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Review of hidden carbon emissions, trade, and labor income share in China, 2001–2011

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HIGHLIGHTS

- This study establishes models concerning labor income share and hidden carbon emissions.
- MIMIC is established to measure the ratio of hidden carbon emissions to total discharge.
- Hidden carbon emissions have a positive effect on labor income share.
- Hidden carbon emissions have various effects on the labor income share.

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ABSTRACT

Coordinated development between the economy and the environment is currently one of the most important issues in China. By establishing models concerning labor income share and hidden carbon emissions, and taking trade as the link in their relationship, this study puts forward the scale effects, technological effects, and structural effects that relate to labor income share under the function of trade. We then establish multi-index and multi-indicator constitutive (MIMIC) equation to measure the ratio of hidden carbon emissions to total emissions, which is further considered the basis of the measurement model. Results of regression analysis carried out on labor income share show that hidden carbon emissions do have a positive effect on labor income share. In the meantime, we also prove that under scale effects, technological effects, and the structural effects of trade, hidden carbon emissions affect labor income shares in different directions. Our conclusions and policy implications are obtained from the calculated results.

1. Introduction

In recent years, many locales in China have suffered from the so-called haze weather. PM2.5 values exceeding 500 have been seen in many places in China,[1] which has resulted in an uptick in diseases of the respiratory system and consequent cardiovascular and cerebrovascular diseases. People's health and lives are being greatly threatened by these conditions, making it more pressing to protect the environment. However, environmental protection and economic development tend to run in opposite directions. Environmental improvements usually come at an economic price, while economic growth almost always results in environmental disruption or degradation. Some scholars assume that economic development in China has not yet reached a high level: as per the classical Kuznets curve in development economics, at a high level of development, the economy and the environment will grow in step with each other after economic growth has occurred and the "inflection point" has been passed. The Kuznets curve takes the shape of an inverted letter "U." Fodha and Zaghdoud (2010) also proved the long-term quadratic relationship between environmental disruption and economic development; however, other scholars assert that the inverted "U" shape actually stems from the transfer abroad of domestic pollution-intensive industries, after the economy has developed to a certain extent. The nature of the pollution has not changed; if we analyze the host country and the country with transferred pollution within a unified framework, the inverted "U" curve would be found not to be valid.

In fact, if the Chinese environment and the economy cannot "work together," then we must make the effective development of the economy the top priority. Besides the aggregate increase in economic growth, we also need to focus on the distribution to the laborers of the profits that come from economic development. For this reason, the index known as "labor income share" attracts

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[1] Serious air contamination is considered to have occurred when the PM2.5 value exceeds 20 – a value considered harmful to the human respiratory system.

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our attention. With respect to individual economic entities, it is very important to let more people share in a country's economic achievements. Research has shown that an increase in labor income share can stimulate consumption and investment, which further quickens economic development; meanwhile, a decrease in labor income share will exacerbate the income gap, burden social security systems, and enflame hostilities between capital and labor. According to the Stolper–Samuelson theorem, international trade can increase the incomes of owners that have abundant elements, while reducing the incomes of owners with scarce elements; this means that if a country with an abundant labor force (such as China) were to open up to the international market, the labor income share in that country would increase. However, what we have observed diverges from theory. Before China opened up to international trade, its labor income share stood at about 50%, but following that opening up, its labor income share fell significantly, especially after gaining entrance to the World Trade Organization (WTO) in 2001, to a value of 39.16% in 2007 (Zhang and Zhang, 2010).

People generally call an economy that has not been observed a "hidden economy" (Giles, 1999). Therefore, the carbon emissions that stem from the production and processing of intermediate products can be called "hidden carbon emissions." Studies of such carbon emissions are rare, despite the fact that they are very important. With the development of vertical specialization, the function of trade on carbon emissions becomes obvious. Many countries can acquire the products they need through importation – products which, in the process of their production, generated high levels of carbon emissions. Ahmad and Wyckoff (2003) researched the hidden carbon emissions of trade carried out by OECD countries, and found out that the carbon emissions of the countries with which they did trade had exceeded 50% of the countries in question. These findings demonstrate that the production and processing of many products that give rise to carbon emissions had typically been finished abroad and then imported into the home countries.

