Received 28 April 2018
Accepted 2 May 2018

Nonlinear effects of fiscal policy on national saving

Empirical evidence from emerging Asian economies

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Abstract

Purpose – The purpose of this paper is to examine the impacts of fiscal policy, namely, net tax and government expenditure on national saving and its nonlinearity. The author first investigates whether the impacts of fiscal policy on national saving have changed after the global financial crisis of 2008. Then, the author tests the nonlinearity of the relationship by taking account of the economic cycle, namely, economic expansion (boom) and economic recession (bust).

Design/methodology/approach – The empirical model bases on a reduced-form equation with national saving as a dependent variable, lagged value of national saving, output gap and fiscal policy as independent variables. The two-step system GMM approach was employed to estimate the empirical model, using a panel of 23 emerging Asian economies in the period of 1990-2015.

Findings – The empirical results show that tax policy and expenditure policy follow the predictions of the overlapping generation model with finite horizon and the Keynesian view. The nonlinearity of fiscal policy is twofold. The conduct of fiscal policy in the period after 2008 seems effective, while the effect is insignificant in the period before 2008. Likewise, fiscal policy tends to have more significant effects in bust cycle. The effect of tax policy is increased during recession, while the effect of government spending is more pronounced during economic downturn.

Originality/value – The contributions of this paper are twofold. First, it is shown that fiscal policies in the region had more impacts on national saving after the global financial crisis of 2008. Second, the research confirms nonlinear impact of fiscal policy on saving behavior during economic recession and economic boom.

Keywords Nonlinearity, Fiscal policy, National saving, GMM

Paper type Research paper

1. Introduction

Asian economies have long been acknowledged among the top savers in the world, but the situation has become less optimistic after the global financial crisis of 2008. Figure 1 reports the average national saving to GDP in emerging Asia and other parts of the world, namely, developed European countries, Latin America, Africa, OECD and developing Eastern Europe. Among these regions, East Asia always has the highest saving ratio. From the neoclassical growth theory to endogenous growth model, savings has played an essential role in obtaining and sustaining a high economic growth. In practice, "takeoff" countries in the region with high economic growth, including Hong Kong, China, Indonesia, Republic of Korea, Malaysia, Singapore, Taipei, China, and Thailand have also attained a remarkable level of savings. However, the region has failed to maintained the upward trend of saving rate. After the Asian financial crisis of 1997-1998, average saving rate of the region has

This research is funded by University of Economics, Ho Chi Minh City, Vietnam.

Journal of Asian Business and Economic Studies
Vol. 25 No. 1, 2018
pp. 2-14
Emerald Publishing Limited
2515-964X
DOI 10.1108/JABES-04-2018-0001

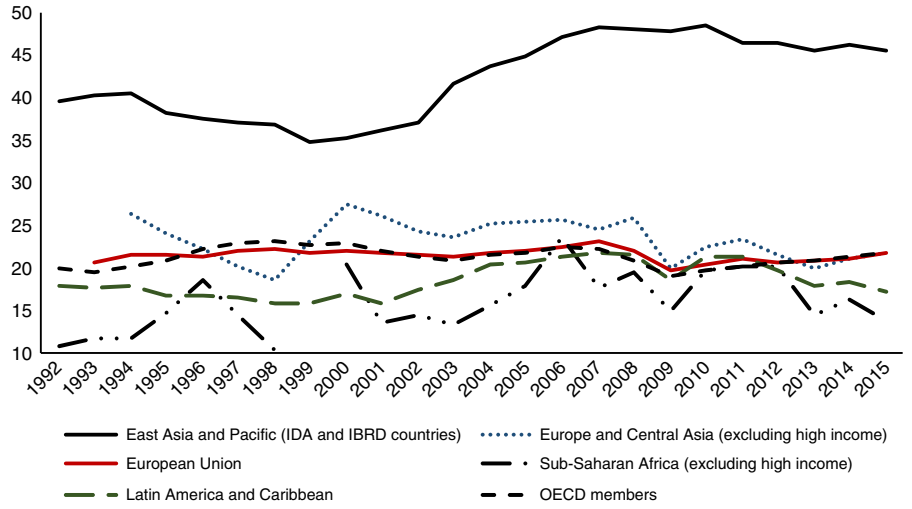

Figure 1.
Average national saving to GDP in the world

increased gradually from 1999 to 2007. This increasing trend was halted at the outbreak of the global financial crisis of 2008. Since then, it is observed that a declining trend in saving rate has become visible. The Asian economies have not yet faced the problem of low national saving rate and poor economic growth like developed countries, such as England, Australia, the USA. Nevertheless, Barrell and Weale (2010) have warned governments against a low national saving rate, as a low rate would put a pressure on the total wealth of future generations.

