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Law and economics analysis of hazy weather governance

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ABSTRACT

As the economy continues to develop, the impact of human activities on the environment intensifies, and hazy weather appears from time to time. How to reduce the appearing of hazy weather and its impact on people's lives has become an issue of great concern to the whole society. Based on the current situation of hazy weather and it's causes, the paper interpret the occurrence of hazy weather form the perspective of Law and Economics, focusing on the use of emissions trading system extending form the property right defined system guided by "Coase Theorem" and pollution charges system of Pigovian tax theory to analyze the governance of hazy weather. The features of public goods and externalities of atmospheric environment lead to "the tragedy of the commons". Emissions trading system and pollution charges system provide effective solutions from the perspective of market mechanisms, but the treatment effect of these two systems is not obvious in China. There are some issues, for example, unsound laws and regulations, non-standard operation, unreasonable charging fees, limited charging areas and others. Therefore, it is necessary to improve the relevant laws and regulations, establish reasonable monitoring and measurement systems, and strengthen supervision and management to give full play to the effect of emissions trading system and pollution charges system.

KEYWORDS

Hazy weather; Governance; Law and economics; Emissions trading; Pollution charges.

INTRODUCTION

With the rapid development of China's social and economic development, environmental issues have become increasingly prominent. Coal-based energy consumption rose sharply, vehicle population increase sharply, emissions of nitrogen oxides and volatile organic compounds increase significantly in economically developed regions, ozone and fine particulate matter pollution aggravate, and inhalable particles and total suspended particulate pollution is still serious. Since the autumn and winter in 2012, Hazy weather occurred in more than half of China, leading to a serious decline in air quality. In Beijing-Tianjin-Hebei region, Yangtze River Delta region and Pearl River Delta region, PM2.5 pollution is aggravating and hazy weather occurred frequently. Hazy weather brought inconvenience to people's lives, as well as affect people's health. In order to control fog and haze, the state also increases the efforts on environmental protection and accelerates the adjustment of energy structure. PM2.5 monitoring indicators are added in China's newly released Ambient Air Quality Standards in 2012.

The presence of features of public goods and externality of atmospheric environmental resources determines that the market is difficult to solve environmental problems simply by itself, so it necessarily requires something beyond the role of market forces existing. "Country" and "government" are the foreign born market forces. However, studies form Laws and Economics show that under the purposes of maximizing social wealth, the optimal allocation of the atmospheric environmental resources not only requires government regulation, but also needs market mechanisms, both of which are important means to solve environmental problems.

ANALYSIS OF HAZY WEATHER IN CHINA

Hazy weather in China

Hazy weather is a new kind of weather phenomenon emerged in recent years. Haze is the result of a specific interaction between climatic conditions and human activities, and is a mixture of fog and haze. Economic and social activities are bound to a large number of fine particulate matter emissions, once the emissions exceed the carrying capacity and the degree of atmospheric circulation, the concentration of fine particles will continue to accumulate, if it affected by the static stability weather and other factors at this time, it is prone to appear large-scale haze. The main components of haze are sulfur dioxide, nitrogen oxides and particulate matter, and the first two of them are gaseous pollutants. Particulate matters, especially PM2.5 (Particulate matter whose aerodynamic equivalent diameter is less than or equal to 2.5 micron) are the culprit to heavier pollution. They combine with fog together, making the sky instantly to be gray. Air quality continuing to get worse will have a significant negative impact on climate, environment, health, economic and other aspects, such as causing acid rain, photochemical smog, and a fall in atmospheric visibility. Behind these negative effects, enormous economic costs are hidden.

The Chinese Academy of Social Sciences released the "Green Paper on Climate Change: Addressing Climate Change Report (2013)," in which it pointed out that hazy weather overall have increasing trend and the persistent haze process increases significantly in China in the past 50 years. Since the 21st century, there is an increasing trend on the frequency and severity of hazy weather and most parts of the country are affected by hazy weather in varying degrees. According to the satellite remote sensing monitoring of Chinese Ministry of Environmental Protection, over 100 million square kilometers of land area suffered haze pollution, and Beijing, Hebei and some other places have severe pollution. At present, China has already formed the nine foggy haze area, the most serious of which include Beijing-Tianjin-Hebei region, North China including Shandong, Henan and other places, East China with the Yangtze River Delta as the main area, South China with the Pearl River Delta as the center region and southwest region including Sichuan Basin area.

