EVALUATION OF THE SCHEMES TO DEVELOP INFRASTRUCTURE PROJECTS: OFFICIAL DEVELOPMENT ASSISTANCE VERSUS PUBLIC PRIVATE PARTHERSHIP

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ABSTRACT: The governments of developing countries are always lack of funds to improve the infrastructure condition in their countries. The tight government budget is one of the main reasons for prolonged infrastructure projects in the developing countries. That's why the developing countries are interested to find alternative source of funding. Using private fund on the basis of public private partnership (PPP) has been growing significantly for developing infrastructure projects in the developing countries. On another hand, the developing countries receive some amount of financial assistance from donor countries for the infrastructure development. But the infrastructure projects financed by the official development assistance (ODA) are in a slower progress compared to public private partnership (PPP) projects. This paper analyses the effectiveness of the ODA projects versus the PPP projects.

1. INTRODUCTION

It is crucial to evaluate effectiveness of execution schemes of large infrastructure development projects such as Special Economic Zone (SEZ) projects from an economical point of view.

While studying through different cases of SEZ development projects and visiting sites of SEZs in Mongolia, Indonesia, and Cambodia, the author noticed there were huge differences in between the projects. Especially after visited the 4 different SEZ projects in Cambodia, she was curious about to evaluate the effectiveness of execution schemes of SEZs in quantitative way. The author impressed the rapid progress of Phnom Penh SEZ which has been developed under PPP scheme and also wondered the slow progress of Sihanoukville Port SEZ which has been developed under ODA scheme in same country Cambodia. She noticed that the time factor is the most important factor for developing SEZs.

For evaluating economical effectiveness of the execution schemes of the SEZ projects, some simulations should be done on the basis of current economic data of the country. The author was seeking an appropriate way of analysis for checking the effectiveness of SEZ projects. And she found out that Computable General Equilibrium (CGE) model can be applied on this purpose.

So the author decided to evaluate the effectiveness of her proposed project Ulaanbaatar Airport SEZ under 2 different execution schemes of ODA and PPP to the rest of the country by using CGE model based on statistical data of Mongolia.

2. GENERAL EQUILIBRIUM MODEL

Computable General Equilibrium models are a class of economic models that use actual economic data to estimate how an economy might react to changes in

policy, technology or other external factors. In other words, CGE models are designed to establish a numerical framework for empirical analysis and evaluation of economical policies. That's why they are called Computable General Equilibrium Models.

- Computable → numerical solution (empirical data)
- General → description of the whole economy
  - o full economic cycle
  - o all markets
- Equilibrium → demand equals supply
  - o prices are adjusted to achieve market equilibrium
  - o general: on all markets simultaneously
- Model → solvable set of equations

CGE models are commonly used in following research topics.

- General macroeconomic issues
- Fiscal policy issues
- International trade policy
- Regional and transport policy
- Environmental policy
- Industrial and labour policy

3. GENERAL EQUILIBRIUM MODEL OF MONGOLIA

CGE model of Mongolia was needed to do the analysis. But there was not any CGC model was developed in Mongolia before and it was needed to collect sufficient data for developing CGE model of Mongolia. The country Mongolia was lack of statistical and other data as the all the developing countries. For doing the analysis following steps were taken by the author to collect necessary data step by step and developing the not applicable one by herself.

1.   Obtain Input Output Table of Mongolia

2.   Develop Social Accounting Matrix (SAM) of Mongolia by using the data from Input Output Table of Mongolia and various sources

3.   Develop General Equilibrium Model of Mongolia by using the data from Social Accounting Matrix of Mongolia

4.   Input the data from General Equilibrium Model into GAMS; General Algebraic Modeling System programming

5.   Ready GAMS file for the analysis of SEZ

3.1 Input Output Table of Mongolia

One of the most important data sets is the Input Output Table for implementation of quantitative analysis. This table is a data matrix which shows annual transactions among economic sectors of a country. This data set can be used not only for basic quantitative analysis but also calibration of advanced economic simulation models. Though it is a very important data set, an Input Output Table for the Mongolian economy had not yet been produced until 2008.