In addition, a low saving rate would raise another concern in the "rebalancing growth" path of the region (Jha *et al.*, 2009). In the long-term, the restructuring process in the emerging Asia demands that the region must become more independent of external demands and focus more on satisfying internal demands, i.e. boosting domestic consumption (Abdon *et al.*, 2014). This is because economic growth obtained with domestic savings is more sustainable than the growth fueled by foreign demands (Patra *et al.*, 2017). Yet, there is evidence that economic growth in the region has depended largely on foreign demands, which made the region vulnerable in the recent global financial crisis (Jha *et al.*, 2009). Thus, in a context of low savings, the region would have more difficulties in pursuing a "rebalancing growth" path.

If that is the case, should governments take any initiative to influence the saving dynamics? Although governments have long been using fiscal instruments as a tool to stabilize the economy, foster growth and maintain social equality, the answer to the question above is not straightforward. From the tax neutral theory of Ramsey (1927) and Keynes (1936), fiscal policy has been at the center of the research about impacts of government spending, taxation and debt on the economy. Even in the theoretical ground, there are contradicting results. Among these theories, two basic opposing views are Ricardian and Keynesian. In the Keynesian view with price rigidity and aggregate demand, private consumption depends on income and fiscal policy can affect output. On the contrary, the fiscal multiplier in the Ricardian view is zero. Table I shows that existing theories about the relationship between fiscal policy and national saving through the private consumption channel have not reached a consensus. On the other hand, there are several concerns about the conduct of fiscal policy to obtain short-term and long-term goals in the emerging Asian economies. Abdon *et al.* (2014) argue that fiscal authorities in the region are lacking experience in using countercyclical fiscal policy, comparing to their counterparts in developed countries.

The motivation of this research is many fold. First of all, despite the fact that the impact of fiscal policy on economic activities is still ambiguous, Hur *et al.* (2010) argue that government spending would play an important role in promoting private consumption in medium and long term. If we heed the advice of Hur *et al.* (2010), a long-term vision and understanding of the relationship between fiscal policy and macroeconomic variables would be necessary to prepare for a sound fiscal discipline and efficient implementation of fiscal policy. Furthermore, given the downward trend of national saving rates in emerging Asian economies, it would be reasonable to examine the possible impact of fiscal policy on the saving behavior, whether the policy help to promote the saving rate or put a pressure on it. Answering these questions would help policy makers in the region prepare better for the restructuring process in the future. Second, if the downward trend of the national saving rate in the region materialized since 2008 continues, it would create difficulties for local governments in achieving their growth target and other social-economic goals. Given this behavior of savings, this paper would like to investigate whether government activities have the same impact on savings before and after the global financial crisis. Third, there is evidence about an expansionary fiscal contraction (see e.g. Barry and Devereux, 2003; Balcerzak *et al.*, 2016; Hogan, 2004). If this is the case, a fiscal contraction can result in a boom and a fiscal expansion can create a bust in the economic cycle. The expansionary fiscal contraction effect depends on the economic condition (Giavazzi *et al.*, 2000). These results imply a nonlinear impact of fiscal variables on private sector. Thus, the research tends to investigate the possible change in the way fiscal policy affects saving behavior during economic recession and economic boom.

As a result, the paper would like to investigate the relationship between fiscal policy and national saving, using a panel of emerging Asian economies. The paper is planned as follows. First, Section 2 would review the existing literature, analyze the theoretical results as well as empirical findings. Section 3 provides our empirical model, methodology and a data description of our sample. Section 4 is devoted to the discussion of the empirical models and robustness test. Section 5 concludes the study.

