Resources, Conservation & Recycling 133 (2018) 242–249

Contents lists available at ScienceDirect

Resources, Conservation & Recycling

journal homepage: www.elsevier.com/locate/resconrec

Full length article

How does demographic structure affect environmental quality? Empirical evidence from China

Zongyong Zhang[a,f,1], Yu Hao[a,b,c,d,e,*,1], Zhi-Nan Lu[g,h,1], Yuxin Deng[a]

[a] School of Management and Economics, Beijing Institute of Technology, Beijing, 100081, China
[b] Center for Energy and Environmental Policy Research, Beijing Institute of Technology, Beijing, 100081, China
[c] Sustainable Development Research Institute for Economy and Society of Beijing, Beijing, 100081, China
[d] Collaborative Innovation Center of Electric Vehicles in Beijing, Beijing, 100081, China
[e] Beijing Key Lab of Energy Economics and Environmental Management, Beijing, 100081, China
[f] Tyndall Centre for Climate Change Research, School of International Development, University of East Anglia, Norwich, NR4 7TJ, UK
[g] Thrombosis and Vascular Medicine Center, State Key Laboratory of Cardiovascular Disease, Fuwai Hospital, Chinese Academy of Medical Sciences and Peking Union Medical College, Beijing, 100037, China
[h] Cardiology Department, Centro Hospitalar Conde de São Januário, Macao, 999078, China

ARTICLE INFO

Keywords:
Demographic change
Environmental quality
CO_2 emissions
Provincial panel data
China

ABSTRACT

China is currently at a crossroads with an aging population and steadily decreasing economic growth rates. In this context, China's demographic policy may impact environmental quality through changes in energy usage and the demographic influences on economic development. Using panel data from 29 Chinese provinces for the period between 1995 and 2012, this study explores the relationship between the demographic structure and environmental quality in China. To accurately examine this relationship, the total effect is further divided into direct effect and indirect effect, which functions in an indirect way through the influences of demographic changes on economic growth. A comprehensive framework composed of a carefully designed two-stage regression model is employed to estimate both the direct and indirect effects of demographic changes on CO_2 emissions. The generalized method of moments (GMM) method is used to control for potential endogeneity and introduce dynamics. The empirical results indicate that the direct effect of the share of the working-age population on CO_2 emissions is positive, while the indirect effect depends on the specific level of GDP per capita because there is evidence of an inverted U-shaped relationship between CO_2 emissions and GDP per capita. At the current stage of economic development, the total effect is positively associated with the share of the working-age population. Therefore, an aging society, although detrimental to economic development over the long term, might objectively alleviate China's environmental pressures to some extent.

1. Introduction

Currently, China's economy has entered the phase of "new normal, which means the economic growth rate will decrease considerably from its prior breakneck speed to a moderately high level.[2] During this period, the transition of China's economic structure has progressed rapidly. Meanwhile, energy and environmental pressures continue to increase, as China's emissions of various pollutants and greenhouse gases (GHG, especially carbon dioxide or CO_2) seem to have no peers worldwide. To relieve these pressures, China made a solemn promise at the 2014 APEC meeting to reach a peak of carbon emissions by 2030 and vowed to attempt to achieve this goal earlier. Concomitantly, China's age structure (juvenile, adult, or aging type) is also changing profoundly, as evidenced by a low fertility rate, a booming senior population, and a decreasing labor force (Golley and Zheng, 2015). For example, according to the National Bureau of Statistics (NBS), the share of the population aged 0–14 steadily declined from 22.9% in 2000–16.6% in 2010; conversely, the share of the population older than 65 increased from 7.0% to 8.9% in this period. However, the working-age labor force (15–64 years old) has stopped increasing. Confronted by these changes, Beijing further eased the one-child policy that persisted for more than three decades, and implemented a universal two-child

