The Major Determinants of Sustainable Development in Selected Pacific, East and West Asian Countries

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Abstract
Sustainable development is a Controversial concept which has been considered over the three decades. It is comprehensive development and includes all of dimensions as "economic'', "social'' and ''environmental''. In economic objective, it requires substantial economic change that can be brought about by investment and trade. They are effective factors of sustainable development for all countries. This paper provides useful information of these issues. We analyze the relationships between trade, investment and sustainable. Using the average of annual time series data from 1990 to 2009, we apply Analytical Hierarchy Process (AHP) to countries classification. The results indicated that economic factors are key criteria to achieve sustainable development while China has the highest priority among the selected countries.

Keywords: Sustainable Development, Trade, Investment, AHP

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1. Introduction

Sustainable development as a phenomenon introduced internationally in the 1970s. It is a major intellectual framework in many countries specially developing countries. Sustainable development is holistic development and consists of social, economic, cultural, environmental and other needs of human, not only in one country but also in worldwide. On the other hand the most important property and attraction sustainable development is its comprehensive. In fact sustainable development is a new arena in twenty-first century which considers all of fields simultaneously. Although this concept has various definition and interpretation, but it has unique meaning in international level.

Quaddus and Siddique (2001) quoted *sustainable development* from World Commission on Environment and Development: "Humanity has the ability to make development sustainable — to ensure that it meets the needs of the present without compromising the ability of future generations to meet their needs. The concept of sustainable development does imply limits — not absolute limits, but limitations imposed by the present state of technology and social organization on environmental resources, and by the ability of the biosphere to absorb the effects of human activities. But technology and social organization can be managed and improved to make way for a new era of economic growth. In the end, sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs (World Commission on Environment and Development, 1987)."

Given these concerns, it is clear that sustainable development involves multiple factors, then it is not unusual that we consider multiple aspects of sustainable development such as economic, social and environmental. Ignoring these sections and their factors in researches related to sustainable development issue in all countries creates problems to interpret the results. Therefore identifying the constructive role of them in collection activities of sustainable development is very important. Hence, recognizing the structure and position of countries is a necessary matter that policy makers should consider about it. Since, one of the most essential steps to determining the position of countries to achieve sustainable development is classification of them based on indexes mentioned, the main goal of this paper is ranking the selected countries in east and west

of Asia and Pacific with attention to approach sustainable development.

The organization of this paper is as follows: Section 2 reviews some of the previous studies conducted on this issue. Section 3 describes the relationships between trade, investment and sustainable development. In Section 4 AHP model used in the study was discussed which make the Analytical Framework of the paper and discuses the results and main findings of the analysis and finally the last section concludes.

2. Literature Review

There are numerous studies about sustainable development planning and the relationships between sustainable development and its criteria. And so we present an overview of these studies. McDaniels (1994) considered practical issues in implementing sustainable development concepts for utility planning. The author emphasized on the role of value trade-off and value focused thinking approach. On the basis of broad review of sustainability Milne (1996) used an analysis of the concept of sustainability and its relationships with decision-making and indicated that sustainability is related to economic, social and ecological values. Lesser and Zerbe (1995) considered that what can economic analysis contribute to the ''sustainability'' debate? The authors debated that benefit-cost analysis as an economic analysis has an appropriate role in providing information to decision makers. Minns (1994) took mathematical model as a tool to aid R&D investment decisions in a sustainable development. The author discussed interaction between government policy and business decision-making and presented a methodology to help R&D investors to take environmental and sustainability issues into account when assessing the future competitiveness of technology. Kelly (1998) by using a systems approach identified decisive information for sustainable development. The author believed that this approach aid to indentify the linkages among the sustainable indicators. Quaddus and Siddique (2001) offered a decision conferencing approach to sustainable development planning based on a multi-criteria model. The authors used detailed sensitivity analyses and the results showed that environmental variables are sensitive to the final result. Ene et al. (2011) demonstrated a theoretical approach for dynamic modelling of sustainable development. They aimed promoting an economic tool for Romanian decision makers to in order to evaluate scenarios and planning options. Nathan and Reddy (2010) suggested a framework to select criteria for sustainable development indicators in a tree fashion at successive levels. They used AHP and displaced ideal method to