2. Literature review

From definition, national saving is the difference between real income (Y) and private or household consumption (C) and government spending (G). Or, in another word, the sum of private saving (S_p) and government saving (S_G) is shown in the following:

$$S = S_p + S_G = (Y - T - C) + (T - G) = Y - (C + G) \tag{1}$$

where T equals to total taxes minus transfer and interest payments. From Equation (1), impacts of fiscal policy on national saving depend on the response of private consumption to

Theory	Impacts of fiscal policy on national saving through private consumption channel Increase in net tax (at a fixed level of government spending)	Increase in government spending (at a fixed level of tax)
Keynesian	Positive	Negative
IS-LM framework	Unclear	Unclear
Model with limited planning horizon	Positive	Negative
Model with unlimited planning horizon	Unaffected with non-distortionary tax policy. Negative with distortionary tax policy	Unaffected with non-distortionary tax policy. Negative with distortionary tax policy

Source: Giavazzi *et al.* (2000)

Table I.
Theoretical results of the impacts of fiscal policy on national saving

changes in net tax and government spending. However, as aforementioned in Table I, theoretical models have not yet reached a consensus about the relationship. According to the traditional Keynesian view, an increase in government spending or a decrease in tax would lower national saving, assuming that household consumption is independent of government spending. With this assumption, household consumption would rise if net tax falls. Therefore, when governments increase spending and/or lower net tax would reduce savings of both sectors, leading to a fall in national saving (Blanchard, 2003).

In a conventional IS-LM framework with a fixed level of government spending, an increase in tax (or a decrease in transfers) would raise the government budget surplus and put a pressure on private consumption and private saving. Furthermore, according to Blinder and Solow (1974), the wealth effect would intensify the negative impact of increasing government budget on national saving. Yet, the increase in government budget could be higher or lower than the fall in private saving, which leaves the total effect on national saving undetermined. In the same manner, a higher government spending, or a lower net tax would also have equivocal impacts on national saving.

In an overlapping generation model with no heritage and limited planning horizon, a one-time increase in tax to reduce government debt and attenuate future generation's tax burden would reduce net income of current generation, assuming that government spending is unchanged. Households thus lower their consumption and saving accordingly. However, the fall in private saving would be lower than the increase in net tax because individuals would equally divide the reduction in consumption over their life cycle. As a consequence, the increase in government budget would surpass the reduction in private saving, which in turn raise the national saving. On the contrary, a higher government spending would lower private saving. Lower private and public saving imply lower national saving.

On the other hand, an overlapping generation model with unlimited planning horizon will result in Ricardo equivalence (Barro, 1974). In this aspect, a decrease in net tax with unchanged present value of government spending would not affect the national saving. This is because the consumers perceive that, without changes in the government size, a fall in tax today would only imply more taxes in the future. The consumers thus save the part of deferred tax for the future. Consequently, a reduction in budget surplus would be offset by an increase in the private saving, which makes the total national saving unchanged. Similarly, government expenditure would crowd out private investment in a one-to-one manner. A unit increase in government spending reduces permanent income by one unit, and then, one unit of private consumption. From the definition of national saving, this increase in government spending would not change the total saving. However, these impacts depend on whether the changes in fiscal stance are temporary or permanent (Hayford, 2005). A permanent increase in government expenditure would imply a permanent increase in tax, which is the one-to-one case mentioned above. On the contrary, a temporary increase in government expenditure would reduce less private consumption, and thus, reduce the national saving. If tax is raised temporarily, a today increase in net tax would imply lower tax in the future and change the dead-weight loss of tax at different time. This in turn affects the present value of income before tax and private consumption. If the households have infinite planning horizon, the national saving would be lowered.

In addition, there is a strain of literature examining the nonlinear impacts of fiscal policy on national saving, such as the theoretical models of Feldstein (1982) and Drazen (1990). These theories were then developed by Blanchard (1990). A traditional framework should contain two periods with two types of consumer. The neoclassical consumer can borrow and save, while Keynesian consumer can only save. Government finances the increasing expenditure by taxing both types of consumer. Government expenditure affects disposable income positively. The impacts of fiscal policy will then be investigated in both periods for both consumers. These theoretical frameworks show that fiscal policy is positively related

to consumption decision, and eventually national saving. Besides, the Keynesian consumers suffer more than the neoclassical consumers in economic recession because of their liquidity constraints, which require them to spend all the changes in disposable income.