Form 1981 to 2010, the occurrence of hazy weather significantly was in winter than in summer and haze days in winter accounted for 42.3% of all the year round. For the times of haze process which continue for more than three days, the average monitoring data in 2001 to 2012 is twice more than the average monitoring date in 1961 to 2000, and for the times of haze process which continue for more than six days the monitoring data is 3.1 times than that of the contrast data. In 2013, a wide range of continuous hazy weather continue to occur, and the impact cover the North China Plain, the Huang-Huai region, Jianghuai region, Jianghan region, Changjiang River, and south China. The national average number of haze days was 4.7 days, which is over 2.3 days than the same period in normal years (2.4 days) and is the maximum of 52 years (form 1961 to 2013). In the eastern region, the average number of foggy days is 16 days, which is less 8 days compared to normal years and the highest in 52 years (since 1961) at least; but the average number of haze days is 36 days, which is more 27 days than normal years and the highest in 52 years at most. Among them, the number of haze days in some areas, such as Jiangsu, Anhui, Zhejiang, Henan, Hebei, Beijing, and Tianjin are more than 100 days, and the number of haze days in Heilongjiang, Liaoning, Hebei, Shandong, Shanxi, Henan, Anhui, Hunan, Hubei, Zhejiang, Jiangsu, Chongqing and Tianjin are up to the same period in history. From the North to the southeast coast, and even the Southwest, there have been gradually 25 provinces and more than 100 cities occurring hazy weather in varying degrees, covering more than half of the land.

Reasons for the formation of hazy weather

Reasons for the formation of hazy weather have natural factors and socio-economic factors. Natural factors mainly are continued accumulation of pollutants caused by adverse weather conditions. Due to the low urban atmospheric pressure and low wind speed, tiny particles in the air at low altitude constantly gather to dissipate, then high air humidity make

droplets combine to fine particulate matter to form larger mixed particles, and too dense geographical layout of the city led to mutual contamination between conduction, all of those promote pollution formation. Socio-economic factors mainly are the irrational structure of energy consumption, industrial emissions, vehicle exhaust emissions and construction dust resulting from the development of urbanization.

(1) Irrational structure of energy consumption. For a long time, the structure of energy production—"rich in coal, lack of oil, less gas"—determines that the Chinese coal-dominated energy consumption structure will not change in the long term. Although since the 1990s, the proportion of natural gas and clean energy in the total energy consumption have shown a rising trend, coal and oil dominated energy consumption structure has not changed. In 2012, the total energy consumption of China was 36.1732 trillion tons of standard coal, of which coal accounted for 66.6% of total energy consumption and oil accounted for 18.8%. The negative effects of such structural features of energy with low calorific value of fossil fuel-based and "new energy shortages" on the environment is large. The burning of coal and oil cause a lot of pollutant emissions such as sulfur dioxide, soot, dust and other pollutants. In addition, as China's energy technology, equipment and management level is relatively backward, overall technology in coal industry is underdeveloped and energy utilization is low, so part of the energy was emitted directly into the atmosphere in the form of particulate pollutants, polluting the atmosphere seriously.

(2) Significant emissions of industrial gases. Industry consumes a lot of resources and energy and causes a lot of emissions of pollutants in the provision of raw materials and products for the economic and society. Production process can cause various gas and dust, for example metallurgy and machinery manufacturing production, automotive paint and building materials production. In 2012, industrial emissions of sulfur dioxide is 19.117 million tons, accounting for 90.3% of total sulfur dioxide emissions; industrial emissions of nitrogen oxide is 16.581 million tons, accounting for 70.9% of total emissions of nitrogen oxides; industrial exhaust smoke (dust) emissions is 10.293 million tons, accounting for 83.4% of the total smoke (dust) emissions.

(3) Vehicles exhaust emissions. Nitrogen oxides (NOx), hydrocarbons (HC), carbon monoxide (CO), suspended particulates (PM) and other harmful gases of vehicle exhaust are sources of haze. Exhaust emissions of vehicle, especially large vehicles using diesel, such as buses, trucks, etc., make a lot of particulate matter emissions to the atmosphere because the combustion is incomplete. In addition, small cars use gasoline, and particulate matter and various gaseous pollutants of their emissions are fewer, but because of the large number, the amount of discharge is large in general, and once meets heavy fog weather, the nitrogen oxide in the exhaust gas is easily converted secondary particles pollutants, resulting in hazy weather. In 2012, vehicle exhaust emissions of nitrogen oxides were 6.4 million tons, accounting for 27.4% of total NOx emissions.

