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Sustainable policies and strategies in Asia: Challenges for green growth

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ABSTRACT

Due to the ever-increasing pressure of environmental crises stemming from natural disasters, it is worthwhile to analyze the new paradigm of sustainable challenges in the context of green growth policies and green IT strategies in the Northeast Asian region, based on performance-oriented governance. The primary aim of this special issue is to study and identify new conceptual characteristics associated with this revolutionary paradigm shift in the field of innovation in Asia. It is crucial to discuss the theoretical modeling underpinning these green growth and green IT strategy case studies. Diverse comparative studies on these policies and strategies would assist us in understanding the paradigm shift taking place in the area of performance-oriented green growth, an aspect important for the future of global economy and social change. As a workable mechanism, most papers emphasize the leading role of the government to facilitate the governance on the green growth.

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1. Introduction

The world economy and global community has been significantly affected by the most rapidly changing paradigm shift in Northeast Asian countries (OECD, 2014; Rozman, 2004). The effective leadership of the government and the selective concentration by the global business leaders in this region has led to this initial stage of dynamic performance (Choi, 2015a). In the early 2000s, China became known as the global factory, due to the huge inbound FDI produced at the lowest costs in the world. However, this rapid growth made a big challenge for the government to fight against severe environmental crises. China became the world's largest consumer of coal, using about 45% of the global total in the year 2010. It is also the largest emitter of CO₂. Recently, industrial air pollution such as particulate matter smaller than 2.5 μm wide (PM_{2.5}) and other GHG levels have been seriously high in China. Berkeley Earth released a study showing that air pollution kills an average of 4000 people every day in China, or 17% of all China's deaths. For 38% of the population, the average air they breathe is "unhealthy" by US standards (Berkeley Earth, 2015). Likewise, Japan, due to the lack of any natural resource such as coal, has depended heavily on nuclear energy for the past half century. Since nuclear energy is more beneficial than fossil fuels in terms of carbon emissions and has lower unit production costs, Japan became the third biggest user of nuclear energy, with

54 commercial reactors nationwide. Japan had depended on nuclear reactors for one third of its energy. Unfortunately, the tragic Tōhoku earthquake and tsunami on March 11, 2011, destroyed and damaged 17 of these reactors and due to increasing panic about nuclear instability following the meltdown at the Fukushima Daiichi nuclear plant, the Japanese government proclaimed a zero-nuclear economy. In order to overcome the environmental crisis, the Chinese government declared "war against pollution" at the opening of the annual meeting of parliament in March 2014.

Korea is not the exceptional for this environmental crisis. Every year in the spring, yellow sand storms from Mongolian deserts travel to the Korean peninsula, an event that has become much more serious recently because sand storms bring with them the industrial toxic air of the Northeast China. However, the Korean government emphasized much on the advance e-government or government 3.0 to overcome these environmental mishaps. Using an idea labeled smart revolution, the government tried to utilize all these new challenges as the opportunities toward the green growth. Other Asian countries are on the same path even if each country may be operating at different speeds and display different efforts toward green growth. Since these countries are proactive in establishing themselves in the frontier of information and communication technology (IT), it could be insightful for global community to learn more about green growth strategies within the context of green IT. Especially, global companies in the region started out by employing catch-up strategies to overcome the challenges of fierce price competition, their subsequent espousal of innovative strategies in green growth, with the strong support of government policies, has gone a long way in

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establishing them as new trendsetters (Choi, 2015a). All these new challenges in the region should be analyzed in more detail based on their sustainable performance because it is vital to understand why some firms are more innovative and develop more innovative projects than others, and what determines innovation performance. It is this premise that is the basic proposition for this special edition.

Many researchers point out that most Asian companies have been directly or indirectly managed by government, and thus it is a formidable challenge for these companies to maintain sustainable performance under the fierce pressure of the government for the green growth (Buckley, 2009; Choi and Lee, 2009). In its leading role, the government could result in very effective performance, but only in the short term or in initial stages (Gao, 2015). As we shall see in this special edition, the pro-active role of the government leadership has been losing its competitiveness over time (Choi et al., 2010), and thus governance factors on the green growth become much more important as the Asian countries enter the second stage of green growth. Therefore, it will be crucial to discuss the theoretical modeling underpinning these government policies and business strategic case studies in the most dynamic countries in the world.