* Corresponding author at: School of Management and Economics, Beijing Institute of Technology, Beijing, 100081, China.
E-mail addresses: zongyong8090@163.com (Z. Zhang), haoyuking@bit.edu.cn (Y. Hao), lzn1982hy@163.com (Z.-N. Lu), dyx9404@163.com (Y. Deng).
[1] These authors contributed equally to this study and share first authorship.
[2] For more information and discussions about China's "new normal", see http://www.bbc.com/news/business-34344926 and https://www.ft.com/content/28ea640e-ef62-11e5-aff5-19b4e253664a?mhq5j=e1.

https://doi.org/10.1016/j.resconrec.2018.02.017
Received 4 November 2017; Received in revised form 14 February 2018; Accepted 14 February 2018
0921-3449/ © 2018 Elsevier B.V. All rights reserved.

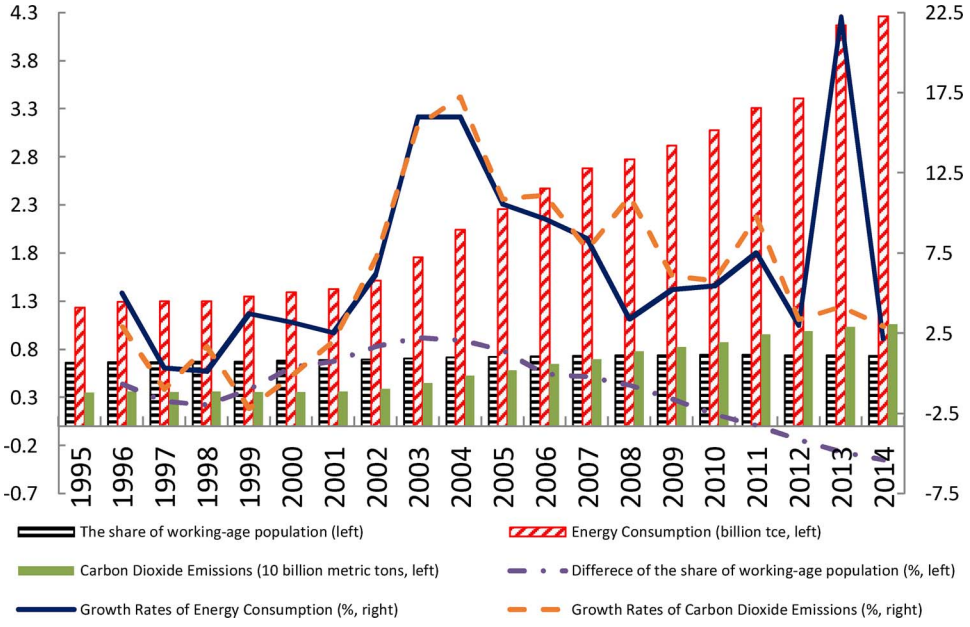

Fig. 1. Depiction of China's working-age population proportion, energy consumption, carbon dioxide emissions, and corresponding annual-growth rates, 1995–2014.
Notes: The data on the working-age population were compiled from the China Statistics Yearbooks (various years). The data on national energy consumption were collected from China Energy Statistical Yearbooks (various years). The data on China's national CO_2 emissions were obtained from the PBL Netherlands Environmental Assessment Agency (accessed at http://www.pbl.nl/en/publications/trends-in-global-co2-emissions-2014-report and http://infographics.pbl.nl/website/globalco2-2015/). The annual-growth rates of the indicators were calculated by the authors.

policy on October 29, 2015. This policy could be regarded as a moderate amendment of the strict one-child policy. According to the National Health and Family Planning Commission, the two-child policy will add 30 million people to the labor supply by 2050[3]

