



# The impact of resource tax reform on China's coal industry



Huihui Liu<sup>a</sup>, ZhanMing Chen<sup>b,c</sup>, Jianliang Wang<sup>d,\*</sup>, Jihong Fan<sup>e</sup>

<sup>a</sup> Academy of Chinese Energy Strategy, China University of Petroleum, Beijing 102249, China

<sup>b</sup> Department of Energy Economics, School of Economics, Renmin University of China, Beijing 100872, China

<sup>c</sup> National Academy of Development and Strategy, Renmin University of China, Beijing 100872, China

<sup>d</sup> School of Business Administration, China University of Petroleum, Beijing 102249, China

<sup>e</sup> School of Foreign Languages, China University of Petroleum, Beijing 102249, China

## ARTICLE INFO

### Article history:

Received 21 March 2016

Received in revised form 26 October 2016

Accepted 3 November 2016

Available online 12 November 2016

### JEL classifications:

E65 Studies of Particular Policy Episodes

Q41 Demand and Supply • Prices

Q43 Energy and the Macroeconomy

Q48 Government Policy

L72 Mining, Extraction, and Refining: Other

Nonrenewable Resources

L78 Government Policy

### Keywords:

Resource tax

Volume-based tax

Ad valorem tax

China's coal industry

Tax reform

Oversupply

## ABSTRACT

Contributing to approximately two-thirds of primary energy consumption, coal usage is the focus of China's energy policies. To regulate the resource taxation system and reduce the burden of coal enterprises, the Chinese government launched a reform of its resource tax system in 2014 for coal, introducing the ad valorem system to replace the volume-based system that had been in place for the preceding thirty years. To assess the impact of the tax reform, this paper constructs two-stage dynamic game models by taking the coal and coal-fired power industries as the players. The market situations of shortage and oversupply are investigated separately. Empirical data are collected to estimate the model parameters for numerical simulations. The model results suggest that the tax reform will reduce both coal prices and the coal industry profitability if the tax levied on each ton of coal is maintained at the same level as before the reform, regardless of whether the market is in a shortage or an oversupply situation. However, the increased buyer's power will amplify the effect of the tax reform. The numerical simulations also provide an estimation of the tax rate of the ad valorem system that maintains the profit of the coal industry. Considering the demand and supply situations in China's coal market, policy recommendations are provided to guide further reform of China's resource tax system.

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## 1. Introduction

With the deepening of its market reform, China is currently experiencing multiple challenges related to economic development, environmental protection, and climate-change mitigation. Energy conservation and emission reduction are considered important measures by the Chinese government to address these challenges (NDRC, 2014; GOSC, 2014). As a commonly applied fiscal instrument, the resource tax has been used to adjust the cost of energy use and affect the speed of resource exploitation (Hotelling, 1931); therefore, it has become an important component of policies to conserve energy and reduce emissions (Shi et al., 2015).

As the most abundant indigenous energy resource, coal has always dominated China's primary energy supply, accounting for 64% of

China's total energy consumption in the year 2015 (NBS, 2016a). To regulate the resource taxation system and reduce the burden of the coal enterprises (The State Council, 2014), China has launched a reform of the coal resource tax. In 2014, the Ministry of Finance (MOF) and State Administration of Taxation (SAT) jointly issued the *Notice on the Implementation of the Coal Resource Tax Reform*, which was announced on December 1st of the year, an ad valorem tax would be implemented nationwide to replace the volume-based tax. The provincial governments are responsible for setting their tax rates between 2% and 10% in accordance with their economic development levels and resource endowments. In addition, all non-tax charges, such as the resource compensation fee and the coal price adjustment fund, will be cancelled.

Market observations suggest that the reform has achieved its purpose of alleviating the fiscal burden of coal enterprises in the short term. According to statistics released by the State Administration of Taxation (China Tax News, 2016), in 2015, the total revenue from the coal resource tax increased by 18.5 billion Yuan compared to that before

\* Corresponding author.

E-mail address: [wangjianliang305@163.com](mailto:wangjianliang305@163.com) (J. Wang).

the reform, and 36.6 billion Yuan of non-tax charges have been cancelled, leading to a decrease of approximately 18.1 billion Yuan in the overall burden of coal enterprises and a decrease of 4.3 Yuan in the average tax burden for each ton of coal. Taking Anhui Province as an example, after one year of implementing an ad valorem tax system, total tax revenue increased by more than 0.2 billion Yuan, but the tax burden of coal enterprises dropped 15% (Anhui news, 2016). It is observed that in 2015—after the implementation of tax reform—coal prices have continued to decline and the comprehensive coal price decreased by 27% (China Tax News, 2016). In the longer term, however, the influence of the tax reform on the coal industry must be explored theoretically because the game strategies of market players (the coal industry and the coal-fired power industry) may change.

Our paper seeks to answer the following questions. Following the reform, what equilibrium state will be achieved in the coal industry chain? Under different reform targets, what are the reform's impacts on the coal industry's profitability and tax burden? Because the tax payable is closely related to the coal price in the ad valorem tax system, the reform will inevitably change the pricing strategy. How will the reform affect the coal price? What tax rate should be considered for the new taxation system? Given that the coal-dominated energy structure will likely be maintained for the foreseeable future (Lin et al., 2012), these questions are worth studying to help guide the current tax reform and facilitate the healthy development of the Chinese coal industry.

