

Determinants of savings in the APEC countries

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Abstract. *The determinants of savings is the subject which is studied frequently in economic literature. Because that the saving conditions are contribute to the economic growth. This study examines the determinants of savings in the APEC countries. Panel data analysis was used for sixteen APEC member countries during the period of 2000-2013. According the analysis results that income, age dependency ratio, young population, rural population and urban population affect on savings positively. Financial depth affects on savings negatively. Inflation and old population have no significant effect on savings in APEC countries.*

Keywords: APEC, saving, life-cycle hypothesis, panel data.

JEL Classification: D91, E21, F49.

1. Introduction

There has been wide literature to examine the determinants of savings. Some of these studies analyze savings at country level (Ozcan et al., 2003; Hamadi et al., 2011; Yong et al., 2008; Agrawal et al., 2010; Horioka and Wan, 2007; Jongwanich, 2010; Athukorala and Sen, 2003) and others analyze the country group level savings (Williamson, 1968; Masson et al., 1998; Faruqee and Husain, 1998; Loayza et al., 2000; Wan et al. 2003; Cohn and Kolluri 2003; Thanoon and Baharumshah, 2005; Bhandari et al., 2007; Horioka and Hagiwara, 2011; Thanoon and Baharumshah, 2012; Das and Ray, 2012; Zhou, 2014). The reason of interest in saving conditions is that the saving has been considered as the substantial factor for investment and subsequently affects the economic growth.

Keynesian perspective discusses the investments as a factor of only influence on generating income. This perspective ignore that the investment is a substantial factor for increasing productive capacity. Considering this dual structure of investment together, it can be said that investment could increase productive capacity and generates income (Domar, 1946: 139). Domar, puts the propensity for saving on the one side of equality, and he puts growth of labor, discovery of natural resources, technological achievements on the other side of equality. In a stable economy, instable circumstances may occur by the imbalances between saving and other conditions (Domar, 1946: 144). In Domar's approach savings are substantial factor for economic growth. Solow suggests that the propensity for saving represents how much current output can be saved and invested. Consequently, the accumulation of capital can be recognized during the current period. This accumulation of capital leads how much capital would be available for the following period. Hence, increase in capital accumulation rises to the level of output and subsequently affects the growth (Solow, 1956: 68).

The aim of this study is to analyze the determinants of savings for APEC (Asia-Pacific Economic Cooperation) countries. The study used panel data analysis during the years 2010-2012. That data used sixteen APEC countries, which are Australia, Brunei Darussalam, Canada, Indonesia, Japan, Malaysia, Philippines, New Zealand, Thailand, United States, China, Mexico, Chile, Peru, Russian Federation and Vietnam.

The first section of study offers the literature review of the related studies which examine the determinants of savings. Second section includes data and methodological approach of the study. Third section provides analyzing process. Fourth section presents results of the panel data analysis. Finally last section of study provides the conclusion remarks.

2. Literature review

Williamson (1968: 205, 209) examine the determinants of savings in developing Asia. He achieves the results that corporate and government sector are not the only source of excessive savings for Asia region. Transitory income is much more effective on marginal

propensity for saving than permanent and measured income. Interest rates have more impact on the short run savings decision than the long run savings decision. Direct tax increases have a direct and negative effect on aggregate real savings in Asia region.

Masson et al. (1998), analyze potential determinants of private saving behaviors. They used data from 21 developed and 40 developing countries. They find that demographics and growth are significant determinants of private savings. Interest rates and trade have positive but moderate impact on private savings. In countries where income per capita is lower than that of the USA, increases in GDP per capita provides the growth of savings while in countries where income per capita is higher, it causes savings to reduce (Masson et al., 1998: 483).

Faruqee and Husain (1998) investigate long-term determinants of private savings in Indonesia, Malaysia, Singapore and Thailand. Analysis results show that increase in the rate of private savings of these countries are very remarkable. The study examined common experiences for strong saving performances among them. According to the results, demographic changes and increases in per capita income have an impact on regional saving trends (Faruqee and Husain, 1998).