Fortunately, The Input Output Table of Mongolia was officially prepared for the first time based on the data of 2005 and published on the Statistical Year Book – 2007 in 2008.

3.2 Social Accounting Matrix of Mongolia

The author developed the Social Accounting Matrix of Mongolia based on the Input-Output Table 2005 of Mongolia by following the guideline of "Textbook of Computable General Equilibrium Modelling" due to lack of the data the proper Social Accounting Matrix of Mongolia was not prepared and published anywhere.

3.3 GAMS programming

After completed SAM Mongolia, the SAM was input to the GAMS programming (Today most CGE models are formulated and solved using one of the

GEMPACK or GAMS software systems. In this analysis, the GAMS was used.) for applying the economic effectiveness analysis. All the data in SAM was converted to GAMS programming input style. And the file was prepared as the basic for the analysis.

4. DYNAMIC ANALYSIS

4.1 Assumption of Dynamic Analysis

- Ulaanbaatar Airport SEZ project

Figure 1. Location of proposed Ulaanbaatar Airport SEZ

- Execution scheme
  - Case 1. PPP scheme
  - Case 2. ODA scheme
- Investment amount: 100 million USD (suppose to use the current infrastructures as basic for the new SEZ)
- Type: 40 year loan
- Loan Interest rate: 0, 2% per year
- Repayment: Starting from 11th year
- Capital Depreciation rate: 4% per year
- Increase in Capital amount by developing SEZ: After started the operation of the new SEZ, supposed to be filled by investors within 8 years and due to the new investors the capital amount will be increased by 40% at the end of the 8th year since the operation started. In the next 20 years, the capital amount will keep growing in slow speed within 20 years and supposed to be increased by 60% at the end of the 28th year since the operation started.

- Increase in Labour amount by developing SEZ: After started the operation of the new SEZ, supposed to be filled by investors within 8 years and due to the new investors the Labour amount will be increased by 20% end of the 8th year since the operation.

- Project schedule

Table 1. Project Schedule

	PPP	ODA
Basic Conceptual Design	2009-2010	2009-2013
Detail Design	2011	2014-2015
Build	2012	2016-2017
Preparation for Operation	2013	2018-2019
Operation	2014-2056	2020-2056

- Loan condition

Table 2. PPP loan condition

Loan	Year	Loan Amount (million USD)	Loan Amount (million MNT)
Loan 1	2009	12 ,5	16 250,0
Loan 2	2010	12, 5	16 250,0
Loan 3	2011	25,0	32 500,0
Loan 4	2012	50,0	65 000,0
Total		100,0	130 000,0

MNT- tugrug (currency of Mongolia)

- Exchange rate: 1USD= 1300MNT

- PPP Loan repayment will finish in 2051.

Table 3. ODA loan condition

	Year	**Loan Amount (million USD)**	**Loan Amount (million MNT)**
Loan 1	2009	8,33	10 833,3
Loan 2	2011	8,33	10 833,3
Loan 3	2013	8.33	10 833,3
Loan 4	2014	12, 5	16 250,0
Loan 5	2015	12, 5	16 250,0
Loan 6	2016	25,0	32 500,0
Loan 7	2017	25,0	32 500,0
Total		100,0	130000,0

-     Exchange rate: 1USD= 1300MNT

ODA Loan repayment will finish in 2056.

4.2 Working Age Population Effect

For calculating the Labour amount, the author compiled the data from "Mongolian Population Projection 2008-2030". Following steps were taken to compile the proportion of Labour amount increasing.

1.   Calculate total working age population by picking the number of population with 15-64 year-old in male, 15-59 year-old in woman (according to Labour Law of Mongolia) from the "Mongolian Population Projection 2008-2030"

2.   Suppose employment population rate will be constant as 62% as 2008.

Employment population rate=Working population/Working Age Population

or

Working population= Working Age Population*0,62

3.   Since there was no applicable data after 2030 in Mongolia, the author projected the total working age population based on the ratio of growth from 2008 to 2030 and tendency of working age population proportion projection based on the study of Spoorenberg (2008). According to Spoorenberg (2008), working age population proportion in Mongolia will be the peak in 2020-2030 and gradually decreasing.