determining the weights of a criterion relative to others for each level and aggregating of scores respectively. Johnson (2005) discussed the interface between trade, investment and sustainable development for India. The author emphasize that there is a need for much more involvement of NGOs in the trade, investment and environment debate and the development of eco-labelling standards. In addition regulation and accountability of TNCs for actions is a primary concern in ensuring that the principles of sustainable development are adhered to and promoted internationally. Furthermore, there is a need to identify a differentiation between agribusiness and agriculture and to be greater involvement of NGOs, experts and other interested parties in decisions under SPS (Agreement on the Application of Sanitary and Phytosanitary Measures) and TBT (Agreement on Technical Barriers to Trade Agreements) agreements. OECD Paper (2001) expressed the impacts of FDI on sustainable development through many channels. Kirkpatrick and et al (2004) examined three aspects of trade liberalization and investment flows effect on sustainable development. Islam and et al (2010) related the impacts of trade and environment on sustainable development. They discussed market access, barriers to trade and impediments and spoke about trade liberalization, timber trade and environment. After the analyzing the agreements on tropical timber, the authors described illegal logging, deforestation and pollution on trade and environment. They studied sustainable forest and management eventually expressed the sustainable development on tropical timber trade.

Vallance and et al (2011) clarified what might be meant by the term social sustainability and emphasized different ways in which it contributes to sustainable development more generally. They used three parts of social sustainability to explore ways in which contradictions and complements between them impede or promote sustainable development. Ionescu (2009) organized the paper in different parts. In the second part the author analyzed the world trade with the manufactured goods and with the basic goods. The results showed that the trade policy has an indirect effect on labor market, the internal sold goods sector and significant impact on the efficiency. Pirtea and Milos (2009) presented the correlation between FDI and economic growth empirically related to Romanian economy. They found that there is a positive relationship between GDP and FDI, but it's not very strong. Golusin et al. (2011) indicated the review of the achieved degree of sustainable development in South Eastern Europe by using the linear regression method.

The main goal of this paper was to indicate to a strong contradiction between the development of ecological and economic subsystems.

From the above literature, it is imperative that the impact of economic, social and environmental aspects on sustainable development need to be assessed for each country. In fact countries must identify their location to achieve sustainable development. The main objective for this paper is to classify countries with respect to main criteria to attain sustainable development in selected Pacific, East and West Asian countries. The study uses AHP technique which is more suitable for this purpose. We use the average of annual time series data for the period 1990 to 2009 for which data is available.

3. Trade, Investment and Sustainability

Inward FDI is a major instrument for increasing the funds supply for domestic investment which promotes capital formation in the host country. It is the stimulus of local investment by increasing domestic investment by means of links in the production chain. In addition to, Inward FDI can increase the export capacity of the host country. It causes to increase foreign exchange earning in developing country. Moreover, there is a connection between FDI and new job opportunities and enhancement of technology transfer and it also raise overall economic growth (Frimpong and oteng-Abayie, 2006).

The impacts of FDI on sustainable development can investigate through three channels. The impact of FDI on economic growth is the first one. It is clear that market openness (to both trade and investment) increase economic growth. Open markets cause resources to be used more efficiently and productively and help firms to enter world markets. It leads to increase sales potential of them and actualizes economies of scale. It also decreases prices, varies production and increases purchasing power of wages. The second channel is Environmental protection. FDI can have positive and negative effects on environment. For example investment liberalization can lead to increase of production and consumption of polluting goods or expands industrial activity. On the other hand investment liberalization can affect on environment beneficially. For instance FDI can improve structural efficiencies and protects environment through making new investment. Then investment also increases society demand for having healthier environment. Instead of relying only an economic growth and market mechanisms, it is necessary to pay attention policy coherence and the implementation and enforcement sufficient environmental

regulations to restrict damages of environment that bring about FDI. The third channel is Social development. This impact can consider from to aspects, labor market and distribution of wealth (OECD paper, 2001).

In developing country, trade may cause to improve the skills by way of importation or adoption of better production technology and innovation. Exporters adopt and acquire knowledge of superior production technology either through intensive competition in foreign markets or because they are sub-contractors to foreign enterprises. Producers of import-competing goods in an open economy have to face compete with competitive imports. Since their products, within the context of a developing country, are usually capital-intensive, they need to adopt better or more capital-intensive production facilities to survive (Aryeetey, 2005).

Wacziarg (2001) found that there is a strong positive impact of trade policy openness on economic growth along with accelerated accumulation of physical capital, technological transmissions and improvements in the quality of macroeconomic policy.