(4) Construction dust in urbanization. Urbanization is an important part of economic development in recent years, mainly for improving social productivity and expanding the scale of urban areas. In the process of urbanization, construction site dust generated a lot of PM2.5. In 2013, the construction area of real estate business houses is 6,655,720,000 square meters. However, many construction firms are lack of environment consciousness and one-sided pursuit of economic efficiency, so that the construction site is not in strict and effective management, making a wide range of construction dust released into the atmosphere, lowering the horizontal visibility and polluting atmospheric environment.

ANALYSIS OF HAZY WEATHER GOVERNANCE FORM LAW AND ECONOMICS PERSPECTIVE

Analysis of occurrence of hazy weather form law and economics perspective

The assumption of Law and Economics is rational people, that is, social individuals including enterprises are rational people, which have been expressed as “economic man" in economics. Behavioral characteristics of “economic man” are, with enterprise as an example, all the acts of every enterprise depend on the economic benefits or profits. Although the goal of environmental pollution control is a society composed by the "ecological man", in which every individual should bear the obligation that environmental costs does not spill in economic activity, but the environmental management system, as a means to achieve goals of "ecological man", its location still should follow logical starting point of the "economic man" and "rational man" in economic behavior analysis system and the legal system, otherwise the whole society can not form the source of power to protect environment and the benign circulation system of environmental protection.

The atmosphere is public goods. Public goods in Economics refer to goods that have non-exclusive and non-competitive features in the consumption. Public goods consumption is not exclusive, which means that the consumer rights of public goods is not determined by a person at all, but by the whole community jointly and any one person's consumption does not exclude others from consumption of this goods. Public goods consumption is not competitive, which means that the marginal cost of each additional unit of goods consumption is zero and any one person's consumption does not affect the consumption of others on this goods. Since public goods has the "non-exclusive" and "non-competitive" feature, configure of environmental resources have the problem of market failure, which would result in "the tragedy of the commons" phenomenon. "Public goods" nature of the atmospheric environment makes it difficult for environmental protector to exclude others enjoying revenue for environmental protection and for spoilers to shoulder the cost of environmental, then external problem appears.

As for analysis form Law and Economics perspective, the externality of economic activity is the inner reason for economic man to ignore environmental protection, that is, people’s economic activities had an impact on others and the environment, but these effects (usually negative effects) are not included in market transactions costs and prices. The most important reason of such externalities is “the tragedy of the commons". This theory holds that public resources, like public

goods, have no exclusivity, and any one person who wants to use public resources can use for free. However, people to use public resources reduce the others to enjoy. Therefore, public resources created a new problem that once you provide goods, policymakers should focus on how much it is used. So, we must as far as possible to reduce the overflow of negative externalities causing "the tragedy of the commons" to make public resources to get a fair and efficient utilization. Public goods nature of atmospheric environment leads to the externality issues, then based on the “rational man " hypothesis, businesses or individuals will enjoy the protection of the environment benefits without incurring the cost of environmental damage for their own economic interests, leading to air pollution worsening and occurrence of hazy weather. This is the analysis of the occurrence of hazy weather in the field of Law and Economics.

Governance of hazy weather form law and economics perspective

The impact of Law and Economics on Environmental Law originally was to reveal the "public good" nature and externality of environmental resources in the early 20th century. Public goods nature of environmental resources and irreversibility of environmental pollution determine the necessity of intervention of another hand outside market, and that is government intervention. Government intervention can be divided into direct intervention and indirect intervention, the former refers to forced intervention, like the government's executive order, on the performance of the mandatory provisions of the law, while the latter refers only to government intervention, which is non-compulsory intervention. Indirect government interventions often make use of market forces to achieve policy objectives. Emissions trading system extending form the property right defined system guided by "Coase Theorem" and pollution charges system of Pigovian tax theory of Law and Economics are indirect intervention.

Emissions trading to hazy weather governance

Emission trading

Legal economists Coase believed that the greatest cause of "the tragedy of the Commons" is unclear property rights caused by market failure. Thus, he proposed the Coase Theorem that as long as ownership or property rights is clearly defined trading activities between "economic man" will be able to solve the problem of externalities of economic activities on their own, which means that trading activities between environmental polluters and victims will effectively solve the contradiction between them. Clear property rights regulation is a kind of regulation to enhance trading opportunities, because it creates exchangeable property rights in the place where property rights are not obvious originally.