Recognizing that approximately half of Chinese coal consumption stems from coal-fired power plants (CSY, 2014), our study focuses on the coal used for electric power generation to simplify the model without missing the dominating market factors. Our study constructs two-stage dynamic game models with the coal industry and the coal-fired power industry as two players and solves the equilibrium outcomes at the industry level. On this basis, empirical data are collected to estimate model parameters and create numerical simulations. The indifference curves of the coal industry's profit and the tax burden on each ton of coal are drawn under the two tax systems to investigate the impact of the tax reform.

With the reform and opening-up of China, the coal industry has experienced a change in the supply–demand relationship. According to data released by the National Bureau of Statistics, from the 1990s to 2008, there was a shortage in the total coal supply, with a supply–demand ratio of less than one. After 2009, however, China ended the historical situation of the coal supply falling short of demand (NBS, 2016b). Taking thermal coal as an example, the total supply volume was 110 million tons more than the total demand in 2010–2013, 177 million tons more in 2014 and 122 million tons more for the first 11 months of 2015 (NBS, 2016b). The emergence of this oversupply situation can be partially attributed to the closure of small, dangerous coal mines and partially attributed to a decrease in coal demand. On the one hand, the growth of the Chinese economy has slowed, affecting demand for coal; on the other hand, to promote environmental protection and climate-change mitigation, the Chinese government has sought to control the use of untreated coal and to substitute coal with electricity and natural gas (NEA, 2015). With the development of clean-coal utilization and high-efficiency power generation, it is believed that overcapacity will be further cut and that in the future, the supply–demand relationship will remain balanced.

As the supply–demand relationship changes, market power will rotate between coal buyers and coal sellers, especially with respect to pricing decisions. To guarantee the completeness of existing theoretical models and improve the adaptability of our model in guiding reform practices, different model configurations should be established to identify both sellers' market (shortage) and buyers' market (oversupply) situations. This model treatment can help us understand how different market situations will affect the market equilibrium results, leading to practical policy recommendations and guidance for the tax reform against different economic backgrounds.

The major innovations of this study are two-fold: 1) this study establishes two-stage dynamic game models connecting the coal industry and coal-fired power industry, providing an analytical framework for follow-up studies of China's coal-related industries and characterizing their strategic behaviours; 2) the paper uses the equilibrium outcomes of game models and empirical data to examine the impacts of resource tax reform on the coal industry in terms of profitability, tax burden, and market equilibrium.

The remainder of this paper is organized as follows: Section 2 introduces the background of China's implementation of the resource tax reform; Section 3 provides a review of the literature; Section 4 describes the basic model setting; Sections 5 and 6 solve the model in different market situations; and Section 7 concludes the study by providing policy recommendations.

## 2. Background on China's implementation of the resource tax reform

China's resource tax was first implemented in 1984 as a volume-based tax, meaning that tax revenue is based exclusively on the volume of exploitation without considering the market price of the resource. In 2011, a national resource tax reform on oil and gas was implemented, and China moved from a volume-based tax (8–30 RMB yuan/ton on oil and 2–15 RMB yuan/m<sup>3</sup> on gas) to an ad valorem tax with a tax rate of 5%–10% (Shi et al., 2015). The resource tax reform on coal followed the reform of the oil and gas tax.

One explicit reason why China adopted the volume-based resource tax system is that it is convenient to operate and does not depend on resource prices, thus reducing both administrative costs and the risks of tax dodging. As a result of market forces, however, resource prices fluctuate with relative changes in supply and demand. Along with China's economic development, the demand for resources is growing more rapidly than the expansion of production capability. Over the last decade, there has been a noticeable rising trend in China's resource prices for the last decade. Another frequently ignored reason for rising resource prices is inflation; i.e., the general price level measured by the GDP (Gross Domestic Product) deflator increased by 51% from 2000 to 2010 (CSY, 2015).

Against this background, the implementation of a volume-based resource tax, which levies taxes according to the output volume of resources, has at least two major problems. First, there is no automatic mechanism to bring the resource market back to a rational equilibrium. When the tax levied on each volume of resource product is constant, the resource tax has the same effect on the market regardless of whether there is an oversupply or a shortage situation. Second, there is a distortion of the taxation system and an increased burden on resource enterprises. The volume-based tax calculation method cannot respond to the fluctuation of resource market price. As a result of inflation, the actual tax income from the same volume of output will be reduced. Because resource tax income is a major revenue source for some of China's provincial governments, local governments have an incentive to charge additional fees such as the resource compensation fee and the coal-price adjustment fund. These additional fees sometimes bring more revenue to local governments than the resource tax.

Compared with the volume-based resource tax system, the ad valorem system can solve the two problems noted above. First, in an overheated market, the tax rate in proportion to the market price will increase the cost of resource use and cool down the market, and vice versa. Second, with only an ad valorem tax, the taxation system is both clear and easy to manage. The inflation effect can be reflected in the resource price and can thus be compensated by the increased tax revenue. Therefore, additional fees can be naturally cancelled. Accordingly, the Chinese government is gradually promoting the reform of the resource tax, shifting from a volume-based system to an ad valorem system.

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