Trade by creating specialization in productive activities causes countries able to exploit comparative advantage. In addition, trade by extending market for local producers, allows them to take advantage of economies of scale. It leads to increase income levels and the efficiency of resource allocation. Furthermore, trade can enhance the rate of investment and/or improved incentives for the development and technology diffusion and therefore it can affect on long-term economic growth positively (Kirkpatrick & et al, 2004).

The aim of trade and investment liberalization is reducing barriers to domestic markets, therefore they are interconnected. For achieving this goal they perform in different ways but both procedures are part the trend towards economic globalization (Johnson, 2005).

4. Methodology

Analytical Hierarchy Process (AHP) helps decision makers to construct simple hierarchy for the complex problems and they can make a systematic frame work to evaluate quantitative and qualitative factors. According to Lee & et.al (2007) the AHP process can summarize as below:

Decision makers set up goal and they then make criteria and structure the hierarchy. Forth stage assesses whether the hierarchy is arranged properly or not regarding the goal. If the response is negative the process will not continue. If the response is positive researcher moves to fifth stage which build a pre-review. In sixth and seventh stages pair-wise comparisons is made and calculate weights of criteria respectively. The eighth stage checks for consistency. In the next stage consistency ratio (CR) is examined which should be between 0 and 0.1. If it is greater than 0 and less than 0.1, the tenth stage is started which aggregates the weights. The final stage takes the overall weights (Lee & et.al, 2007).

5. Model specification, results and analysis

Considering figure 1, application model is specified. According to Saaty (1980), Analytical Hierarchy Process (AHP) can depict and apply in several stages: decomposition, prioritization, synthesis and sensitivity analysis. For this purpose, at first hierarchy tree must depict. The criteria of this method are composed of 2-tier hierarchy. The structure of criteria is shown in Fig. 1. This tree consists of main goal level, criteria and alternatives. Goal is the highest level of hierarchy tree in planning model. Here, according to Quaddus and Siddique (2001), our goal is sustainable development. In Level 1, there exist 3 criteria which are Economic, Social and Environmental factors. In fact they use for evaluating or measuring of it. They are primary dimensions of sustainable development.
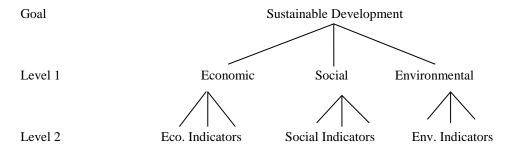

Fig. 1: AHP hierarchy structure
Source: Quaddus and Siddique (2001)

For achieving better and accurate results, we must adopt appropriate and more criteria that can cover the main goal. For the necessity of doing accurate research we can use sub-criteria. Level 2 is composed of the 3 sub-criteria of possibility of Economic, Social and Environmental Indicators. Level 2 of the model defines the Level 1 factors.

In order to determine relationship between trade, investment and sustainable development two variables can be used that include Foreign Direct Investment (FDI) net inflows and trade. In addition there are two variables for other dimensions which are social and environmental. These variables are as follows: Health (Proxied by Life Expectancy) as a social indicator and

CO2 Emission as an environmental indicator. There are several variables for these indicators but we had some problems about lacking data, therefore we had to select these variables for this study. The last level of hierarchy tree is alternatives which use for priority scheduling and researcher identifies them. Actually, selected Pacific, East and West Asian countries are our alternatives. All of the data for selected countries have been taken as the World Bank Indicators. We used twenty – year average data from 1990 to 2009 for 20 countries. These countries are introduced in Table (1):

Table (1): Selected Pacific, East and West Asian countries

Australia	China	Fiji	Indonesia
Iran, Islamic Rep.	Japan	Jordan	Korea, Rep.
Malaysia	Mongolia	New Zealand	Papua New Guinea
Philippines	Saudi Arabia	Solomon Islands	Syrian Arab Republic
Thailand	Tonga	Turkey	Vietnam

Source: Authors

Now, a new and modified form of Figure (1) is shown in Figure (2), finalizing the AHP hierarchy structure
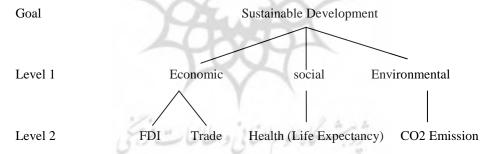

Figure (2): Final AHP hierarchy structure

Source: Authors

In pair-wise comparisons level of AHP method, criteria compare to each other. In this research we used real quantitative data directly for constructing pair-wise comparisons matrix. In the next stage, relative weights of criteria calculate from each level. Table (2) and Figure (3) show the composite priority weights, and considering Figure (4) it is clear that economic criteria have had more effect for achieving sustainable development. The less effect belongs to environment criteria. Hence countries that have better performance in these factors can increase their grade in sustainable development. It is noticed that Consistency Ratio (CR) will calculate in this approach.