Loayza et al. (2000) conduct an empirical study on political and non-political factors behind the differences of savings among 150 countries. Their results show that private savings increase with the growth of real per capita income. This impact of income on private savings is higher in developed countries compared to developing countries. Dependency ratio has a negative impact on private savings. Prudence caused by inflation influences private savings in a positive way. Financial policies are the instrument with moderate impact on increasing the national savings. Financial liberalization influence private savings negatively (Loayza et al., 2000: 180).

Wan et al. (2003: 416) investigate determinants of rural China's saving behavior. They find that Chinese rural areas have an undeveloped capital market structure so consumers face with liquidity constrains. If there were policy implications to refine rural capital market, consumption expansion could be helped and domestic demand could be stimulated. Also in China, urban residents are protecting with social rights by government. But these protection arguments do not exist in rural China. This situation has effects on rural savings behavior. Finally they find that cultural motives are effective in savings.

Cohn and Kolluri (2003: 1207) investigate the household saving behavior for G-7 countries in the years 1960-1999. They find that higher real interest rates and increasing of government dissaving effect household savings positively. A decline in social security supports the cause to increase household saving.

Thanoon and Baharumshah (2005), examine the saving behavior of East Asian countries. They conclude that financial crisis impact savings and determinants of savings not only in the short term but also in the long run. Additionally external savings bring a negative

impact on domestic saving rates. Interest rates have little negative impact on savings, which is significant in terms of standard significance. Demographic factors are effective in long term saving rates. Economic growth and export positively affect long term saving rates during the pre-crisis period. There is no finding related to negative effect of economic stagnation due to crisis on short- and long-term saving rates (Thanoon and Baharumshah, 2005: 262).

Bhandari et al. (2007), examine the determinants of private savings in five South Asian countries. They conclude that government expenditures and past savings have a negative impact on private savings. Financial development and increase in income per capita affect the private savings positively. Rate of dependency, localization level and real interest rates appear to have less impact on private savings in these countries (Bhandari et al., 2007: 216).

Horioka and Hagiwara (2011) analyze domestic saving rates trends in developing Asia in the years 1966-2007. They find that generally domestic savings have been high and increasing in developing Asia. But there have been important differences of these trends in each country. These differences occur by the age structure of the population, income levels and the level of financial sector development. They also estimate future saving trends in the years 2011-2030 and they conclude that Asia will maintain current saving levels despite population aging. Because population aging will be stabilized by the higher income levels of developing Asian countries.

Thanoon and Baharumshah (2012: 113) analyze the determinants of savings in Asia and they compare the findings with Latin America economies. They conclude that two country groups which have similar conditions in the scope of savings rates are affected by international capital inflows, dependency ratios and the size of the export sector. But economic growth and capital flows affect the savings in different ways between these country groups.

Das and Ray (2012) establish panel data analysis in 1990-2007 period for developing six Asian economies which have high saving rates. The variables such as high growth, low age-dependency, increasing degree of financial deepening, presence of liquidity constraint, remittances, terms of trade shock and human capital formation are leading determinants of the savings for these six countries.

Zhou (2014) examine the number of brothers who have an individual effect on the household savings rate in rural China. He finds that additional brother can reduce an individual's household savings rate to at least 5 percentage points. Brothers helping in households by sharing their risks provide them a source of informal borrowing and brothers also share household's costs of supporting parents. Sisters have a little effect on the household's saving rate. Finally he focuses that decline in the average number of brothers in households affects one-third of the increase aggregate household savings rate in urban China.

3. Data and methodology

Data used in this study to analyze the determinants of savings in the APEC countries were obtained from the World Bank Database. Dependent variable included Gross Domestic Saving as a percentage of GDP (S). One of independent variable is annual percentage GDP growth per capita ($GDPP$). This variable represents the income level. Modigliani (1966: 167) in his life cycle hypothesis suggests that if aggregate income increases progressively in a time period, it will affect saving rates positively. GDP Deflator (annual %) (INF) variable indicate inflation. In high inflation periods individuals shift to save up to avoid economic uncertainty conditions. $M2$ as a percentage of GDP ($M2$) variable represent financial depth. According to the life-cycles model, financial development has a negative impact on savings because it can increase opportunities for consumption (Masson et al., 1998: 488).