Fig. 1 simultaneously depicts the China's working-age population share, energy consumption, and CO_2 emissions from 1995 to 2012. The growth rates of the three variables follow a similar trend, rising from 1995 to the mid–2000 s (although to different degrees) and declining afterward. Although this observation is not remarkable, the general trend is obvious: the working-age population may be closely related to CO_2 emissions through economic development and changes in energy consumption. It is also noteworthy that in recent years (especially after 2011), the growth rates of China's CO_2 emissions have obviously decreased, although total energy consumption continued to grow at a relatively robust pace. As Green and Stern (2017) summarized, a recent slowdown in China's CO_2 emissions was likely caused by improvements in the energy mix (i.e., an increase in the share of renewable energy and a reduction in the use of coal; Ye et al., 2017), the enhancement of energy efficiency, and the transformation of China's economic structure. As demonstrated by many early studies that population growth leads to increased environmental pressure (O'Neill et al., 2012; York, 2007; Wei and Hao, 2010), the universal two-child policy may add considerable pressure to China's energy consumption and environmental quality.[4]

Will China's environmental quality be influenced by this age structure change or not? This question still needs to be answered due to few studies in this field, especially in terms of possible mechanisms. Generally speaking, a decrease in the child dependency ratio[5] in a community is seen as an alleviation of the labor burden in the age structure because this leads to a 'structural dividend,' which means that affluent labor resources improve the economy, the so-called demographic dividend,[6] as has been the case with China's development. However, this advantage seems to have already been gradually exhausted as indicated by the age structure data above, and as found in recent studies such as Zhong et al. (2013). Therefore, to mitigate the pressure to reduce GHG emissions and maintain moderately high growth, China needs to take full advantage of the demographic dividend during the age structure changes and avoid possible adverse effects on its economy and environment. This paper investigates the relationship between the age structure and environmental quality in China to help optimize the population structure and reduce GHG emissions in this major global economy.

In this regard, the contribution of this study is twofold. First, this paper for the first time focuses on the relationship between the aging population and energy consumption-related emissions in China. Second, the direct and indirect effects of demographic changes on environmental quality are distinguished and examined using a well-designed two-stage regression model. Moreover, the generalized method of moments (GMM) method is utilized to control for potential endogeneity. As a result, the estimation results of this study could provide important and meaningful policy implications to corresponding policy makers to cooperate and coordinate population policies and environmental regulations.

The rest of this paper is organized as follows: The second section contains a brief literature review of relevant studies. The third section introduces the method and data utilized in this study. The fourth section presents the main estimation results and corresponding discussions. The fifth section concludes the study and presents policy implications. Finally, the last section summarizes the main limitations of this study and provides possible future research directions.

[3] This statement is from a news briefing by the National Health and Family Planning Commission on November 10, 2015. More details (in Chinese) are available at http://news.dichan.sina.com.cn/2015/11/12/1137610.html, http://finance.sina.com.cn/China/20151030/132923631748.shtml, and http://theory.people.com.cn/n/2015/1130/c40531-27870229.html

[4] Except for the age structure, the absolute amount of population also influences economic growth and environmental quality. For example, the process of population growth may have a positive impact on development because of economies of scale (Liu and Hu, 2013). In other words, as noted by Peng (2011), sustained population growth will inevitably exert a significant impact on China's pollution problems. Some studies also emphasized the effects of a high population density because a crowded population usually puts pressure on resources and the environment (Liu and Hu, 2013).

[5] The dependency ratio refers to the ratio of youth, children, and the aged to the total population (aged 15–64). The terms "youth" and "children" refer to those younger than 14, while "the aged" refers those over 65. Based on these definitions, the child dependency ratio is the average number of children raised by one couple.

[6] In addition, according to previous studies on the impact of population changes on economic development, there is another reason for a population dividend except for the decline in social dependency. This is the changes in the new saving motivation, referred to by some scholars as a "second demographic dividend" (Mason and Lee, 2006; Wang and Mason, 2007; Cai, 2010; Lee and Mason, 2010). In other words, along with increasing life expectancy and the aggravation population aging, people are motivated to save for their quality of life in their senior years and accumulate more assets during their working years, which may also be conducive to economic growth. However, investigating the mechanism of the second demographic dividend is beyond the scope of this paper.

Download English Version:

https://daneshyari.com/en/article/7494287

Download Persian Version:

https://daneshyari.com/article/7494287

Daneshyari.com