2. Issues in the governance of green growth

The most important issue with green growth is the characteristics of the governance with regard to policies and/or business strategies. In this special edition, governance is defined as the workable mechanism for sustainable performance of the collaboration network (Choi, 2015a, p.2). Most previous definitions on governance emphasize the process to establish cooperative performance. Especially, green growth has a two-dimensional face of Janus to the national economy. It may give the new opportunity for a company to improve management effectiveness, cultivate competitive advantage, create a good image, and finally participate in the sustainable development. At the same time, it results in a riskier environment with higher costs and detrimental effects simultaneously. Song Hang and Zhao Chunguang in this special edition conclude that highly risk-taking companies to promote the social responsibility fulfillment can significantly reduce their operational risk as well, while publishing independent social responsibility reports leads to significantly increased operational risk. It implies if the government or a company just tries to marginally participate in the green growth activities with show-up effect only, then its performance on the published reports may be an unexpected pitfall to them in the future. In order to avoid this situation happened in Volkswagen Dieslegate (Volkswagen emissions scandal), a company should make more serious efforts, instead of just showing off effects. On 18 September 2015, the United States Environmental Protection Agency (EPA) issued a notice of violation of the Clean Air Act to German automaker Volkswagen Group after it was found that Volkswagen had intentionally programmed turbocharged direct injection (TDI) diesel engines to activate certain emissions controls only during laboratory emissions testing. To meet its advertised nitrogen oxide (NOx) output level, Volkswagen has had to recall about eleven million cars worldwide, and in 500,000 in the United States, during model years 2009 through 2015. Green growth must avoid superficial advertising for recruiting more customers in the short-term, because if a company does not provide sustainable governance on these performances, it may return as the long-term huge loss, sometimes even no future for the company.

As shown in the Volkswagen Dieslegate case in the United States, the role of government toward green growth is so crucial (Terra et al., 2013). In the research and development process in Japan, Shunsuke Managi examined the determinants of green technology invention, and find out that the patent applications related to emissions trading increased rapidly among private companies, mainly due to their increased priority after 2005. Clearly, the Japanese government gave strong pressure for the Japanese companies to make efforts to improve its

environmental efficiency in 2005, and it made a great potential advantage for companies to enhance their technologies more pro-actively.

Needless to say, most of sustainable development policies require the volunteering partnership among the public, and most of sustainable management strategies also demand the trustworthy leadership in the collaboration network management (Choi, 2015b). Hao jiao, Y. Dan, and M. Gao analyzed the moderating effect of ownership on the relationship between entrepreneur competitiveness and its technology innovation, using 788 listed Chinese companies. They find that Guanxi network ability, social responsibility ability and strategic leadership have a significant effect on technological innovation. Here, they brought the unique cultural factor of Guanxi, a social human network with full responsibility and loyal trust each other (Choi and Jin, 2015, p.13616). Guanxi may give the strong, more proactive motivation for all the partners in the cooperation network. Yu Cui, Chuan Sun. and Hongjun Xiao also analyzed the moderating effect of risk propensity on agility of the business leaders, and concluded that the effect of alertness to business ideas on innovativeness, risk-taking and pro-activeness are both positive and significant assets in the Chinese companies.

