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Original Articles

Analytical approach to win-win game analysis for Chinese and Japanese development assistance strategies in Africa

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ABSTRACT

Still influenced by the cold war thinking, many countries – especially looking to new rising powers – might interact in the international scenario through competition, instead than cooperation. However, China has seen more opportunities in cooperation than challenges in competition. Since 2013, Chinese president Xi Jinping pointed out clearly in various public occasions that this world has become a community of common destiny. In this paper, we used an asymmetric dynamic evolution game model, adding the hypothesis of win-win game, to analyze why China would like to choose the strategy of cooperation, rather than competition, in international affairs. We applied this analytical framework to the case study of Chinese and Japanese environmental assistance programs to Africa. We found that, based on the traditional game theory, under the hypothesis of the cold war mentality, China and Japan may act as mutual rivals. Under this circumstance, China, as an emerging developing country, will more likely choose the strategy of competition, rather than cooperating with other countries. Instead, Japan, as a traditional developed country, will more likely choose to cooperate, rather than competing with China, especially if the expected cost of the failure of the competition is high. However, in the new hypothesis of win-win game analysis, we found that cooperation strategy on development assistance to Africa is more likely a rational choice for both China and Japan. Thus, we suggest that China might keep practicing its win-win strategy and do not use the outdated zero-sum game and winner-take-all strategy as some of its counterparts may probably do. This analytical framework can be applied to other international affairs involving China and other countries.

1. Introduction

According to the Organization for Economic Co-operation and Development (OECD)'s definition, Official Development Assistance (ODA) includes grants provided by the government for economic development and concessional loans (IMF, 2003). However, in a new book by Lin (2016), the World Bank former chief economist, he affirmed that OECD's definition of development assistance is too narrow. Instead, being economic development the main purpose of ODA, all instruments serving this target, such as investments, trade, aid, and cooperation, should be included, as long as they support the increase of recipients' welfare (see Tables 1 and 2).

Looking to ODA with the same perspective of Lin (2016), it is also possible to analyze environmental cooperation, for example to fight against climate change and protect the ozone layer, which have attracted much attention nowadays. In fact, this also kind of assistance includes funds, technology and environmental expertise applied to developing countries (Yao et al., 2004). Being the second largest economy of the world after the United States, China increased its foreign investments, reaching $145.67 billion in 2015 (second after the United States' $300 billion) (The Blue Paper of Chinese Enterprise Globalization, 2016).

Africa has received much development assistance from international community in the past 80 years. In recent years, US, Europe, Japan and other donor countries began to pay close attention to African investment assistance with more proved reserves of oil and natural resources in Africa. In parallel, China had a sharply increased its large scale investments for assistance to Africa. Sino-African bilateral trade volume surged rapidly, with an average annual rate of 30% in the past decade, from 10 billion USD, in 2000, to more than 200 billion USD in 2015. By the end of 2015, China recorded more overseas investment in Africa (26 billion USD) than the USA (22 billion USD). Now, the Chinese initiative

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Table 1
Chinese promised assistance to Africa.

Year	Amount of total assistance (million dollars)	Number of recipients
1988	60.4	12
1989	223.5	24
1990	374.6	43
1991	302.9	36
1992	345	55

Table 2
Value of China-Africa import and export trade in 2012–2017.

Year	Amount of import and export trade (billion US dollars)	Year-on-year growth
2012	198.49	–
2013	210.24	5.9%
2014	221.88	5.5%
2015	179.03	−19.3%
2016	149.2	−16.7%
2017	169.75	13.8%

of “one belt one road” is expected to further promote the Chinese foreign investments, particularly in African infrastructures, increasing the opportunity of Chinese enterprises’ investments as well.

However, China should pay more attention to environmental problems during foreign assistance actions, transferring environmentally friendly technologies (Shahbaz et al., 2015). In this sense, the Asian Infrastructure Investment Bank (AIIB) already locked priority investment areas, such as energy, transportation, water supply and wastewater treatment, environmental protection, rural and urban development and logistics, planning to lend 1.5–2 billion USD in the first year. This is also a side-effect of Paris Agreement, promoted by United Nations conference on climate change (UNFCCC) in December 2015.