$CR \leq 0.1$ suggests a satisfactory degree of consistency. All of above stages have done by using Expert Choice software. The calculated Consistency Ratio is 0.04 and since it is less than 0.1, this is a consistency in our model.

The results of analysis in terms of three measures (economic, social and environmental) among 20 countries show that China has the highest priority of 0.152, followed by the Tonga which has 0.132 priority weight. In the context of all countries, economic indicators are extremely effective (Figure 4). According to importance of economic measures, countries with high levels in this field, can achieve the highest level of sustainable development. China

has gained the highest grade among all countries (Figure 5). It has the highest value for FDI. Since economic criteria have the most effect on sustainable development. For the countries that are the same in economic criteria, the determinants of sustainable development are social and environment factors.

Table (2): Composite priority weights

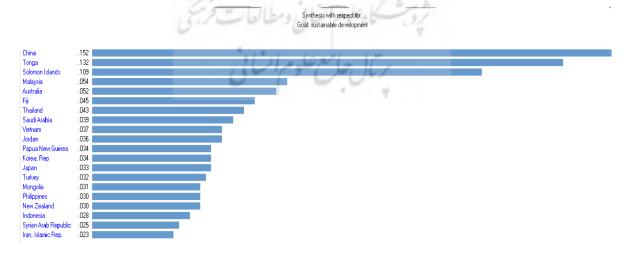| Alternative	Priority
China	.152
Tonga	.132
Solomon Islands	.109
Malaysia	.054
Australia	.052
Fiji	.045
Thailand	.043
Saudi Arabia	.039
Vietnam	.037
Jordan	.036
Papua New Guinea	.034
Korea, Rep	.034
Japan	.033
Turkey	.032
Mongolia	.031
Philippines	.030
New Zealand	.030
Indonesia	.028
Syrian Arab Republic	.025
Iran, Islamic Rep.	.023

Source: Authors

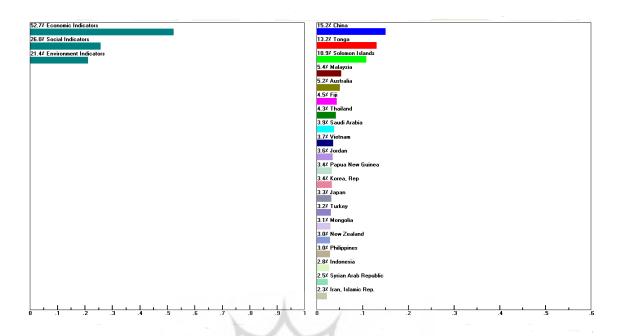**Figure (3): Composite priority weights**

Source: Authors

Figure (4): Dynamic Sensitivity for Sustainable Development
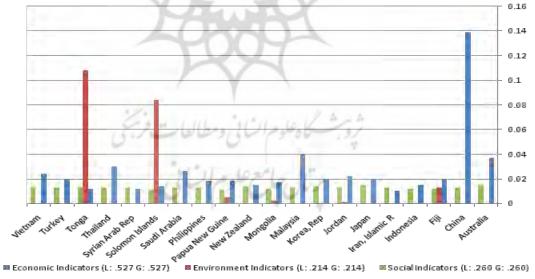
Source: Authors

Figure (5): The situation of each country related to criteria

Source: Authors

5. Conclusion

In this paper, considering important and effective determinants of sustainable development, we have arranged the selected Pacific, East and West Asian countries by using the Analytical Hierarchy Process (AHP) method. AHP method is strong approach that applies mathematical techniques and a systematic framework to codify allocation goal. One of the most important properties is decision making and selection according to expert view. In this research we have used this technique for classification and priority scheduling of these selected countries.