Age dependency ratio as a percentage of working population ($AGEDP$) variable is widely used to determine on savings. This variable is defined as the ratio of dependent people, who are younger than 15 or older than 64, to the working population those ages 15-64. Agenor and Aisenman (2004) find positive relationship between age dependency and savings. Kibet et al. (2009), Loayza et al. (2000), Das and Ray (2012) find negative associations between dependency and savings. Kelley and Schmidt (1996: 366) indicate that there is no indefinite relationship between dependency ratio and savings. Population aged 15-64 as a percentage of total population (PY) and population aged 65 and above as a percentage of total population (PO) variables access to the model from life cycle hypothesis. Modigliani (1966: 163) asserts that individuals save in the earlier part of their life. Thereby individuals can support their consumption by dissaving in the later part of their life. For these reasons expectations can be positive between PO and savings whereas expectations can be negative between PY and savings. Rural population as a percentage of total population (RRL) and urban population as a percentage of total population (URB) are final independent variables in the model. Generally in the rural regions saving tendency is much improved than it is in urban regions. The rural life conditions encourage individuals to save up. Main reason of this circumstance is that the rural regions provide insufficient financial facilities for individuals. Also it can be said that urban regions provide sufficient financial instruments and government protection arguments for individuals (Wan et al., 2003). By this reason urbanization can affect the savings negatively.

$$S_{it} = \beta_0 + \beta_1 GDPP_{it} + \beta_2 INF_{it} - \beta_3 M2_{it} - \beta_4 AGEDP_{it} + \beta_5 PY_{it} - \beta_6 PO_{it} - \beta_7 URB_{it} + \beta_8 RRL_{it} + u_{it} \quad (1)$$

i symbolizes country and t symbolizes time; $i = 1-16$ countries and $t = 2000-2012$ (13 years). In this study the analysis was made with the unbalanced panel data set. In this set, the number of data set and years are not equal for each country. The model was established as in Equality 1, based on the theoretical and empirical studies in literature.

4. Process of analysis

If all observations are homogenous, pooled OLS model can be used in panel data analysis. However if observations contain unit and/or time effects, it can be appropriate to use fixed effects or random effects models (Yerdelen Tatoğlu, 2012: 163-164). So, likelihood ratio (LR) test was used for the model in order to determine whether there are unit and time effects. In LR test, it is examined whether standard error of unit effect is equal to zero ($H_0: \sigma_u=0$). Additionally, LR test is also used to examine whether standard error of time effect is equal to zero ($H_0: \sigma_\lambda=0$) (Yerdelen Tatoğlu, 2012: 170). If unit and time effects are not determined in LR test, pooled OLS model can be used. However if unit and/or time effects are determined in test results, it can be concluded that the model is one sided or two sided.

Table 1. LR Test

	Unit Effect	Time Effect
χ^2	212.71	0.00
prob.	0.0000	1.0000

According to the results of LR test, there is an only unit effect in the model. For this reason, the model is one sided. Hausman specification test is used to determine whether unit effects are fixed or random.

According to Hausman test, if there is no correlation between error components (u_i) and explanatory variables (x_{kit}), both fixed effects and random effects estimators are appropriate. However, if there is correlation between error components and explanatory variables, random effects estimator is inappropriate. In Hausman test, null hypothesis is set up in the way that there is no correlation between error components and explanatory variables (Hill et al., 2011: 559). It can be said that random effects are appropriate when there is not a correlation between u_i and x_{kit} , and fixed effects are appropriate when there is a correlation between u_i and x_{kit} (Gujarati, 2003: 650).

Table 2. Hausman Test

χ^2	38.52
prob.	0.0000

According to the results of Hausman test, it is decided that unit effects are fixed. Accordingly, analysis is made in accordance with one sided fixed effects model.