Japan too is investing in African assistance. It is possible to trace the history of Japanese-African cooperation, dividing it in four phases: The beginning stage (1966–1973); The adjustment stage (1973–1992); The strategic transformation stage (1992–2003); The adjustment and a new development stage (2003 – present). Japan's present ODA goal is “to ensure the recipient country's prosperity, promoting the peaceful development of the society”. The basic principle of Japan's ODA latest adjustment occurred in year 2015. In particular, it didn’t not only the programme name changed from “the outline of development aid” to “the outline of development cooperation”, but it also put forward the policy of “advance the civilian sector cooperation”. In 2016, Japan announced the implementation, in the following three years, of a 10 million USD “talented person training plan”, as well as a plan to invest 30 billion USD in Africa. In this stage, the Japanese assistance to Africa has gradually changed from “development aid” to “strategic assistance”. The major field of China’s investment assistance to Africa is social infrastructures construction. This, inevitably, had variable impacts on the local environments. In 2007, some environmental groups pointed out that some of the existing Chinese water conservancy projects potentially were harming the indigenous populations and the environment. Thus, in recent years, China’s investment assistance to Africa has paid more attention to the climate and environment. For example, China's assistance to Africa, in 2009, included 100 clean energy projects, such as solar energy, biogas and small hydropower. The cooperation on environmental protection was clearly mentioned by Chinese president Xi Jinping during the Forum on China-Africa Cooperation (FOCAC), being included in Green development, one of the ten existing Cooperation Programs.

On the other side, also Japan paid closer attention to global environment protection and climate changing problem with the entrance of 21st century. Especially in recent years, Japan has made the environmental protection of African countries as an important part of the assistance programmes. In particular, Japan is providing assistance to Africa by studying the climate-related issues of African environment and performing some infrastructure programs for disaster prevention and medical support. For example, Japanese actions are providing safe drinking water to the African countries, which are suffering from flood or draught disaster and building protections for villages in Kenya against floods. Japan is offering environmental management support and taking some real actions in order to improve the environmental quality of African Countries.

Considering the necessity of coordinate action and the need of mutual benefits among Countries in developing aid programs, this paper investigates the potential of Overseas Development Institute (ODI) environmental friendly actions toward Africa, based on game analysis, focusing on China and Japan as investing Countries.

Game theory is a common method for the study of international disputes (e.g.: Schubert and Lambsdorff, 2014; Arena and Pechenkina, 2016; Bas and Schub, 2016). In classical game theory, under Nash equilibrium hypothesis (Nash, 1950), a strategy is chosen, under the condition of rationality of the participants. For example, considering both the consensus and disagreements between China and the U.S. on the climate change problem, Jin et al. (2014) built a strategic simulation model, based on game theory, to discuss the ongoing negotiation strategies. However, irrationality, repeatability and longevity problems of the participants’ actions are ignored, as well as the variable nature and evolution national benefits and interests.

On the other side, the evolutionary game model with bounded rationality has been extended from the biological research field to the economic one, on the basis of interdependence among participants’ behaviors. Friedman (1991) was the first who started to expound the theory of evolutionary games, which was used in economics. Van der Laan and Tieman (1998) discussed the main concepts of evolutionary game theory and their applicability to economic issues. Hodgson and Huang (2012) discussed the origins and research orientations of evolutionary game theory and evolutionary economics, concluding that the collaboration of these two genres can enhance the understanding of structures and causal processes in the world. In the evolutionary game model, participants with bounded rationality will change their strategic choice based on the development situation.

The evolution of groups, which is another important factor to consider, is characterized by both selection and mutation processes. In parallel, replicator dynamic equations assure the equilibrium of Evolutionary Stable Strategy (ESS) (e.g.: Taylor and Jonker, 1978). In particular, for the political and economic benefits and long-term development, participants will adjust the strategies all the time along the game process. Finally, the participants will find their most balanced strategy to fit their own interests. Jin et al. (2015) analyzed the dynamic evolution process of regional environmental protection programme based on an evolutionary game model when the payoff matrix is dynamic rather than static. Li and Chen (2015), as well as Liu and Chen (2016), discussed the factors affecting the energy cooperation between China and central Asian Countries, based on evolutionary game model. Then, they derived several policy recommendations to strengthen Central Asian countries cooperation willingness. Bai et al. (2017) constructed a Sino-Japanese evolutionary game model to analyze the tendency of Japan’s behavior strategy selection on the fishery resources and considered the essence of the competition between China and Japan as a repeated dynamic evolutionary game.

Through the literature review in the evolutionary game theory, using the second approach, applied to an asymmetric evolutionary game (e.g.: Samuelson and Zhang, 1992; Sethi and Somanathan, 2001), this paper will derive whether a win-win situation is theoretically feasible.