

## [*Environmental Externalities and Political Abuse: Interactions in the Chinese Context*]

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### Overview

China is going through very a serious environmental pollution currently. Most cities are often enveloped by heavy smog. A thick layer of toxic fog has been blanketing the vast area of China's most developed regions which are as large as the west Europe. Water pollution happens more than 1700 times/year in China and more than 1.4 billion people are now suffering from its torture<sup>[1]</sup>. How to control the pollutants discharged by industrial companies is a crucial issue to mitigate China's environmental pollution. Based on the hypothesis of "economic man", the companies would set their emission amount to get the highest profit even if a part of it is illegal as the swage treatment cost will increase their total cost and legal compliance can only decrease their economic profit<sup>[2]</sup>. Thus illegal discharge would be common if non-optimal government regulations exist<sup>[3,4,5]</sup>. The increase in corruptibility shifts the government's relative weight away from welfare towards bribe and the exist of indolence will make illegle discharge free of punishment. Companies may choose to bribe the government when the government officials is not honest enough and they may choose to discharge illegally if the expectation of punishment is lower than the profit they can get. So we can find that different integrity and diligence degree of government officials, and different intensity of regulation policies will lead to different discharge behaviour of companies. Meanwhile, we are going to further explore how to motivate companies to realize pollutant emission reduction by making political reform to improve integrity and diligence degree of government officials.

The paper is organized as follows: After the introduction, the model that describes the composition of companies' profit is built in the second section and we will further analyze the impact of companies' discharge behaviour on their profit. The solutions to the function under different discharge behaviour are presented in section three. In section four, we will describe the impact of corruption and diligence of government officials on companies' discharge behaviour based on the mathematical solutions. And the political factors that influence the regulation policy and the possible way to increase the intergrity and diligence degree of government officials will be discussed. In section five we take a paper mill near Huaihe River of China as a case analysis to test the above model. In the final section conclusion and policy suggestions are derived.

### Methods

Industrial companies' discharge will be changed according to different regulation policy, integrity and diligence degree of government to get the highest profit. Bases on this assumption, industrial companies will choose their most profitable discharging behaviour from the following four kinds: (1) discharge at the social optimal level; (2) choose the underlying discharges without bribing government officials; (3) bribery government officials to get the government permitted discharging amount above the social optimal level without underlying discharging; (4) choose the underlying discharging level and meanwhile bribe government officials to avoid the possible punishment. We further assume that production plan as well as the discharging plan will be set at the beginning of the year. The following function is chosen to describe a industrial companies profit when it chooses the discharging behaviour from the above assemblage, companies will choose their decisions to get the highest profit at the beginning of the year.

$$M = (q \times (p - oc) - k \times E0) \times (1 - \lambda \times (e - x^*)) + k \times e - C \times k \times (x^{**} - x^*) - \phi \times P \times D \times \frac{(e - x^{**})^3}{x^{**}}$$

$M$  is the maximum profit that an industrial company can get;  $q$  is the company's productivity and we assume that there is no inventory;  $P$  refers to the selling price;  $oc$  refers to the production costs excluding COD treatment cost, we take COD as an example of the key pollutant in swage;  $k$  refers to the cost to treat every ton of COD;  $E0$  refers to the COD amount which is produced with maximum productivity;  $\lambda$  refers to the hazard of every ton of COD;

$e$  refers to the actual emission of COD;  $x^*$  refers to the COD emission at social optimal level;  $C$  reflects the corruption degree of government officials;  $\phi$  is an adjustment parameters;  $P$  refers to the punishment of every exceeding ton of COD;  $D$  reflects the diligence degree of government to monitor companies' discharge behavior;  $x^{**}$  refers to the COD emission that is permitted by government officials when bribery exists.

We will solve the function to obtain the maximum profit of the company under its different discharging behaviour and then will compare these maximum profits to get the optimal discharge behaviour when different regulation policies are applied.

## Results

First, the effect of single regulation policy is limited and different regulation policies must be combined to get the best regulation effect.

Second, industrial companies will not bribe the government to get the permission of the exceeding discharge amount if the bribery cost is high enough. Moreover, a further increase in bribery cost won't have significant influence on companies' discharge decision. While further increase in diligence degree of government official will significantly reduce pollutant emission.

Third, the impact of the same regulation policy on companies with different profit and different pollution treatment cost will be different. That is, the smaller the company's profit is, the harder it is to regulate its discharge behaviour; the higher the company's pollution treatment cost is, the harder it is to regulate its discharge behaviour.

## Conclusions

It is concluded that companies' pollutant discharge behaviour has close link with the integrity and diligence degree of government officials, which is decided greatly by political system. Hence, how to control companies' pollutant by the reform of political system is our special interest in this study. We find that anti-corruption movement is beneficial for pollution control, thus to reduce government corruption by political system reform is one of the key tasks to deal with pollution. Meanwhile, we also find that it is an effective way to control pollution by increasing the diligence of governments. Hence, another crucial method to mitigate pollution in China is to improve government diligence by political system reform.

## References

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