All these micro-level analyses emphasize the pro-active role of the business leader and business culture for the sustainable performance (Turró et al., 2014). However, sometimes misleading guidance of business strategies and economic policies may lead to an unsustainable practice based on poor advertising practices as well. Qunwei Wang et al. empirically tested the innovation efficiency for 38 Chinese new energy enterprises from 2009 to 2013, and found a phenomenon of "focusing less on R&D, emphasizing market too much". The innovation activities in most enterprises are considered extensive but inefficient. It implies that most of Chinese companies want to show to the government and public for their efforts for green growth, but they do not care about the real performance of their innovation efforts. Among all the renewable energies, the R&D efficiency of solar energy enterprises showed the lowest, implying that the government support on the solar energy industry did not work well. Kung, Zhang and Kong analyzed also the problematic over-exploitation and too much intensive use of nonrenewable fossil fuels in China, and found that an inappropriate subsidy amount resulted in inefficient resource allocation, and over-exploitation of it. Song and Wang analyzed the environmental bias in technological progress, and found that China's degraded environment in recent years can be attributed to the production bias of technical progress, coming from an aging society, implying that that an increase in the ratio of an aged population will reduce the labor force input as well as stimulate pollution-based technical progress, and reduce total savings conversely. In the empirical test of companies in Taiwan, Chen and Hung also found that the organizational attitude, perceived behavioral pressure, environmental consciousness of consumers have a significant positive effect on the selection of green products, while the subjective norms and the social indirect impression by consumers are not significantly related to the intentions toward using green products. Poyang Lake is the largest in-land lake in China surrounding three provinces of China, and thus the Central government of China has been promoting the Poyang Lake Eco-economic Zone (PLEEZ). Using a global metafrontier Luenberger productivity indicator (GMLPI), Yu et al. analyzed environmental total-factor productivity of PLEEZ and found that the establishment of PLEEZ is partially effective only in encouraging eco-innovation, while PLEEZ is lacking an eco-leadership effect, resulting in the huge loss in energy efficiency in the region. In order to boost the GMLPI, it needs the regional specific different treatment in more systematic way. Choi (2015a) proposed all these kinds of showing-off activities as the consultocracy, and it results in the missing link in the governance for the sustainable performance.

The second most important issue to understanding the dynamic changes in Asian countries in the context of green growth is urbanization (Zhao and Wang, 2015). Due to the complex relationships between resources, energy, urbanization and the environment, it is imperative to explore methods that maximize eco-friendly efficiency and reduce

environmental pollution to achieve green growth (Guo, 2015). Li, Chi and Wang evaluated the interrelationship between urbanization and energy efficiency by the total-factor energy efficiencies of 29 provinces in China. They concluded that almost two-thirds of the measured provinces are in energy inefficiency but have been improving obviously and slowly, an indicator of the huge potential for green growth. It implies that the fine tuning of the government policies on specific regions is required to get more field-oriented performance, because even in the same region it may give different energy efficiency. Xie, Wang and Choi also analyze the dynamic changes of industrial land green use efficiency (ILGUE) for the four main industrial zones in China during 2003–2013 using the global generalized directional distance function (GGDDF) and global Malmquist-Luenberger index approaches. By the same token, Li, Chi and Wang, Xie et al. also found that there is some heterogeneity on the provincial performance of ILGUE. It should be noteworthy that the central government land policies are effective only in the Beijing-Tianjin-Tangshan (BTT) zone, while the land financing policy by local governments showed a negative effect on improving ILGUE except in the Yangtze River Delta (YRD) zone. It implies that the urbanization policies should be managed with field-oriented vigilance. Reckless urbanization nationwide has already resulted in the serious unbalance between the demand and supply of the so precious land, due to these so hasty urbanization policies both by the central as well as the local governments in China.

To harmonize field-oriented policies toward the green growth, indirect and predictable policies are so important that it could guide the optimal path control for the public-private partnership (PPP). Rui Zhao et al. analyzed the simulated optimal path control on the green growth by the carbon reduction labeling scheme. System dynamics is applied to simulate the created game model and we analyze two scenarios, namely the individual and combined intervention of incentive policies. The simulation results highlight that both a direct subsidy and preferential taxation positively influence the implementation of the carbon reduction labeling scheme. Moreover, a combination of these two policies of a carrot-and-stick approach is more efficient to drive the implementation of the carbon reduction labeling scheme.

It is interesting that most of papers emphasize the undesirable effect of the government leading role, even if they admit the positive side, and thus field-oriented more specific, but indirect role of the government policies are much important in the long-term for countries in the take-off stage toward the green growth (Tan et al., 2016).

