



Analyzing energy savings potential of the Chinese building materials industry under different economic growth scenarios



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ABSTRACT

As a vital industry providing raw materials to construction, building materials industry plays an essential role in China's energy consumption growth during urbanization. The objective of this study is to investigate the transition of future energy demand and energy savings potential of the Chinese building materials industry. The co-integration method is applied to identify the influencing factors of the sectoral energy use. Considering that economic growth is the driving force for the sectoral energy demand, this paper develops multiple scenarios to comprehensively analyze the transition of sectoral energy use and map various possibilities. Results indicate that although sectoral energy consumption peaks varied among different scenarios, the predicted sectoral energy use, which would account for a smaller share in national energy usage in the future, shows a similar downward trend after the first rise. Results also demonstrate that the sectoral energy savings potential is considerable. Policy implications are summarized as follows: (1) the relatively rapid economic growth stage provides an opportunity for the sector to conserve energy and reduce emissions; (2) technological progress ensures continuous improvement in sectoral energy efficiency; (3) the sector should speed up industrial restructuring and upgrading to deal with higher energy costs promoted by energy pricing reform.

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1. Introduction

Given the important role of China in the international energy market, never before has it been so important to investigate the determinants of energy consumption in China. As the most important sector in the field of energy consumption, energy conservation in energy-intensive industries is closely related to China's energy sustainable development. In the context of the Chinese economy's "new normal" – an era of relatively slower economic growth, the government has proposed to actively promote energy conservation and emissions reduction in high energy consuming industries to realize the construction of an ecological society. Building materials industry, one of the six most energy-intensive industries in China, consumes about 9% of the national energy annually. In 2011, energy consumption of the sector was 300.15 million tons of coal

equivalent (MTCE), which was close to the total primary energy consumption of Saudi Arabia (the world's dominant oil producer and exporter) in the same year. Particularly, the sectoral energy use accounted for 8.63% and 1.72% of national and world energy consumption, respectively [1]. In general, value added of building materials industry contributed to 1% of the GDP and nearly 5% of the total industrial value added (IVA) of China's industrial sector [2]. Additionally, the strategy of "One belt, one road (OBOR)" provided an opportunity for the sector to export the overproduction capacity as well as industrial transformation and upgrade. As a vital industry providing raw materials to construction, building materials industry plays an essential role in energy utilization pattern of China during urbanization.

As shown in Fig. 1, energy consumption of China's industrial sector was dominated by manufacturing (about 68%), while energy consumption of building materials industry accounted for more than 16% of energy use in manufacturing. Specifically, the sectoral energy consumption increased from 80.2 MTCE in 1985 to 300.15 MTCE in 2011, indicating a growth of about 274%. In addition, the annual energy consumption increased at the rate of 5.4% during the period 1985–2011 in spite of a slight decline in the late 1990s because of the industrial restructuring. China's urbanization

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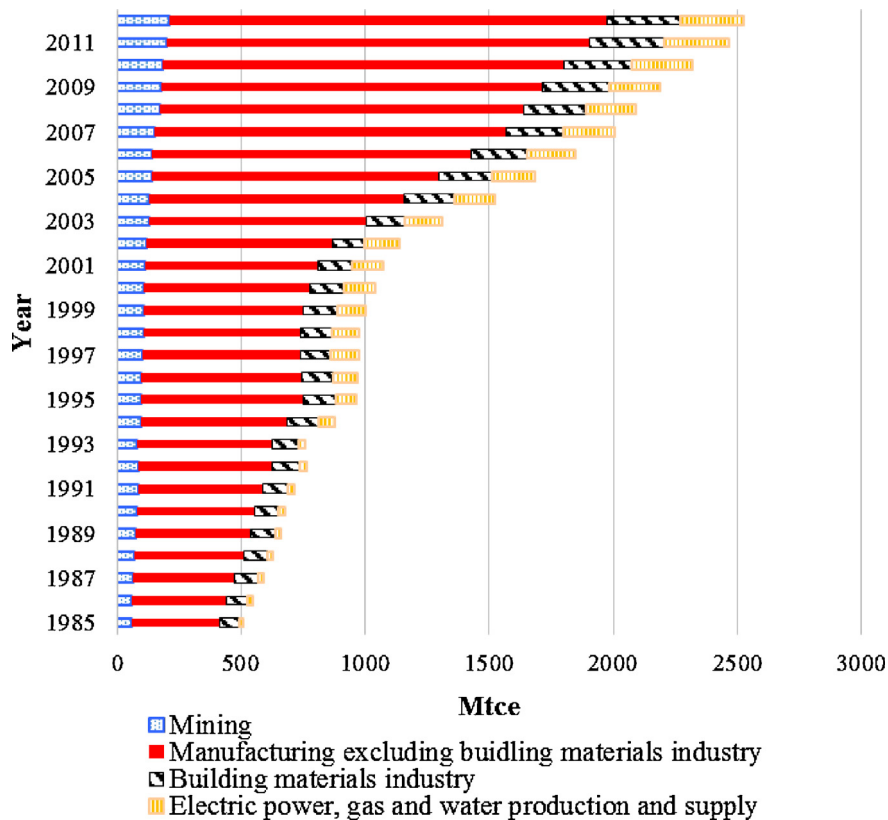