Figure 2. Working Population Projection, 2009-2056
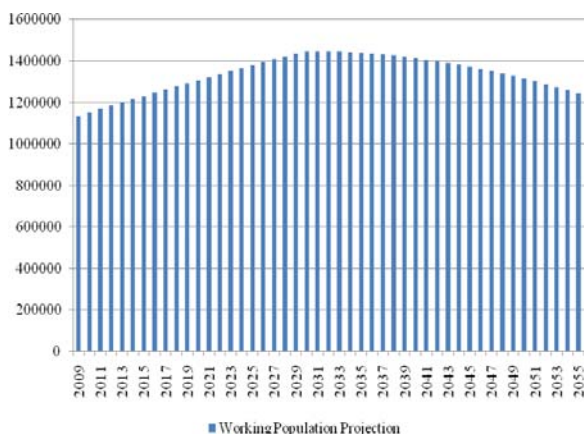
4.3 Process of the Analysis

1. Calculate coefficient of Labor, Capital and Foreign Saving for each case and each year until complete the repayment of loan (Please note that the analysis is different from real situation. Due to the limitation of model neglected other changes except Labor, Capital and Foreign Saving.)

2. Change coefficients of Labor, Capital and Foreign Saving for the base case of Mongolian CGE model

3. Calculate new equilibrium level by using GAMS program for each case

4. Collect results from GAMS result file after the new equilibrium level was found.

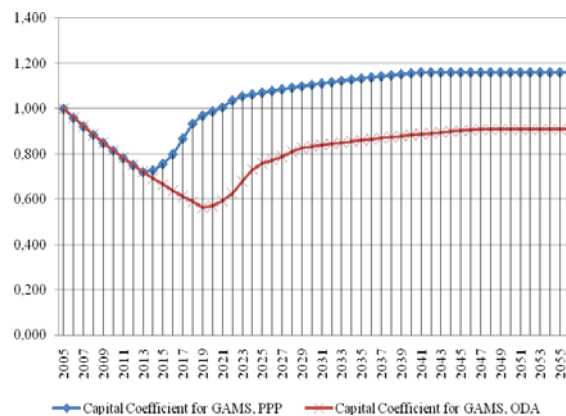Figure 3. Capital coefficients for CGE Model
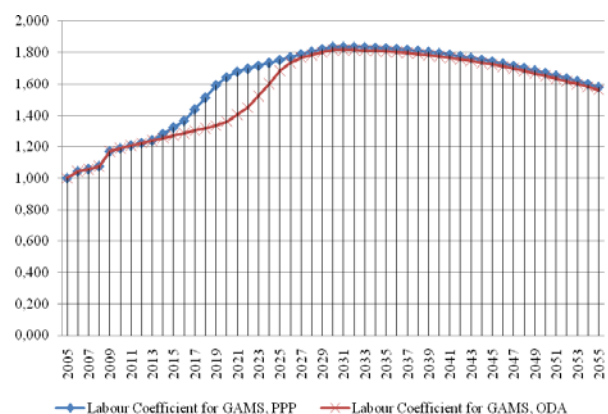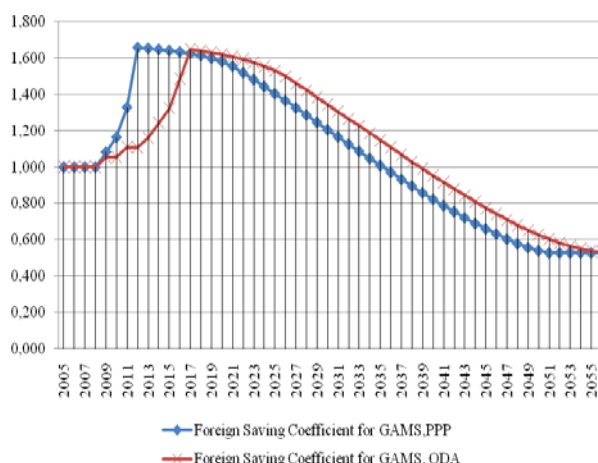

