

プロジェクト名：ジェニユイン・セイビングに関する研究
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1. Research Purpose

This study's aim is to provide an empirical examination of the determinants of genuine savings (GS), using the autoregressive distributed lag approach to cointegration methodology. Pearce and Atkinson (1993) suggest the "genuine savings" concept. Related to that, the World Bank has developed a dataset called "adjusted net saving" that has become an important indicator when judging a country's sustainability.¹ With the availability of data, there have been many GS-related studies conducted recently. While most GS research focuses on their average values, Sato and Samreth (2008), in an examination of sustainability, conduct a study focusing not only on the average of GS but also on their trends and volatilities. However, that study does not analyze the GS determinants. This study examines the case of Saudi Arabia, an oil-rich country. It is selected for the preliminary analysis due to the fact that, although it is the world's largest oil-exporting country, its GS values are negative in most of the period between 1971 and 2008, and the average value is -1.91.² In such a situation, the country needs to improve its GS performance in order to be on the track to sustainability. Given this, the information on the determinants of GS is very important for policy makers dealing with the sustainability policy.

2. Estimations and Results

The estimation equation is specified as:

$$gs_t = \beta_0 + \beta_1 growth_t + \beta_2 corrupt_t + \beta_3 urban_t + \beta_4 trade_t + \varepsilon_t, \quad (1)$$

where *gs* is genuine savings (the adjusted net savings, excluding particulate emission damage, as the share of gross national income, GNI); *growth* is per capita growth rate of the gross domestic product (GDP); *corrupt* is the corruption score ranged from 0 (most corrupt) to 5 (least corrupt); *urban* is the share of the urban population in the total population; *trade* is the sum of total exports and imports in GDP. ε represents an error term. The specification is based on previous research, such as Dietz et al. (2007).

This study applies the autoregressive distributed lag (ARDL) approach to cointegration proposed by Pesaran et al. (2001) as the estimation method. Equation (1) can be expressed as the error correction representation of the ARDL model below.

$$\begin{aligned} \Delta gs_t = & \xi_0 + \sum_{i=1}^n \xi_{1i} \Delta gs_{t-i} + \sum_{i=1}^n \xi_{2i} \Delta growth_{t-i} + \sum_{i=1}^n \xi_{3i} \Delta corrupt_{t-i} + \sum_{i=1}^n \xi_{4i} \Delta urban_{t-i} \\ & + \sum_{i=1}^n \xi_{5i} \Delta trade_{t-i} + \theta_1 gs_{t-1} + \theta_2 growth_{t-1} + \theta_3 corrupt_{t-1} \\ & + \theta_4 urban_{t-1} + \theta_5 trade_{t-1} + \mu_t, \end{aligned} \quad (2)$$

where μ is an error term.

The following sources provide the data employed in this study. The data of GS, per capita GDP growth, the share of urban population, and trade are retrieved from World Development Indicators (WDI), published by the World Bank. For corruption, the data are obtained from the International Country Risk Guide (ICRG), published by the Political Risk Service. This study employs annual data, spanning 1984 to 2008 for the estimation, which are chosen based on the availability of the sample sizes of all variables in the estimation equation.³

First, to check for the existence of a long-run relationship between the variables under consideration, the F-test's null hypothesis, $H_0 : \theta_1 = \theta_2 = \theta_3 = \theta_4 = \theta_5 = 0$, is tested against its alternative, $H_1 : \theta_1 \neq 0, \theta_2 \neq 0, \theta_3 \neq 0, \theta_4 \neq 0, \theta_5 \neq 0$ in Equation (2). By setting the lag order to one, the F statistic obtained is 3.8630, exceeding the upper bounds of the critical values provided by Pesaran et al. (2001).⁴

¹ For a detailed explanation on GS and its relationship with sustainable development, see Sato et al. (2011), among others.

² This value is calculated based on the data of adjusted net savings obtained from the World Bank in 2010.

³ Although the WDI database provides the data available since 1960, the data of corruption obtained from ICRG is available only from 1984.

⁴ The lag order is set to one to ensure a sufficient degree of freedom for the time series analysis, since the available sample period is small.

There is, therefore, evidence supporting the existence of a long-run relationship among the variables being considered. With the maximum lag order being one, the ARDL(1,0,1,0,0) model is obtained based on the Schwarz Bayesian criteria. Table 1 provides the long-run and error correction terms (EC) estimation results.⁵ The statistical significance and correct sign of EC's estimated coefficient (smaller than one in absolute value) provide more evidence for a long-run relationship among the variables. The model also passes diagnostic tests of functional form, normality, and heteroscedasticity.⁶ From the table, the estimated coefficient of corruption score is positive and significant, indicating that a better quality of institution (or lower level of corruption) improves the GS performance of the country. This result is natural. The negative effect of trade can also be observed from the table. This result should not be surprising, given the fact that crude oil is a main component of trade in Saudi Arabia. The increase in crude oil's exports, leading to the increase in the depletion of its natural resources, negatively affects its GS performance. Moreover, the result indicates that the urbanization has a positive effect. One possible interpretation is that higher urbanization induces more capital investment to facilitate it, leading to the increase in physical capital. This contributes to the increase in GS value. A remarkable result from this estimation is the insignificant effect of economic growth on genuine saving.

Table 1: Long-run estimation results (dependent variable: gs)

Variable	ARDL(1,0,1,0,0)	
	Coefficient	Standard Error
<i>growth</i>	-0.0912	0.2734
<i>corruption</i>	0.1365***	0.0446
<i>urban</i>	4.3487***	0.6163
<i>trade</i>	-0.2418**	0.0899
<i>constant</i>	-3.5747***	0.5183
EC_{t-1}	-0.7092***	0.1774

Note: The asterisks ***, ** and * are 1%, 5% and 10% of significance levels, respectively.

Finally, the stability test, using the cumulative sum (CUSUM) and CUSUM of squares (CUSUMSQ) of the recursive residuals tests, indicates that the estimated equations are stable since the plots of CUSUM and CUSUMSQ are within their criterion bands of the five percent significance level.⁷

3. Conclusion and Future Research

This study provides an empirical examination of the determinants of genuine savings, using the autoregressive distributed lag approach to cointegration as the methodology. As a preliminary analysis, the oil-rich country of Saudi Arabia is used for the analysis. From the estimation results, it is evident that institution quality and urbanization positively affect the GS performance, while trade has a negative impact. The estimation cannot confirm the impact of economic growth. Although the analysis in this research provides some useful information, some extension and improvement are needed in the future. As a direction for extension, studies on other oil-rich countries should also be conducted. This can be a single-country estimation or a panel analysis. As a direction for improvement, various estimation specifications should be taken into account to examine the robustness of the estimation results.

Based on this preliminary result, I hope to extend and improve this research with my co-author, Prof. Masayuki Sato, from Kyoto University.

References

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⁵ The results of short-run estimation are not reported to save space. They are available upon request.

⁶ The results are available upon request.

⁷ The plots of CUSUM and CUSUMSQ are not reported to save space. They are available upon request.