporate environmental performance, many other factors continue to influence economic growth. We follow the literature about economic growth[1] and use the Pearson correlation coefficient analysis to exclude some factors with correlation coefficients greater than 50%. The final variables retained as investment (*INV*), inflation rate (*INR*), government consumption (*GC*), banking development index (*BD*), and stock market development index (*SD*) as the controlled variables[2]. The definitions of all related variables and the corresponding data resources are presented in Table 1 in Appendix.

As with the functional form, a linear model and first-difference model are used to estimate the effect of theoretical rating corporate environmental performance value on economic growth as equation (2) and equation (3) listed below.

$$EG_j^t = \beta_0 + \beta_1 CEP_j^t + \beta_2 ASALE_j^t + \beta_3 INV_j^t + \beta_4 INR_j^t + \beta_5 GC_j^t + \beta_6 BD_j^t + \beta_7 SD_j^t + e_j, \quad (2)$$

$$\Delta EG_j^t = \gamma_0 + \gamma_1 \Delta\overline{CEP_j^t} + \lambda_2 \Delta ASALE_j^t + \gamma_3 \Delta INV_j^t + \gamma_4 \Delta INR_j^t + \gamma_5 \Delta GC_j^t + \gamma_6 \Delta BD_j^t + \gamma_7 \Delta SD_j^t + \upsilon_j, \quad (3)$$

where $\overline{CEP_j^t}$ is estimated theoretical rating of environmental performance value from the first stage estimated in equation (1).

Since data for corporate environmental performance and economic growth are pooling across time series and cross-sectional models, the estimation by ordinary least squares (OLS) will cause biased estimated coefficients. Furthermore, if we adopt time series analysis,

[1] Solow (1956), Barro (1991), Levine and Zervos (1998), Arestis et al. (2001), Beck and Levine (2004).

[2] Banking and capital market development is proposed to influence economic growth (Levine and Zervos, 1998; Arestis et al., 2001; Beck and Levine, 2004). Thus, in addition to the macroeconomic variables, we add the banking development index and stock market development index in the model.

the results suffer from the serial correlation problem. Additionally, if we adopt cross-sectional analysis, the omitted sample difference results in heteroscedasticity. Under serial correlation or heteroscedasticity, the estimations accomplished by the above methods are not the best unbiased estimates (Hsiao, 1986).

Before the estimation proceeds to the second stage, the F-test is used to check the equilibrium of the intercept in the estimation of the first stage. If the intercepts are unequal we cannot adopt OLS (Hsiao, 1986). Likewise, the Lagrange multiplier test (LM test) (Breusch and Pagan, 1980) is employed mainly to examine whether the intercept is random or not. If the intercept is random the use of OLS is an inappropriate estimation method either. It is clearly shown that either the theoretical discussion or the empirical test outcomes direct the use of the panel data model to examine our hypothesis.

According to the assumption of the intercept, there are two kinds of panel data models, the fixed effect model and the random effect model. In the fixed effect model, or the least squares dummy variable model (LSDV), we set dummy variables to control the region and time specific fixed effect and represent them on the intercept[1]. If we only control the region or time specific fixed effect, it is a one-way fixed model. If both the region and time specific fixed effect are controlled, it is a two-way fixed model. The random effect model is also called the error component model. In the random effect model, the observation is supposed to be sampled from the population at random; thus, the sample difference will result from the random sampling process. However, the sample difference is assumed in the fixed effect model.

Both the random effect and the fixed effect models represent the sample difference on the intercept, but there is additional random residual in the random effect model. The Hausman test is employed to decide if the fixed effect or the random effect model is appropriate (Hausman, 1978). If the explaining variable is relative to the residual in the intercept, we use the fixed effect model; otherwise, the random effect model is selected.

3. Results and discussions

Table 2 presents the descriptive statistics of the variables used in this study. After we estimate the theoretical value of corporate environmental performance, we select the appropriate estimation approach in the linear model and the first-difference model through the F-test, LM test and Hausman test. The results are summarized in Table 3.