On the empirical ground, Pradhan and Upadhyaya (2001) base on an error correction model to conclude that deterioration in budget deficit lowers national saving. Using a panel of OECD countries, Giavazzi *et al.* (2000) examine the nonlinear relationship between fiscal policy and national saving. The results show that the effects in fiscal contractions are stronger than those in fiscal expansions. The effect of an increase in net tax is insignificant in time of tight fiscal policy, while significantly positive in time of less pronounced fiscal contractions. The level of public debt does not explain the nonlinearity. Hayford (2005) conducts a study for the US economy and concludes that fiscal policy, in particular government expenditure, strongly impacts national saving and output gap. Chinn *et al.* (2014), Chinn and Ito (2007), Huntley (2014), Röhn (2010) find the positive relationship between budget deficit and national saving. Deficit in government budget balance leads to an increase in private saving, but the increase is less than the deficit and thus national saving falls. Chun (2007) comes to the conclusion that the increasing aging speed of the population and government budget imbalance in long-term lower the national saving ratio in Korea. In another study, Barrell and Weale (2010) show that the authority can affect the low saving rate in England through the conduct of fiscal policy, transfers and real estate's prices. Arestis and Resende (2015) base on the Keynesian point of view to conclude that fiscal deficit would change the relative prices in the economy, and eventually affect net export, national saving and current account. However, the degree of the Keynesian twin deficit in the study is low because the systemic relationship between the expansionary fiscal policy (fiscal deficit) and the increase real exchange rate does not exist.

3. Empirical model and data

3.1 Empirical model

From the theories and definition from Section 2, the study will examine the impacts of fiscal policy on national saving using a reduced-form empirical model with national saving being a dependent variable. The empirical model would take the form of:

$$ns_{it} = \beta_1 ns_{i,t-1} + \beta_2 gap_{it} + \gamma_0 tax_{it} + \alpha_0 exp_{it} + \eta_{it} + \mu_t + \varepsilon_{it} \quad (2)$$

where *ns*, *gap*, *tax*, *exp* denote national saving, output gap, net taxes and government expenditure, respectively. η_i and μ_t are individual fixed effect and time fixed effect, respectively. ε_{it} denotes the model random error. All the variables are calculated as a percentage of potential GDP.

There are several advantages in using national saving as a dependent variable: according to Hayford (2005), fiscal policy would directly affect national wealth through its effect on national saving; using national saving allows for direct comparison with the prediction of Ricardian equivalence theorem (Giavazzi *et al.*, 2000); and Barrell and Weale (2010) advise governments to watch out for a low national saving rate, since only a high saving rate could create more wealth for the future generation. Hence, the priority would be looking straightforwardly at the national saving, rather than examining whether the saving comes from private or public sector.

In order to account for the possible multicollinearity when the right hand side of Equation (2) contains both government revenue and government expenditure, Miller and Clarke (2014) propose the removal of several components from government revenue or government expenditure. For instance, the use of net taxes, i.e. taxes minus transfers, would attenuate the problem of multicollinearity in this context. Moreover, the use of potential GDP in the calculation of the variables would bring some advantages

Hayford (2005): improve the stationary characteristics of the variables; render the sample unaffected by fluctuations in the business cycle. Besides, according to Giavazzi *et al.* (2000), the variable output gap to potential output on the right hand side of Equation (2) would control for the response of private saving and government budget surplus to fluctuations in income.

In Equation (2), there are possibilities of endogenous problem involving the fiscal variables. For instance, automatic stabilizers in the tax code and the fiscal discipline of each county react to the business cycle (Giavazzi *et al.*, 2000). Because the tax code contains such automatic stabilizers, government revenue would fluctuate along with the economic cycle. As a consequence, government revenue and national saving would response to a same shock. In the Keynesian view, investment and national saving positively correlate the business cycle. Besides, the fiscal discipline and implementation of the tax code would be other sources of endogeneity.

