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Relationship between Energy Consumption and Economic Growth: Empirical Study Based on Data on Hebei Province from 1980 to 2008

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Abstract

This paper uses the methods of co-integration analysis and Granger Causality test, analyses the relationship between energy consumption and economic growth of Hebei Province from 1980 to 2008. The empirical results show that there is a stable causal relation between TEC and GDP in the long run. Hebei's economic growth contributes to energy consumption growth. To change economic development mode and save energy, reduction of pollutant emission will not only impact the economic growth, but also achieve energy-saving, emission reduction and sustainable development.

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Keywords: energy consumption; economic growth; cointegration analysis; Granger Causality test introduction

1. Introduction

Today, the issues of energy and environment are concerned all over the world, and becoming more and more important in our social and economic development. With the rapid economic growth and development, the contradiction between economic growth and energy consumption is increasingly prominent. Relating to energy consumption and economic growth, domestic and international scholars have done a lot of research to discuss that has economic growth resulted in energy consumption or has the energy consumption promoted economic growth or they are.

Hebei locates in north china, and is an important province in energy production and consumption. At present the relevant research between economic growth and energy consumption in Hebei province is very limited. Therefore, this study is to analyse the relationship between GDP and the total energy consumed in Hebei province by the methods of co-integration analysis and Granger Causality test according to the data from 1980 to 2008, total 29 sets of annual data.

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2. The status of energy development and economic growth in Hebei province

2.1. The analysis of energy consumption and economic growth trends

Coal, oil, gas and electricity are the main energy consumed in Hebei province. Coal shares the largest proportion, accounting 92.35% in 2008. From 1980 to 2008, energy consumption of Hebei has increased from 312.05 to 24225.68 ten thousand tons of coal equivalent (Fig 1), increasing 7.76 times, and the average annual growth rate reaches 7.71%. The energy consumption of first industry is 612.36 ten thousand tons of coal equivalent in 2008, occupying 2.5% of the total energy consumption ;the second industry is 18487.76 ten thousand tons of coal equivalent, occupying 82.1%; the third industry is 1781.44 ten thousand tons of coal equivalent Occupying 7.4%;and the residents living consumption is 1946.36 ten thousand tons of coal equivalent , Occupying 8%. The industry still shares the largest proportion in energy consumption. In the meantime, the GDP of Hebei has increased from 219.24 billion yuan to 16188.61 billion yuan, the average annual growth rate is 10.7%. The energy consumption and GDP of Hebei shows a steady rising trend , and we can preliminarily assess that there exists some kind of relationship between the energy consumption and economic growth.

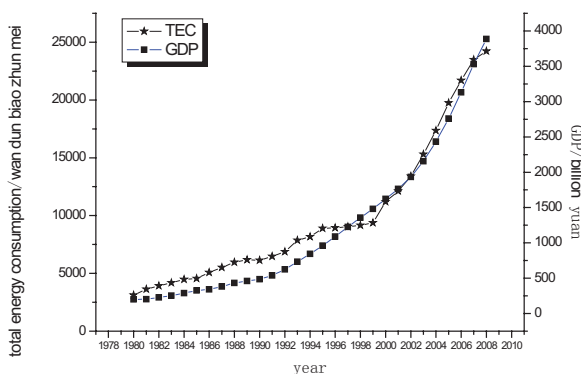


Figure 1 The trend of total energy consumption and GDP (at the constant prices of 1978)in Hebei from 1980 to 2008

2.2. Elasticity coefficient of energy consumption

The elasticity coefficient of energy consumption is a indicator which is to reflect the proportion of energy consumption growth rate and national economic growth rate.

Elasticity coefficient of energy consumption = Average growth rate of energy consumption / Average annual growth rate of the GDP

In figure 2 the curves show that the trend of energy consumption elasticity coefficient in Hebei is similar to the nation and highly fluctuates without obviously regularity. From 1982 to 2008 the average annual elasticity coefficient of energy consumption is 0.70, higher than 0.65 of the nation. Since 2000,the elasticity coefficient of energy consumption is greater than 1 (except 0.94 in 2001). It shows that the economy development of Hebei has entered a new rapid growth stage, due to the characteristics of industrial structure, rapid economic growth results from the rapid growth of high-energy industries like steel, cement and so on.

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