Table 2. Descriptive statistics of the related variables

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
EG	144[2]	1.81	2.97	-6.00	10.76
CEP	17,212[3]	56.10	13.75	43	72
ACEP	144[2]	58.64	4.03	54.75	63.20
SALE	17,212[3]	37.62	59.25	1.50	335.78
ASALE	144[2]	40.16	44.21	24.28	65.69
MB	17,212[3]	21.54	14.86	6.24	125.20
DAR	17,212[3]	42.73	11.97	25.11	69.67
INV	144[2]	22.67	5.98	7.76	48.50
INR	144[2]	2.65	2.18	-1.95	11.70
GC	144[2]	16.09	6.20	2.98	41.48
BD	144[2]	47.54	34.75	2.93	169.49
SD	144[2]	19.46	39.40	0.01	314.77

Notes: 1. The data resources are the same as those shown in Table 1. The sample period is from 2009 to 2012. 2. These variables are observed at the country level. 3. These variables are observed at the firm level.

Table 3. F-test, LM test and Hausman test for selection of estimation method and model

Test method	Linear model	First-difference model
F-test	48.71***	64.36***
LM test	1,036.50***	964.81***
Hausman test	36.78***	48.05***

Note: *, ** and *** denote a 10%, 5% and 1% level of statistical significance.

[1] The region specific fixed effect means the fixed effect of each regional characteristic on an explained variable, when other explaining variables are controlled. This effect is indifferent over time. Time specific fixed effect means the fixed effect of a specific period on an explained variable, when other explaining variables are controlled. This effect is indifferent in every region.

Both the F-test and the LM test reject the null hypothesis of linear model and the first-difference model. These results indicate that OLS is not appropriate in these two models. Furthermore, the results of the Hausman test show that the explanatory variables are relative to the residual in the intercept; thus, the fixed effect model is selected.

In the first stage, we use corporate financial variables to estimate the theoretical rating of corporate environmental performance value. The results, presented in Table 4, indicate that the coefficients of *SALE, MB* and *DAR* are positive and significant. Especially the significance level of *MB* is achieved at 1%. These results qualified affordability theory (Schuler and Cording, 2006) and slack resources theory (Waddock and Graves, 1997), the affordable cost of environmental responsibility is relative to corporate financial performance and surplus resources. Therefore, corporate environmental performance, or the extent of the external cost internalization, is a function of corporate financial indicators.

Table 4. Relationship between the theoretical rating of corporate environmental performance value and corporate financial variables

Variable	Linear model	
	Coefficient	Standard error
Constant	11.2041***	3.5042
SALE	0.0052*	0.0028
MB	1.1429***	0.2949
DAR	0.0166*	0.0093
F-value		5,103.664***
Adjusted R-squared		0.1472

Note: *, ** and *** denote a 10%, 5% and 1% level of statistical significance.

In the subsequent analysis, we controlled the fixed effect in the linear model and first-difference model to estimate the relationship between the estimated rating of corporate environmental performance value and indicator of economic growth. The results are presented in Table 5.

Table 5. The relationship between corporate environmental performance and economic growth

Variable	Linear model		First-difference model	
	Coefficient	Standard error	Coefficient	Standard error
Constant	0.1107*	0.0546	0.1884*	0.0985
ACEP	0.0352***	0.0117		
ASALE	0.0087*	0.0046		
INV	0.0950**	0.0468		
INR	-0.0126*	0.0071		
GC	-0.1614*	0.0855		
BD	0.2149**	0.0932		
SD	0.0255*	0.0143		
ASALE ×*ASALE*	0.0194***	0.0059		
ΔACEP			0.1314***	0.0346
ΔASALE			0.0165**	0.0078
ΔINV			0.2110***	0.0323
ΔINR			-0.0961**	0.0419
ΔGC			-0.1542**	0.0727
ΔBD			0.3420**	0.1685
ΔSD			0.2636*	0.1342
ΔACEP ×*ΔASALE*			0.0350***	0.0122
F-value		247.828***		223.179***
Adjusted R-squared		0.4734		0.5102

Note: *, ** and *** denote a 10%, 5% and 1% level of statistical significance.

In Table 5, the coefficients of $\overline{\Delta CEP}$ and $\overline{\Delta CEP}$ are positive in the linear model and first difference models, and both are significant at the significance level of 1%. The coefficient of $ASLE$ and of $\Delta ASLE$ are also significant at the significance level 1% in both linear and first difference models. The increase of annual sales will create higher economic growth rate. The results indicate that increased environmental performance of major corporations positively influences the domestic economic growth rate.