In the same manner, the study implements another setup to test for the hypothesis in Abdon *et al.* (2014) and Hur *et al.* (2010) that there was success in the conduct of fiscal policy in the region after the financial crisis. To this end, the empirical model is set up as:

$$ns_{it} = \beta_1 ns_{i,t-1} + \beta_2 gap_{it} + \gamma_0 tax_{it} + \gamma_1 tax_{it} \times y_{08} + \alpha_0 exp_{it} + \alpha_1 exp_{it} \times y_{08} + \eta_{it} + \mu_t + \varepsilon_{it} \quad (3)$$

In Equation (3), y_{08} is a dummy variable, which takes the value of 1 for the years after 2008, and 0 otherwise. Such construction of the dummy variable would allow an investigation of a nonlinear impact of fiscal policy on the dependent variable. The year 2008 is chosen for several reason: based on the timeline in Filardo *et al.* (2010), the year 2008 is considered the beginning phase of the global financial crisis; and based on our observation of the average saving rate in the region, the upward trend ended in 2007 and the year 2008 marked the emergence of a downward trend in average saving rate.

Next, the model was expanded by looking at the impact of fiscal policy on national saving during boom and bust cycle. In order to examine this changing impact, fiscal policy variables are allowed to interact with a dummy variable, which captures the boom and bust of the cycle. The empirical model will thus take another form of:

$$ns_{it} = \beta_1 ns_{i,t-1} + \beta_2 gap_{it} + \gamma_3 tax_{it} + \gamma_4 tax_{it} \times D_{it} + \alpha_3 exp_{it} + \alpha_4 exp_{it} \times D_{it} + \eta_{it} + \mu_t + \varepsilon_{it} \quad (4)$$

The dummy variable D_{it} represents two states of the economy: expansion and recession, depends on changes of the business cycle. The recession state depends on the value of output gap to potential output, obtained by using Hodrick-Prescott's filter. The dummy variable takes the value of 1 when the output gap is negative, and 0 otherwise. This setup allows the study of the possible nonlinear impacts of fiscal policy on national saving. The signs of the coefficients γ_3, α_3 would show the impacts during economic expansion. Since during boom, the value of D_{it} is zero so γ_4 and α_4 do not appear in Equation (4). On the contrary, D_{it} takes the value of one during economic downturn, so the signs of the coefficients γ_4 and α_4 would reveal how the effects changes during economic recession. In other words, total impact of fiscal variables during economic recession can be calculated as $(\gamma_3 + \gamma_4)$ for tax and $(\alpha_3 + \alpha_4)$ for spending.

3.2 Empirical methodology

Equations (2)-(4) take the form of a dynamic panel data model, in which both the dependent variable and the regressors are affected by the same shock or some of the regressors significantly correlate with the lags of the dependent variables. This notion of endogeneity is also discussed in Section 3.1 above. To address the issue of endogeneity among the variables, the coefficients of the empirical models are estimated using the method of GMM, proposed by Arellano and Bond (1991) and completed by Arellano and Bover (1995) and

Blundell and Bond (1998). Equations (2)-(4) would take the general form of a dynamic panel model as:

$$y_{it} = Ay_{i,t-1} + B(L)X_{it} + \eta_i + \varepsilon_{it} \tag{5}$$

Transforming Equation (5) into a differenced equation, we get:

$$\Delta y_{it} = A\Delta y_{i,t-1} + B(L)\Delta X_{it} + \Delta\varepsilon_{it} \tag{6}$$

where Δ denotes first difference. Differencing would make $\Delta y_{i,t-1}$ correlate with $\Delta\varepsilon_{it}$ and render the estimates of Equation (6) biased. To address this problem of endogeneity, Arellano and Bond (1991) propose using lags from $y_{i,t-2}$ as instruments for $\Delta y_{i,t-1}$ since $y_{i,t-2}$ is related to $\Delta y_{i,t-1}$, but unrelated to $\Delta\varepsilon_{it}$, given that ε_{it} is not autocorrelated:

$$E\left[y_{i,t-s}\Delta\varepsilon_{it}\right] = 0 \text{ with } t = 3, \ldots, T \text{ and } s \geqslant 2$$

On the other hand, the assumption of strict exogeneity would not be valid in the case of reverse causality ($E[X_{i,t}\varepsilon_{it}] \neq 0$ with $t < s$). Hence, in case of weak exogenous variables or predetermined variables, only their own lags can be used as instruments:

$$E\left[X_{i,t-s}\Delta\varepsilon_{it}\right] = 0 \text{ with } t = 3, \ldots, T \text{ and } s \geqslant 2.$$