3. Methodology issues on the green growth

Green growth is a very complicated process to create not visible, short-term profit, but *invisible values* for clean and more dependable ecosystems, healthier and high-quality life enhancement, and still further economic growth (Choi, 2015b). Even if diverse discussions and efforts for all the goals and objectives of the green growth issues have moved toward green growth, none of the resulting methodologies or approaches tells us clearly how much the resulting outcome is sustainable. Nonetheless, most papers in this special edition handle conflicting interests in a much harmonized, systematic multi-inputs/outputs model for their analyses because traditional simple regression approaches may not match with these issues. One of the most popular methodologies to handle the multi-input/output models is data envelopment analysis (DEA) approaches and structural equation modeling (SEM).

DEA is especially important in the field of environmental economics since it handles desirable outputs as well as undesirable outputs such as CO₂ (Choi and Zhang, 2015). DEA and its enhanced approaches are used in papers of Song and Wang, Qunwei Wang et al., Yanni Yu et al., Le Li et al., Hualin Xie et al. Clearly, DEA and its enhanced modeling explains the substitution effect between the economic growth and environmental protection in more systematic way. SEM is also another popular approach for handling diverse survey related issues because it clarifies the

role of intermediation resulting from the complexity among the diverse variables. Chen and Wang, Hao Jiao et al. used SEM to find out the moderating effect on the stepwise approaches toward the green growth.

Very uniquely, Shunsuke Managi used a decomposition analysis framework to identify the factors driving environmental patent applications in Japan. Using mathematical decomposition, it analyzed the overall weight of each strategic variable for the contribution of the green growth. On the contrary, Rui Zhao et al. used the system dynamics (SD) to find out the simulated outcomes of the different carbon reduction labeling policies. Even if SD is based on the articulated manipulation of the simulation, it gives many insights into the synergy effects on optimal path control.

There are two other papers in the special edition. Since the sustainability is a complex issue, Kung et al. used the price endogenous modeling. They developed a Jiangxi Agricultural and Environmental Sectors Model (JAESM) to examine the feasibility and potential contributions of renewable energy development in terms of all the independent variables such as bioenergy production, farmer revenue, government expenditure (subsidy) and environmental benefits (GHG emission reduction). Song and Zhao utilized diverse time series regression models with the panel data for the corporate social responsibility. Since the sustainable management involves too many complicated, yet complex process, it may not be suitable for the general regression, and thus they used many proxy variables and integrated indexes to utilize regression modeling with a single output of operational risk, which is also a proxy variable. Cui et al. used the questionnaires for the block wise hierarchical moderated regression method to test and compare the change among different models.

From all these methodological efforts, we can find out the green growth or sustainable management requires very delicate articulation on the theoretical models because of its complicated, yet complex process for the sustainable performance. No matter how it is difficult, the papers in the special edition showed the possible way to monitor, measure and manage the optimal path toward the green growth using diverse, but convincing methodologies.

4. Conclusion

The most rapidly growing countries in Asia may not maintain their sustainable performance due to the urgent priority on the environmental issues and its resulting demand on the sustainable development. Now the green growth is not the optional, but the necessary survival kit in the region. Unfortunately, due to the complexity of a sustainable operation for collaborative innovation networking to harmonize all interest groups, it is especially difficult to visualize the performance of these sustainable policies and practices (Myeong et al., 2014). That is the reason most papers in this special issue evoke the importance of creating a new paradigm of performance-oriented strategies geared toward value creation based on harmonized network management. Even if the value is invisible at its core, it has become much more important for all our daily lives due to the rapid diffusion of Internet-based technologies and e-business (Choi and Gao, 2014). We live in the interdependent society, and thus all our interests are intertwined with each other. Instead of the profit maximization or economic efficiency, which is based on the individual decision as the traditional paradigm of the social science, we need to consider the new paradigm of harmonized win-win game of value creation for all. It is much more difficult, but worthy to explore for our new challenges on the frontier toward the future.