To provide more evidence, we allow the dependent variable to be one-period lag and re-estimate the estimation. The results are shown in Table 6. The results shown in Tables 5 and 6 are similar. Both results indicate that the effect of the estimated rating of corporate environmental performance value ($\overline{ACEP}$) on the economic growth rate (EG) is positive and significant. Similarly, the change of estimated rating of corporate environmental performance value ($\Delta\overline{ACEP}$) also has positive and sig-

nificant effect change on the economic growth rate ($\Delta \overline{EG}$). Therefore, the greater the environmental performance each corporation operates, the higher the economic growth rate.

Table 6. Robustness test for the relationship between corporate environmental performance and economic growth

Variable	Linear model		First-difference model	
	Coefficient	Standard error	Coefficient	Standard error
Constant	0.0878*	0.0486	0.1829*	0.0958
ACEP	0.0296***	0.0101		
ASALE	0.0093*	0.0052		
INV	0.1014*	0.0534		
INR	-0.0136*	0.0075		
GC	-0.1284*	0.0727		
BD	0.2255**	0.1035		
SD	0.0267*	0.0144		
ASALE ×ASALE	0.0170***	0.0056		
ΔACEP			0.1270***	0.0386
ΔASALE			0.0153**	0.0069
ΔINV			0.1963***	0.0412
ΔINR			-0.0914**	0.0434
ΔGC			-0.1452**	0.0658
ΔBD			0.3101**	0.1436
ΔSD			0.2356*	0.1255
ΔACEP ×ΔASALE			0.0332***	0.0104
F-value		214.36***		201.049***
Adjusted R-squared		0.404		0.435

Note: *, ** and *** denote a 10%, 5% and 1% level of statistical significance.

Our empirical results support the idea that increased and improved operation of corporate environmental performance will result in a positive contribution to domestic economic growth rate. Although the evidence regarding the effect of improved corporate environmental performance on corporate financial performance is still mixed, the positive effect on economic growth rate demonstrated in this study provides a motivation for governments to promote the concept of corporate environmental performance. In other words, the empirical results suggest that output level decrease does not necessarily dominate the overall effect. That is, externality internalization does not consequently reduce the output level of corporations.

In contrast, improved corporate environmental performance tends to reduce the deadweight loss and benefit the macroeconomics. Governments usually ask corporations to operate more environmental performance based upon ethical reasons and concerns. However, once corporations realize they and/or society as a whole will not be damaged by operating improved environmental performances, governments can encourage corporations to achieve more with a certain policy design. Such evidence has never been testified in prior research. We are not only contributing to bridging the gap between corporate environmental performance and macroeconomics, but also demonstrating a positive and exciting relationship.

Conclusion remarks

In the existing literature regarding corporate environmental performance, studies usually have focused on the effect of corporate environmental performance on financial performance; discussion on the effect of environmental performance on macroeconomics is limited. We used a set of panel data with a two-stage regression approach and fixed effect model to analyze the relationship between corporate environmental performance and economic growth rate for 36 countries between 2009 and 2012. We found that a positive relationship exists between environmental performance of a corporation and domestic economic growth rate.

Theoretically, internalisation of externality reduces the output level of a corporation. Thus, environmental protection and economic growth seem to be conflicting alternatives for a country. This study, however, provides empirical evidence to support the idea that increased and improved environmental performance of a corporation simultaneously increases the economic growth rate. Therefore, the ethical considerations should not be the only motivation for governments to promote corporate environmental performances. Economic consideration could be an effective motivation for governments to implement and enforce more specific environmental policies on corporations.

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Appendix

Table 1. Variables, definitions and data resources

Variable	Notation	Definition	Data resource
Economic growth	*EG*	Growth rate of real GDP per capita.	IFS
Corporate environmental performance	*CEP*	Rating of corporate environmental performance.	ASSET4
Average corporate environmental performance	*ACEP*	Average CEP in ASSET4 of the all rated corporations in each sample country.	ASSET4
Total sale	*SALE*	Annual sale on a log scale.	Datastream
Average sale	*ASALE*	Average annual sale on a log scale of the all rated corporations in each sample country.	Datastream
Market-to-book ratio	*MB*	The ratio of market value to book value.	Datastream
Debt-assets ratio	*DAR*	The ratio of debt to assets.	Datastream
Investment	*INV*	The ratio of investment to nominal GDP.	IFS
Inflation rate	*INR*	Inflation rate from CPI.	IFS
Government consumption	*GC*	Annual government expense.	WDI
Bank development index	*BD*	The ratio loan to private corporations from all banking institutions to nominal GDP.	FSEDD
Stock market development index	*SD*	The ratio of total market capitalization to nominal GDP.	FSEDD