Dales, Canadian economist, earliest used the methods of Coase property to environment field, and proposed the concept of emission rights. He pointed out that pollution is actually a kind of property rights which the government give to a contaminated enterprises, and this property rights should be able to transfer and can improve the efficiency of environment through the market. In fact, if there is no clear definition of property rights, the contract choice on both the polluter and people who polluted by polluters may be limited. But after the government made the property clear, it may generate emission rights market. If sewage permission can be freely exchanged between enterprises, and even be brought by the consumer group or the town which may not choose to use emission rights with the clear property rights, there was the emissions trading. The so-called emissions trading, refers to on the premise of indicators of total amount of pollutant emissions determined, a region allow that emission rights can be bought and sold like a commodity as a way to control total pollutant to ultimately to reduce pollutant emissions and protect the environment. Emissions trading are a policy tool to encourage individuals and firms to protect the environment in the use of incentives. Compared with pollutant charges, it full use of market mechanisms to control environmental pollution. Its basic content is that practice the emission rights permit system, government grant emission permits licenses to companies, enterprises discharge pollutants into a specific number in designated locations, emission permits and emission rights can be traded, and companies can to buy or sell emission rights according to their needs in the market.

Emissions trading to hazy weather governance in China

As an economic means, the pilot implementation of paying for the use and trading of pollution emission rights help to solve conflicts between environmental protection and economic development. With the enhancement of the ability to environmental protection, the government can grant and purchase of emission rights to influence the price of emission rights, increasing sewage costs of enterprises, thus gradually reduce pollutant emissions. With emissions trading, pollution governance becomes profitable for enterprises, which is conducive for market to fully play a decisive role in resource allocation. With the cost of acquiring emission rights continues to increase, companies will compete to use high-tech treatment methods to reduce emissions, and thus reduce the total amount of pollution. In 1976, the United States began the trial permit system. In 1990, the country formally wrote the permit system and the emissions trading scheme in CAA amendments, and vigorously executed. The emissions trading focused on sulfur dioxide emissions trading and implemented in the country’s power industry with reliable legal basis and detailed implementation plan. This market-based systems and measures largely reduce pollution control costs, and achieved good environmental and economic effects, becoming the most extensive emissions trading practices by far.

Emissions trading in our country are still in the initial stage. In 2007, Tianjin, Jiangsu, Zhejiang, Shaanxi and other 11 provinces (municipalities) carry out emissions trading as national pilot unit. Since 2011, emissions trading pilot area are expanding rapidly. The current emissions trading mainly for sulfur dioxide, chemical oxygen demand (COD), nitrogen oxides and ammonia, etc.. But there are still many problems in the pilot implementation of paying for the use and trading of

pollution emission rights, such as the operation of large regional differences without specification, control efforts lag in enterprises and institutions. In addition, emissions trading system lacks the necessary legal support, management practices and guidance documents. How to trade and which transactions it is among market transactions, government transactions and financial transactions are not clear. The effect of emissions trading to control the hazy weather achieved minimal.

Pollution charges system to control hazy weather

Pollution charges system

Pigou thought that in real life, the cause of failure in the allocation of resources is that economic agents' social costs and private costs are not consistent, so it is difficult to rely solely on market mechanisms to achieve optimal state of resource utilization. To eliminate departure marginal private cost and marginal social cost, departure marginal private benefit and marginal social benefits, government should take appropriate economic policies, tax the parts that the marginal private cost is less than the marginal social cost, award or subsidize the parts that the marginal private revenue is less than the marginal social benefit. Therefore, it is necessary for government to adopt tax or subsidies and other measures to regulate.

Pigou' framework of economic analysis to environmental pollution is the root of the theoretical base of pollution charges system. He put forward the point of view about how to internalize the external environmental costs, which is different form Coase' point. It is that environmental costs externalization are not directly linked to producers and consumers, so it can not be internalized by the trading of producers and consumers on their own in the market, but only by taxes added to the cost taken by the state or government taxes. Therefore, states generally established a system of pollution charges today, in which polluters who discharge of pollutants to the environment or discharge pollutants in excess of the prescribed standards must pay fees in accordance with the standard of the law and the relevant provisions.

Pollution charges system to hazy weather governance in China

As early as 1982, China had implemented the "Interim Measures for sewage charges" to collect fees for enterprises' and institutions' some certain hazardous substances of exhaust emissions. In 2003, in the implementation of the "Sewage Charges Imposition of Regulations," it is wrote that according to the provisions of Atmospheric Pollution Prevention Act, enterprises and institutions which discharge pollutants into the atmosphere must pay fees according to the type and numbers of pollutant emissions, for violations refusing to pay sewage charges have appropriate punishment. Collection includes sulfur dioxide, nitrogen oxides, carbon dioxide, dust and other pollutants. Sewage charges are used for air pollution control. Government charge enterprises' damage to the environment and is responsible for the appropriate management. On the pollution charges system, fees are charged to air pollution emissions, which increase the cost of pollution emissions, urging them to improve technology to reduce emissions. It is an important way to control atmospheric pollution in many developed countries.