All the papers herein emphasize the urgent need to fill the missing link in the collaboration network and in procedural perspectives, and thus the role of the intermediation to manage the future challenges (Kim et al., 2010). For effective intermediation, we need not only assistance in the collaboration network, but also from pro-active network managers in order for all the partners to participate in more aggressively. For sustainable performance, we do not need the superficial show-off

effect in short-term, but the continuous contribution of all the partners. For this purpose, the network manager needs to facilitate the cooperation networking among the partners, collaborate with them in innovative ways, and provide all the necessary networking services such as correct information, necessary funding and financing, appropriate monitoring, etc., for the one-stop service for all partners in the collaboration network. This kind of multi-tasking intermediary as the network manager could be called metamediary (Choi and Lee, 2009).

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References

- Berkeley Earth Publishes, 2015. KILLER AIR: study on air pollution in China. <http://berkeleyearth.org/wp-content/uploads/2015/08/Press-Release-Killer-Air-August-2015.pdf> (Retrieved as of 2015-09-07).
- Buckley, J.P., 2009. The impact of the global factory on economic development. *J. World Bus.* 44 (2), 131–143.
- Choi, Y., 2015a. Introduction to the special issue on “sustainable E-governance in Northeast Asia: challenges for sustainable innovation”. *Technol. Forecast. Soc. Chang.* 96, 1–3.
- Choi, Y., 2015b. Intermediary propositions for green growth with sustainable governance. *Sustainability* 2015 (7), 14785–14801.
- Choi, Y., Gao, D., 2014. The role of intermediation in the governance of sustainable Chinese web marketing. *Sustainability* 6, 4102–4118.
- Choi, Y., Jin, J., 2015. Is the web marketing mix sustainable in China? The mediation effect of dynamic trust. *Sustainability* 2015 (7), 13610–13630.
- Choi, Y., Lee, E.Y., 2009. Optimizing risk management for the sustainable performance of the regional innovation system in Korea through the metamediary. *Hum. Ecol. Risk Assess.* 15 (2), 270–280.
- Choi, Y., Zhang, N., 2015. Introduction to the special issue on “the Sustainable Asia Conference 2014”. *Sustainability* 2015 (7), 1595–1602.
- Choi, Y., Lee, E., Wu, D.D., 2010. The risk-effective sustainability of policies: the small business credit environment in Korea. *Int. J. Environ. Pollut.* 42, 317–329.
- Gao, P., 2015. Government in the catching-up of technology innovation: case of administrative intervention in China. *Technol. Forecast. Soc. Chang.* 96, 4–14.
- Guo, C., 2015. A research on the current status and problems on domestic urban greening construction during new urbanization process. *Int. Bus. Manag.* 10 (2), 82–87.
- Kim, K., Choi, Y., Choi, C.Y., Kim, H.J., 2010. The role of intermediaries on technological risk management and business development performance in Korea. *Technol. Forecast. Soc. Chang.* 77, 870–880.
- Myeong, S., Kwon, Y., Seo, H., 2014. Sustainable E-governance: the relationship among trust, digital divide, and E-government. *Sustainability* 6 (9), 6049–6069.
- OECD, 2014. *Urban Green Growth in Dynamic Asia: A Conceptual Framework*.
- Rozman, G., 2004. *Northeast Asia's Stunted Regionalism: Bilateral Distrust in the Shadow of Globalization*. Cambridge University Press.
- Tan, Y., Xu, H., Xiaoling, Z., 2016. Sustainable urbanization in China: a comprehensive literature review. *Cities* 55, 82–93.
- Terra, B., Luis, A., Batista, S., Ricardo, C., Campos, M., Almeida, C., 2013. Interaction among universities, government and spin-off companies in a Brazilian context to generate sports innovation. *J. Technol. Manag. Innov.* 8 (2), 93–106.
- Turró, A., Urbano, D., Peris-Ortiz, M., 2014. Culture and innovation: the moderating effect of cultural values on corporate entrepreneurship. *Technol. Forecast. Soc. Chang.* 88, 360–369.
- Zhao, Y., Wang, S., 2015. The relationship between urbanization, economic growth and energy consumption in China: an econometric perspective analysis. *Sustainability* 7 (5), 5609–5627.

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