This paper describes how to prioritized achievement of sustainable development based on the AHP approach. This empirical illustration suggests that achieving sustainable development can be weighted by this method efficiently. Sub-Criteria were extracted in Foreign Direct Investment, Trade, Life Expectancy and Co2 Emissions involved in Sustainable Development, and were selected from the economic, social and environmental aspects. It is found that Economic Indicators were the dominant aspects of Sustainable Development, while China was the main concern of Sustainable Development among the selected countries. Therefore, decision makers must pay attention these and try to identify the effects of other factors. We must precise that the lack of data series affects somehow the scientific process.

References

1. Aryeetey, E. (2005), Globalization, Employment and Poverty in Ghana, WIDER Thinking ahead: The Future of Development Economics, Marina Congress Center, Helsinki, 17-18 June.

2. Ene, C. M., A. Gheorghiu and A. Gheorghiu, (2011), A Theoretical Approach for Dynamic Modelling of Sustainable Development, MPRA Paper No. 29215.

3. Frimpong, J. And M. Oteng-Abayie (2006), Bounds testing approach: an examination of foreign direct investment, trade, and growth relationships, MPRA Paper No. 325.

4. Golusin, M., O. M. Ivanovic, O.M and Teodorovic, N, (2011). *The review of the achieved degree of sustainable development in South Eastern Europe—The use of linear regression method.* Renewable and Sustainable Energy Reviews. Volume 15, Issue 1, January 2011, Pages 766-772

5. Ionescu, R.V, (2009). *The International Trade as an Element of the Sustainable Development. Euro Economica.* Issue 2(23)/2009. ISSN: 1582-8859.

6. Islam, R; Siwar, C and Ismail, S.M, (2010). *Impacts of Trade and Environment on Sustainable Development.* American Journal of Environmental Sciences 6 (1): 11-19,.

7. Johnson, E, (2005). *The interface between trade, investment and sustainable deveopment: implications for India.* MqJICEL, Vol 2.pp.37-65.

8. Kelly,KL, (1998). *A systems approach to identifying decisive information for sustainable development.* Eur J Oper Res;109:452–64.

9. Kirkpatrick, C; George , C and Scrieciu, S.S, (2004). *The Implications of Trade and Investment Liberalization for Sustainable Development: Review of Literature.* Impact Assessment Research Centre, Institute for Development Policy and Management, University of Manchester

10. Lee S. K; Mogi G; Shin S. C and Kim J.W, (2007). *An AHP/DEA Hybrid Model for Measuring the Relative Efficiency of Energy Efficiency Technologies.* in 2007 IEEE International Conference on Industrial Engineering and Engineering Management.

11. Lesser, JA, Zerbe RO, (1995). *What can economic analysis contribute to the ''sustainability'' debate?* Contemp Econ Policy;13(3):88 – 99.

12. McDaniels, TL,(1994). *Sustainability, value trade offs, and electric utility planning.* Energy Policy;22(12):1045– 54.

13. Milne, MJ, (1996). *On sustainability: the environment and management accounting.* Manage Account Res;7:135 –61.

14. Minns, DE, (1994). *Mathematical modelling as a tool to aid R&D investment decisions in a sustainable development policy climate.* Technol Anal Strategic Manage;6(4):457 – 72.

15. Nathan, H.K.S and Reddy, B.S, (2010). *Selection Criteria for Sustainable Development Indicators.* Indira Gandhi Institute of Development Research (IGIDR).

16. OECD Paper, (2001). *Foreign direct investment and sustainable development.* Mexico City, 26-27 November.

17. Pirtea, M and Milos ,L, (2009). *Foreign direct investment – A Lead Driver for Sustainable Development in Romania ?* Analele Universităţii "Constantin Brâncuşi" din Târgu Jiu, Seria Economie, Nr. 3/2009.

18. Quaddus M.A and Siddique M.A.B, (2001). *Modelling sustainable development planning: A multicriteria decision conferencing approach.* Environment International; 27.pp 89–95.

19. Saaty, T.L, (1980). *Saaty, The analytic hierarchy process.* New York: McGraw-Hill.

20. Vallance, S; Perkins, H C and Dixon, J E, (2011). *What is social sustainability? A clarification of concepts.* ScienceDirect. Article in Press. www.elsevier.com/locate/geoforum.

21. Wacziarg, R (2001). *Measuring the dynamic gains from trade*; World Bank Economic Review 15, 393-429.

22. World Commission on Environment and Development, (1987). Our common future Oxford: Oxford Univ. Press.