Equations (2)-(4) can be estimated using one-step GMM with the assumptions of unautocorrelated error terms and homoscedasticity in both dimensions, cross-section and time. If these assumptions fail to hold, two-step GMM would give asymptotically more efficient results. This is because two-step GMM builds its variance-covariance matrix using a consistent estimate of the weighting matrix taking from the residuals of the one-step GMM. Yet, two-step GMM would downward bias the standard errors (Arellano and Bond, 1991). This downward bias can be fixed by using the finite sample correction of the two-step variance-covariance matrix proposed by Windmeijer (2005). This adjusted variance-covariance matrix helps robust two-step GMM to yield more efficient results than one-step GMM. Moreover, Arellano and Bover (1995) and Blundell and Bond (1998) improve the estimation of Arellano and Bond (1991) by assuming that the correlation between the first difference of instrumental variable and the fixed effect does not exist. This assumption would allow more instruments and improve the estimation. This approach is referred as system GMM, as opposed to the version of differenced GMM in Equation (5). The method of system GMM involves the estimation of two simultaneous equations: the level equation and the first-order differenced equation. In the level equation, lagged differences are used as instruments, while the differenced equation uses lagged levels as instruments.

One problem with the use of Windmeijer's variance-covariance matrix involves the result of Sargan over-identifying test. According to Roodman (2009), the adjusted Windmeijer (2005) matrix would yield inconsistent results of Sargan test. To this end, the study proposes the use of Hansen-J over-identifying test. Besides, it is necessary to account for the autocorrelation of ε_{it} by testing the null hypothesis: $\Delta\varepsilon_{it}$ are not correlated at second order[1]. Rejection of the null hypothesis implies autocorrelation of ε_{it} and thus the GMM estimates would be inconsistent.

3.3 Data

In this paper, a panel data set of 23 emerging Asian economies, spanning from 1990 to 2015 is used to determine the impact of fiscal policy on national saving. The sample is extracted from the database of the Asian Development Bank. The national saving is calculated using the definition provided by Equation (1). Net tax is the difference between total tax revenue and transfers (grants). Government expenditure is the government final consumption.

The output gap is quantified using Hodrick-Prescott's filter, with the recommended smoothing parameter of 6.25 for annual data. Table II reports the summarized statistics for all variables in the empirical model.

4. Empirical results

In Section 3, several aspects regarding the empirical models and methodology are discussed. Section 4 will be devoted to the analysis of the estimated models and their coefficients. Since the estimation method for the dynamic panel models in the study is two-step system GMM, Table III displays several statistics in the lower part in order to assess the validity of the GMM's estimators.

	Observations	Mean	SD	Min.	Max.
National saving	583	23.84	13.09	−15.91	65.17
Output gap	595	−0.04	2.54	−24.44	13.03
Net tax	575	14.86	5.89	2.22	44.61
Government expenditure	581	22.70	8.16	7.80	68.64
y_{08}	598	0.31	0.46	0.00	1.00
Dummy (D)	598	0.50	0.50	0.00	1.00

Table II. Summarized statistics

	(1) Baseline	(2) Before 2008	(3) After 2008	(4) Nonlinear 1	(5) Nonlinear 2
L.National saving	0.671*** (5.38)	0.777*** (8.74)	0.772*** (4.46)	0.979*** (4.22)	0.707*** (6.58)
Output gap	0.0194 (0.14)	−0.0195 (−0.05)	−0.360 (−0.78)	−0.0519 (−0.14)	
Net tax	0.687*** (4.98)	0.127 (0.38)	0.871** (2.17)	0.0636 (0.16)	0.601 (3.14)
Government expenditure	−0.163** (−2.07)	0.122 (0.68)	−0.358** (−2.73)	−0.0667 (−0.49)	0.113 (0.84)
y08				29.65 (1.52)	
Net tax #y08				1.340* (1.88)	
Government expenditure #y08				−2.200* (−1.96)	
dum					1.055 (0.30)
Net tax #dum					0.410** (2.26)
Government expenditure #dum					−0.269** (−2.15)
Observations	546	376	170	546	548
Number of instruments	20	22	17	19	20
AR(1)	−2.22	−2.53	−1.81	−2.08	−2.28
AR(1) p-value	0.026	0.011	0.070	0.038	0.023
AR(2)	1.12	0.40	0.53	0.87	1.05
AR(2) p-value	0.26	0.69	0.59	0.39	0.30
Hansen-J p-value	0.44	0.25	0.62	0.47	0.34