Then, models were examined in terms of basic assumptions. One of these assumptions is constant variance (homoscedasticity) assumption. According to constant variance assumption, while unit values of explanatory variables change, variance of error term remains fixed. If this assumption does not occur, model includes heteroscedasticity (Wooldridge, 2012: 93). According to autocorrelation assumption, there is no correlation between error terms of independent variables (Wooldridge, 2012:353). If this assumption does not occur, it means that there is correlation between error terms of independent variables. Bhargava, Franzini and Narendranthan's Durbin-Watson Test and Baltagi-Wu

LBI Test are used to examine this assumption. Another assumption is about correlation between units. In studies such as domestic and regional economies, neighborhood effects can show spill-over in themselves. In such cases, correlations have spatial view rather than temporal view (Greene, 2012: 389). This assumption is tested through Pesaran Test.

Table 3. Tests of deviation from assumptions

Modified Wald Test	Modified Bhargava et al. Durbin-Watson Test and Baltagi-Wu LBI Test	Pesaran Test
χ^2 863.23	0.7066171	Cross Sect. Indep. 0.151
<i>prob.</i> 0.0000	0.9601869	<i>prob.</i> 0.8797

According to the results of analysis, there is no correlation among units but there are heteroscedasticity and autocorrelation problems in the model. In order to solve these problems, standard errors which are resistant to deviations from assumptions were produced by using method of Driscoll and Kraay.

5. Analysis results

Driscoll and Kraay estimator was used to solve the heteroscedasticity and autocorrelation problems. Table 4 shows analysis results.

Table 4. Analysis results

Explanatory Variables	Coef.	t-statistics	p-value
<i>GDPP</i>	0.32299	3.64	0.002*
<i>INF</i>	0.04960	1.35	0.197
<i>M2</i>	-0.61748	-7.67	0.000*
<i>AGEDP</i>	2.72988	2.92	0.010*
<i>PY</i>	7.59861	3.35	0.004*
<i>PO</i>	0.54013	1.13	0.278
<i>RRL</i>	10.8371	3.16	0.006*
<i>URB</i>	10.72757	3.29	0.005*
<i>Cons.</i>	-1645.05	-3.20	0.006*
<i>F</i>	447.46		
<i>Prob.</i>	(0.0000)		
<i>R²</i>	0.3691		

Note: (*) significant at %1 level.

According to the results of analysis, coefficient of annual percentage GDP per capita growth (*GDPP*) affects the savings positively. 1% increase in *GDPP* causes 0.32% increase in savings. This result is consistent with theoretical expectations. *M2* as a percentage of GDP (*M2*) affects the savings negatively. 1% increase in *M2* causes 0.61% decrease in savings. This result is consistent with theoretical expectations. Age dependency ratio as a percentage of working-age population (*AGEDP*) affects the savings positively. 1% increase in *AGEDP* causes 2.72% increase in savings. Population ages 15-64 as a percentage of total population (*PY*) effects on savings positively. 1% increase in *PY* causes 7.59% increase in savings. Rural population as a percentage of total

population (*RRL*) affects the savings positively. 1% increase in RRL causes 10.8% increase in savings. Urban population as a percentage of total population (*URB*) affects the savings positively. 1% increase in URB causes 10.7% increase in savings. GDP Deflator (*INF*) and population ages 65 and above as a percentage of total population (*PO*) have insignificant effects on savings.

6. Conclusions

This study examines the determinants of savings in the APEC countries. Panel data analysis was used for sixteen APEC member countries. Model was established by theoretical and empirical related studies in the saving literature.

In the APEC countries income variable affects on savings positively. While gross domestic product per capita growth increases, saving rates increase as well. Financial depth affects the savings negatively. Financial facilities improve consumption opportunities. Thereby tendency for saving decline in this phase. Age dependency ratio affects the savings positively. This result can be explained by Kelley and Schmidt (1996) evidence. They indicate that children contribute directly to household market and non-market income. Also more children encourage parents to work more. For these reasons, increase in age dependency ratio causes increase in savings. Young population affects the savings positively. It can be said that individuals save up in the earlier part of their life to maintain their consumption tendency in the later part of their life. Rural population affects the savings positively. This result can be associated with rural region conditions that provide insufficient financial facilities and deficient government protection arguments for individuals. Urban population affects the savings negatively in the APEC countries. This result is adverse to the theoretical expectations. Wan et al. (2003) asserts that culture factor impress the savings and other economic indicators. In this respect urban population affects the savings positively by cultural propensity in the APEC countries. Inflation and old population have no significant effect on savings.

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