As vertical specialization continues to deeply develop, many countries have started the specialized production of their principal products. Some countries (Copeland and Taylor, 2001) have lowered the force of their environmental regulations, in order to strengthen their own economic advantages and national economies. Some other countries have even suggested that polluting industries in foreign countries be transferred to within their own borders. Such phenomena were more serious under free trade conditions. Research carried out by Esty and Geradin (1997) and by Dua and Esty (1997) shows that developing countries have been motivated to lower their environmental protection standards or loosen their control of environmental protections in order to attract foreign investment, and that this has resulted in the polarization of international environmental conditions. Røpke (1994) and Daly and Goodland (1994) suggest that such "race to the bottom" trade practices would make environmental standards collapse altogether in certain countries. If those hypotheses are true, then such trade would not only bring polluting industries into developing countries, but also obstruct sustainable development within their economies. Those countries will not realize their objectives, if they sacrifice environmental standards in the name of trade competitiveness. With more and more emphasis being placed globally on environmental protection, the carbon emissions content of exported goods will also be restricted. Once they exceed certain standards, those products will be handled at low prices or rejected outright. Therefore, even when one country has embraced some polluting industries itself, if the carbon emissions of its products exceed relevant standards, it would be difficult to export them to other countries. Some scholars point out that industries with high trade competitiveness are usually those with low carbon emissions (Porter, 1996). A challenging "paradox" will then arise: only countries with laggard technologies and economies will choose to lower the force of their environmental regulations, to undertake pollution-intensive production. The related products would definitely involve the production of high levels of carbon emissions. However, the management of carbon emissions levels demands the use of high technology and a strong economic base – two conditions that those developing countries would not have. Once those products are handled at low prices or rejected outright on the world market, the economic strength of those countries will be further lowered. Eastin and Zeng (2009) analyzed those factors that influence trade, using provincial panel data from 1996 and 2004; they found that there is no evidence that the fundamental reason behind the stimulation of import and export trade with China is any lowering of environmental standards.

The so-called trade environment paradox was not fully explained until Grossman and Krueger's (1995) research, which drew conclusions on the ways in which trade influences the environment, by way of the scale effect, structural effect, and technological effect. Under the assumption of increasing returns to scale, along with the clustering of pollution-intensive industries, resource-sharing and technological advancement would reduce the quantity of pollutants discharged from the production of unit products. Furthermore, if a certain country continues to expand its pollution-intensive industries, then the economic center of that country would deviate towards such industries and urge the structural transformation of the economy. The three kinds of effects of trade on the environment as put forward by Grossman and Krueger (1995) show that trade liberalization has improved the environmental quality of developed countries, while lowering that of developing countries. Based on these findings, Antweiler et al. (2001) carried out tests on 44 developed countries worldwide and derived conclusions consistent with Grossman and Krueger's theoretical model, thus proving the effect of trade on environment pollution. However, we note that Grossman and Krueger's conclusion was reached under very strict assumptions, and that if one condition was to change, the conclusion would change accordingly. Therefore, although many scholars in developing countries have researched the three kinds of effects of trade on the environment, their conclusions are quite divergent.

According to the Heckscher–Ohlin theorem, trade can lower the production cost of polluting products, and concomitantly increase the efficiency of environmental protections; at the same time, this chain of events can improve laborers' incomes and help fulfill the consumer demand for low-carbon-content general consumer goods (Dean, 2002). However, an increase in laborers' incomes is not synonymous with an increase in labor income share, for the rate of increase of labor income may be lower than that of capital returns. In such a case, the labor income share may actually decrease. On this basis, many scholars have researched the relationship between trade and labor income share. For example, Mezzetti and Dinopoulos (1991) established a model framework involving the factors that influence labor income share; they also categorized trade as import trade or export trade, to examine their effects on labor income share. The results of that research show that labor income share is driven by labor productivity and employment pressure, and that exports or imports may on one hand help improve labor productivity and reduce labor income share, while on the other hand help attract the labor force, relieve employment pressure, and increase labor income share. According to data from manufacturing enterprises in Spain, Fariñas and Martín-Marcos (2007) proved that export enterprises have the capacity to pay higher salaries to their employees – something referred to as "wage premium." Similar research has also been carried out using data from the United States (Bernard and Bradford Jensen, 1999) and Slovenia (De Loecker, 2007).