Notes: y08, a dummy variable which takes the value of 1 for all the years after 2008 and 0 otherwise. dum, a dummy variable representing the period of economic recession. t-statistics in parentheses. The notations AR(i) and AR(i) p-value with $i = 1, 2$ report the Arellano-Bond test of autocorrelation of order i and its p-value, respectively. Hansen-J p-value reports the p-value of Hansen's J-test of over-identifying restrictions. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Table III. Empirical results using two-steps system GMM with national saving as dependent variable

One problem with the GMM's estimators involves the large number of instrumental variables. Roodman (2009) proposes several methods for reducing the number of instruments, which are limiting the number of lagged instruments or combining the lagged values into a smaller matrix. A study can use one or both of these methods. In this paper, the number of instruments follows the rule of thumb that, in every model, the number of instrumental lags is always smaller than the cross-sectional dimension, i.e. the number of countries in the sample. All the estimated models satisfy this requirement. Regarding the problem of autocorrelation of the error terms, the statistics of Arellano-Bond test of first- and second-order autocorrelation are reported. By construction, the error terms are autocorrelated at first order, which make the statistics of the AR(1) test significant at 5 percent in all models, except for Model 3, which is significant at 10 percent. The results of the AR(2) test do not reject the null hypothesis that the errors are uncorrelated at second order at all significant levels. In the last row of Table III, the Hansen-J p-value would help to determine the appropriateness of the instrumental lags. The null hypothesis of Hansen-J over-identifying tests is not rejected, thus ensures the moment condition.

Overall, the coefficients of lagged values of the dependent variable are significantly positive and less than 1, across all models. These conditions are necessary to ensure the steady state assumption, which requires the dependent variable to converge toward its steady state value. The absolute value of the coefficient of lagged dependent variable needs to be less than 1 to ensure the convergence. The range of the coefficients in all models spans from 0.671 to 0.979, implying the persistent and convergent effect of the first lag. The effect of output gap on national saving is ambiguous, given the insignificance of the coefficients across the models.

The results of the baseline model in Equation (2) are reported in column (1) of Table III. The coefficient of net tax is positive and significant at 1 percent, while the coefficient of government expenditure is negative and significant at 5 percent. The results support the forecast of the overlapping generation model in case of finite planning horizon and the Keynesian framework, but refute the conclusion of infinite planning horizon overlapping generation model. In this study, the effect of net tax on national saving does not support the idea of Ricardian equivalence. However, because empirical studies have not reached a consensus on the Ricardian equivalence theorem, the results of this study can still conserve their validity. On the empirical ground, the results are in line with Giavazzi *et al.* (2000), Hayford (2005), Pradhan and Upadhyaya (2001).

4.1 Impact of fiscal policy on national saving before and after 2008

As aforementioned, the study is motivated by the hypothesis that the use of fiscal stimulus packages to counter the adverse consequences of the financial crisis in 2008 is effective. To this end, the study tests this hypothesis using two different approaches to ensure the validity and robustness of the results: on one hand, the sample is divided into two subsamples, before 2008 and after 2008[2]. Then, the baseline model is estimated accordingly for both subsamples; on the other hand, the hypothesis is tested by introducing a dummy variable, as explained in Equation (3). The results of the two subsamples are displayed in columns (2) and (3) of Table III, respectively. Column (4) shows the estimations of Equation (3) with the 2008 dummy variable.

For the subsample of the period before 2008, the coefficients of both net tax and government expenditure are not significant. The effects of fiscal policy in this period support the predictions of the traditional IS-LM framework and the overlapping generation model with infinite planning horizon and non-distortionary tax. To check the validity of the result, the subsample is divided into another two sub-subsamples, before 2000 and from 1999 to 2008. But the results remain robust, pointing out the insignificant effects of net tax and government expenditure during the period before 2008[3].