Fig. 1. Energy consumption of China's industrial sector (1985–2012).

Source: CEIC China Database [2].

process has been accelerated since the year 2000, which pushed the growth of energy demand in building materials industry at the rate of 10.2% during 2003–2011. Although the share of the sector's energy consumption in the total industrial energy use dropped slightly from 15.7% in 1985 to 12.2% in 2011, the average share was still kept at the level of 13.5%.¹

The rapid increase in the use of fossil fuels in building materials industry has brought about two issues: first, it has exerted tremendous pressure on energy resources; second, it has caused serious environmental problems. Energy consumption structure of Chinese building materials industry was dominated by fossil fuels [3]. For instance, in 2011, the sectoral coal consumption accounted for 19.5% of coal use in China's manufacturing industry. The sector's energy-related carbon dioxide (CO₂) emissions contributed by coal

were 495.11 million tons (Mt) CO₂, accounting for more than 90% of the sector's total energy-related CO₂ emissions. Coke was the second largest contributor followed by coal. Carbon dioxide emissions from the usage of coke were 16.84 Mt CO₂ in 2011, accounting for 3.1% of the sectoral energy-related CO₂ emissions. The third largest contributor to the sector's energy-related CO₂ emissions was natural gas, the consumption of which took up 13.1% of that in manufacturing. Carbon dioxide emissions from the usage of natural gas were 13.93 Mt CO₂, accounting for 2.6% of the sectoral energy-related CO₂ emissions in 2011 [4]. Based on the analysis above, building materials industry was a significant contributor to CO₂ emissions in China.

Even though building materials industry plays an essential role in China's economy as well as energy conservation and emissions reduction, not enough attention has been paid to this area. In literature, energy use of the whole industrial sector has been widely discussed in previous studies, the unique characteristics as well as development trend of energy consumption in a specific energy-intensive industry have been less systematically investigated. The novelty of this paper lies in the exploration of the influencing factors of energy usage in Chinese building materials industry based on a co-integration approach. By conducting the scenario analysis, this study further examined the future transitions of the sector's energy consumption, evaluated the sectoral energy consumption peaks, and energy savings potential under different economic-growth conditions. This study is valuable in revealing an insight into the likely trend of the sector's future energy development and the possible changes expected over the next decade. Policy suggestions are provided to address the corresponding challenges as well as to accelerate reduction of energy consumption in the sector. The remainder of this paper is structured as follows. Section 2 presents a literature review. Section 3 describes the methodology and data

¹ Manufacturing excluding building materials industry includes 30 two-digit manufacturing industries: Processing of Food from Agricultural Products, Manufacture of Foods, Manufacture of Beverages, Manufacture of Tobacco, Manufacture of Textile, Manufacture of Textile Wearing Apparel, Footwear and Caps, Manufacture of Leather, Fur, Feather and Related Products, Processing of Timber, Manufacture of Wood, Bamboo, Rattan, Palm, and Straw Products, Manufacture of Furniture, Manufacture of Paper and Paper Products, Printing, Reproduction of Recording Media, Manufacture of Articles For Culture, Education and Sport Activities, Processing of Petroleum, Coking, Processing of Nuclear Fuel, Manufacture of Raw Chemical Materials and Chemical Products, Manufacture of Medicines, Manufacture of Chemical Fibres, Manufacture of Rubber, Manufacture of Plastics, Smelting and Pressing of Ferrous Metals, Smelting and Pressing of Non-ferrous Metals, Manufacture of Metal Products, Manufacture of General Purpose Machinery, Manufacture of Special Purpose Machinery, Manufacture of Transport Equipment, Manufacture of Electrical Machinery and Equipment, Manufacture of Communication Equipment, Computers and Other Electronic Equipment, Manufacture of Measuring Instruments and Machinery for Cultural Activity and Office Work, Manufacture of Artwork and Other Manufacturing, Recycling and Disposal of Waste, Electric Power, Gas and Water Production and Supply.

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