In fact, the mechanism of pollution charges system playing a role is that as long as the sewage charges slightly higher than the cost of processing the emission of pollutants, the enterprise will certainly choose to deal with pollutants themselves. If companies choose to pay sewage charges, there are two situations may occur. One is the sewage charge is too low to force enterprises to fulfill their environmental obligations, so the government should choose to raise sewage charges; another one is the cost of processing pollutants is really too high, then the government should improve sewage charges, which can force companies to make sewage charges be included in the production costs and raise prices. When the price increased to unprofitable state, this high-polluting products will naturally eliminated from the market, while enterprises will turn to new technology to produce new products with low pollution, which is still based on the ultimate goal of environmental protection. Therefore, pollution charges system is highly respected in the environmental pollution control and its advantages lie in that government have no need to be concerned about the cost of environmental pollution control, while pollution charges system will guide the "economic man" to bear pollution control obligations, or shift to produce new low pollution products on their own.

The big question of the current pollution charges system is that the sewage discharge fees are too low. China's current sewage collection standards were enacted in 2003. According to price levels in 2003, the required depreciation of fixed assets, energy and material consumption, maintenance, management, labor and other costs of pollution control facilities, with principles that the sewage charge slightly is higher than the cost of pollution control, taking the prevailing level of China's economic and social development and polluters capacity into account, gas sewage charges implemented in 2003 are much lower than their corresponding pollution control costs with a certain gap. Sewage charges standard does not reflect the marginal cost of pollutants, resulting in companies with payment to buy " pollution rights “or " undermine right " and a abnormal phenomenon of "heavy production and light pollution control”. In addition, charges fields are limited. The current collections of objects are only unit or individual businesses that discharge pollutants directly into the environment. The concentration of articulate matter in the atmosphere (including coarse particulate matter PM10 and fine particulate matter PM2.5) caused by industrial production, vehicle emissions, coal-fired heating in winter and other aspects is an important factor to cause hazy weather. Quite a lot of pollutants such as household garbage and mobile sources such as vehicles, aircraft and ships are still not levied the charges. Pollution charges system failed to play its due role, leading that hazy weather intensified.

CONCLUSION AND SUGGESTIONS

Today, hazy weather is a growing problem in China. The formation of hazy weather has both natural factors and socio-economic factors. Socio-economic factors mainly include irrational energy consumption structure, a large number of

industrial waste gas emissions, exhaust emissions from vehicle and the construction dust in urbanization. Public goods nature and externalities of atmosphere lead to the overflow of negative externalities, making atmospheric contamination.

Studies in Law and Economics show that nor at any time it is need state intervention and nor any state intervention are the best times. It is not only high costs, but the effect is not necessarily ideal to rely on government action in all environmental matter. In the specific environmental affairs, more market mechanisms should be introduced, so that market mechanisms can play a role in helping to achieve more balanced environmental benefits. Therefore, using emissions trading system extending form the property right defined system guided by "Coase Theorem" and pollution charges system of Pigovian tax theory to control hazy weather is necessary. But now these two approaches still have some problems and the treatment effect is minimal. It is recommended to be improved from the following aspects.

(1) Improve relevant laws and regulations. The country began the legislation of the laws of paying for the use of emission rights and emissions trading as soon as possible to provide legal support for the establishment of comprehensive system of paid use of environmental resources, punish the subject and practices of illegal trade, and establish specialized agencies to coordinate the construction of the entire system of emissions trading. Meanwhile, combined with the reality of China's social and economic development, the relevant laws and regulations on sewage charges should be revised and improved.

(2) Establish a scientific monitoring and measurement system. Determination of pollution is the basis of emissions trading and sewage charges. The premise of accurate determination is to implement accurate monitoring and measurement to enterprises' emissions, which requires detecting and calculating enterprises' emissions scientifically and rationally. The country should unify statistical caliber as soon as possible, standardize monitoring technology, and establish a reasonable system of sewage indicators measurement. The verification mechanism by the third party can be taken for the measurement of pollutants.

(3) Strengthen supervision and management. Strengthen monitoring of pollutants and regulatory capacity to guarantee that emissions of various pollutants can be tracked and monitored effectively; strengthen penalties for violations of sewage and law enforcement; establish public oversight mechanism to encourage the public to actively participate in the hazy weather governance.

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