Turning to the results of the period after 2008, as displayed in column (3), the effect of net tax is positively significant, while the effect of government expenditure is negatively significant. These conclusions are similar to the results of the baseline model. It seems that the conduct of fiscal policy has significant effect on national saving after 2008. Yet, the significant effect is not found in the period before 2008. These findings would confirm the first aspect of nonlinear effects of fiscal policy in the region.

This assertion is corroborated by the estimate results of Equation (3), displayed in column (4). In this model, fiscal policy variables are allowed to interact with a dummy variable, which takes value 1 for all the year from 2008 to 2015, and 0 otherwise. In this setup, the effect of net tax in the period before 2008 is determined by the estimated value of γ_0 in Equation (3), while the effect after 2008 is calculated by the sum of the estimated value of γ_0 and γ_1. Likewise, the effects of government expenditure before 2008 and after 2008 are determined by the estimated value of α_0 and $(\alpha_0 + \alpha_1)$ in Equation (3), respectively. It can be observed from column (4) of Table III that only the coefficients of the two interaction terms are significantly different from 0. The estimated coefficients of γ_0 and α_0 are not significant, which substantiate the conclusions about the insignificant effect of fiscal policy on national saving before 2008 and partly support the Ricardian equivalence theorem.

4.2 Nonlinear relationship during boom and bust

In the next model setup, the nonlinearity of fiscal policy is further investigated with the estimated results of Equation (4). In this equation, the period of economic recession is defined as the years where the output gap is negative, while a positive output gap implies a period of economic expansion. Interpretation of the coefficients in Equation (4) would be similar to those of Equation (3). The estimated values of γ_3 and α_3, respectively, stand out for the effects of net tax and government expenditure on national saving during boom period. The effects during bust should be interpreted as the estimates of $(\gamma_3+\gamma_4)$ and $(\alpha_3+\alpha_4)$.

The results in column (5) of Table III show that the effects of fiscal policy are different between boom and bust cycle. The estimated coefficient of net tax is 0.601 and of government expenditure is 0.113 in economic expansion, however, these coefficients are not significant. During economic recession, the effect of net tax increases by 0.410, which is significant at 5 percent level. While the effect of government expenditure is reduced by −0.269 at 5 percent level of confidence. The effect of fiscal variables on national saving behaves in a Keynesian manner and does not support the idea of Ricardian equivalence in economic recession. The negative effect of government spending during economic downturn is more striking, given the fact that both public and private saving are affected by the same adverse shock of a bust cycle.

5. Conclusion

This paper examines the impacts of fiscal policy, namely, net tax and government expenditure on national saving and its nonlinearity. The empirical model bases on a reduced-form equation with national saving as a dependent variable, lagged value of national saving, output gap and fiscal policy as independent variables. Various model setups in the paper allow for the investigation of the nonlinear effects of fiscal policy. The two-step system GMM approach was employed to estimate the empirical model, using a panel of 23 emerging Asian economies in the period of 1999-2015.

The coefficients of lagged national saving imply that persistent long-run effects of other saving determinants are larger than the short-run effects of the variables in the model. From the baseline model, net tax and government expenditure behave in a Keynesian view and an overlapping generation model with finite horizon planning.

Next, dividing the sample into two subsamples yields other distinct results. Although the effectiveness of fiscal policy on national saving is unproven for the period before 2008, it becomes more effective after 2008. These findings are substantiated by another setup of the empirical model, where fiscal policy interacts with a dummy variable, and thus confirming the nonlinear effect of fiscal policy. In the final setup, another dummy variable is created to account for two states of the economy, namely, economic expansion and economic recession. The effect of tax is increased and the effect of government expenditure is intensified during economic downturn. These results corroborate the nonlinear behavior of fiscal policy in different economic contexts.

These findings are novel and compelling to authorities in developing countries in the sense that they urge policy makers to carefully consider the conduct of fiscal policy in different situation of the economy.

Notes

1. $\Delta\epsilon_{it}$ is by construction correlated at first order.
2. The subsample after 2008 includes the year 2008.
3. The results of the two sub-subsamples are not reported, but will be available upon request.

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