Figure 4. Labour coefficients for CGE Model

Figure 5. Foreign saving coefficients for CGE Model

Figure 6. Comparison of total outputs in PPP and ODA schemes

4.4 Results of the Analysis

After running the GAMS program for 2 schemes and 48 cases until finish the repayment of 40-year-loan, all the total 48 outputs for each ODA and PPP schemes, Figure 6 was developed.

Judging from the Figure 6, the result of the evaluation proved that PPP scheme has more effectiveness compared to ODA scheme for the time effectiveness.
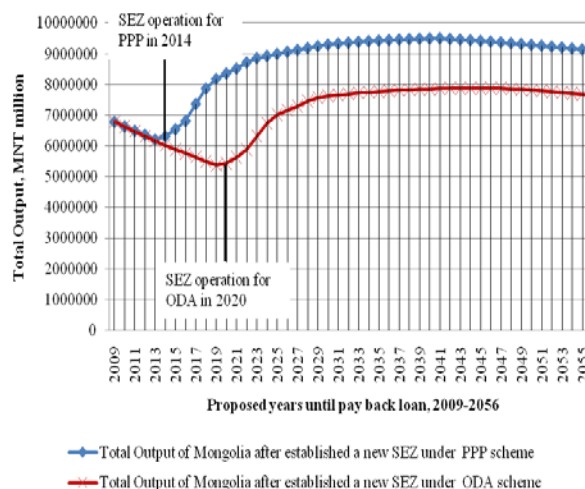
And also in this case, timing of PPP project is matching the working age population growth of Mongolia very well. According to Figure 2, working population is growing until 2030. The SEZ developed under PPP scheme will start operation in 2014. It means the SEZ developed under PPP scheme will enjoy the demographic leveraged effect 16 years.

On another hand, if the SEZ project developed under ODA scheme, the operation will start 2020 or 6 years later than PPP scheme case.

It is better to mention, successful SEZs in the developing countries used the advantage of working population growth effect when they started development of SEZs.

Total output of SEZ project developed under PPP scheme is 21.5% higher than the total output of SEZ project developed under ODA scheme.

CONCLUSION AND RECOMMENDATION

Before starting SEZ projects, the evaluation of the effectiveness of the SEZ project is crucial to be done. But unfortunately, the developing countries are lack of all kind of statistical data and projection and this situation makes difficult to do evaluation. The author also faces the lack of data while she was doing this evaluation.

One of the successful features of the SEZ project has been the right timing before on now on. So PPP scheme has much advantage for developing SEZs in short period on right timing.

The result of the evaluation proved that PPP scheme has more effectiveness compared to ODA scheme for the time effectiveness. This kind of evaluation is highly recommended to use for not only SEZ projects but also all kinds of large infrastructure projects in the developing countries.

REFERENCES

Hosoe N., Gasawa K., and Hashimoto H. 2010, *Textbook of Computable General Equilibrium Modelling: Programming and Simulations.* ISBN 978-0-230-24814-4, UK, 2010

National Statistical Office of Mongolia, 2006, *Statistical Yearbook 2005*, NSO, Ulaanbaatar, Mongolia, 2006

National Statistical Office of Mongolia, 2008, *Statistical Yearbook 2007*, NSO, Ulaanbaatar, Mongolia, 2008

National Statistical Office of Mongolia, 2008, *Mongolian Population Projection 2008-2030*, NSO, Ulaanbaatar, Mongolia, 2008(in Mongolian)

Spoorenberg, 2008, *The demographic window, development, and population policy implications in Mongolia*, Asian Population Studies, Vol.4, No. 2, July 2008