

Preface

Global change is a challenge that mankind faces. Therefore, tackling global change is an important task of scientists. I am a geographer and I have been working on China's historical climate change issue for a long time. We have a unique advantage in this study because of the vast history of China. However, in 1999, I gradually realized the importance of tackling climate change, and China as a superpower should play a greater role in the study. I began to study the problem of global climate change economics according to the requirements of Chinese Academy of Sciences in 2007; further, I found that this is a complex scientific problem combined with physical science and economic science. At this time, the published paper of Prof. Nordhaus and Prof. Yang at AER in 1996 lits up me like a lighthouse, through which I feel that the core problem is IAM.

The global economic crisis took place in 2008 when China was facing two problems: on the one hand, actively involved in tackling global climate change, which the Chinese government put forward the “energy saving and emission reduction” policy; on the other hand, any country's “energy saving and emission reduction” measures are likely to affect other countries and the world economy under the background of economic integration. The reduction measures of multi-countries economic interactions need to be studied facing the global economic crisis. But at this time, all the IAMs I have studied have no economic interaction among countries, and therefore we need to do new exploration. In 2010 we introduced Mundell-Fleming mechanism and technology advances into the popular RICE model to construct MRICE (multifactor RICE), and its first application is the calculation of emission reduction effect of Sino-US economic interaction in a global common emission reduction, which was published in *Economic Modeling*. Since the simulation requires software development, my graduates Lili Cui, Yihong Jiang, Yiping Zheng, Huaqun Li, Huanbo Zhang, Gangqiang Li, and Jing Wu have been taking part in the work. Jing Wu eventually wrote MRICES software system using C#. At then I pay a visit to Prof. Nordhaus, who gave a friendly reception to me and my assistant, answered some of my questions, and presented me the book of him and Dr. Boyer. In 2012, after improving the characterization of technological progress,

Jing Wu, Shuai Zhang, and I completed MRICES-2012, which were released as a public software.

In 2012, I was fortunate to know Prof. Zili Yang. Common scientific understanding and the affection as Chinese linked us together. We had meaningful discussions and he suggested us to focus on mixed emission reduction and game theory. After 2012, we received a joint support from basic scientific research of Ministry of Science and Technology of China and Chinese Academy of Science, and completed the study on EMRICES in 2014. During this study, my graduates Qianting Zhu, Changjiang Shao, Rui Huang, and Changxin Liu took part in this work. As Jing Wu is the backbone of the first phase of the study, Changxin Liu is the backbone of the second phase. Compared to MRICES-2012, carbon trading analysis, sea level rise, and carbon tax impact analysis are included in EMRICES. Unfortunately, due to various reasons, the impact analyses of sea level change, carbon tax, and pollution tax are developed only in China's module in EMRICES, although it is theoretically possible in each economy.

Both MRICES and EMRICES include the keyword RICE to label that it is developed on the basis of RICE. There is a Chinese proverb, "when you drink water, never forget the man who digs the well." MRICES and EMRICES use of the word RICE to express our respect and gratitude to Prof. Nordhaus and Prof. Yang.

CIECIA in this book is another system we developed which is funded by the basis science research project of Ministry of Science and Technology of China. For the development of this system, we visited Prof. Caldeira at Stanford University, and he discussed the algorithm of the carbon cycle model. CIECIA model for depicting the technological progress and industrial structure evolution introduced the mechanism of evolutionary economics. The global economic system is based on global model from Dr. K.Y. Jin's paper published at AER in 2013 combining with our country economic interaction model. In principle, it is a global general equilibrium model, reflecting the global economic integration, so it is more suitable for studying global carbon governance issues. We hope this model can lead to more scholars' interests to global climate change governance under innovation and global economic integration.

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