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Article

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Did Fiscal Stimulus Lift Developing Asia Out of the Global Crisis? An Empirical Investigation

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The substantial slowdown of economic growth since the global financial crisis of 2008-2009 is rekindling debate on whether developing Asia should use fiscal expansion to boost aggregate demand. A key factor in the debate is the effectiveness of countercyclical fiscal policy in the region. The global crisis, as well as the fiscal stimulus packages implemented by developing Asian countries at that time, give some clues to this important issue. The region weathered the global crisis well and experienced a robust V-shaped recovery. According to conventional wisdom, the fiscal stimulus packages put in place by Asian governments played a key role in the region's recovery. The central objective of this paper is to empirically test this wisdom by using cross-country panel data. Our main finding is that the stimulus has had a limited but positive impact on developing Asia's output during the global crisis. This lends some support to the notion that countercyclical fiscal policy can help the region cope with severe external shocks. The broader, more fundamental implication for regional policymakers is that the region's long-standing commitment to fiscal discipline can yield significant benefits beyond macroeconomic stability. An important consequence of this commitment – relatively healthy fiscal balance sheets – enabled the region's governments to quickly and decisively embark upon fiscal stimulus programs.

Keywords: Fiscal Stimulus, Fiscal Policy, Countercyclical Stabilization, Global Crisis, Developing Asia
JEL Classification: E62, E63, E32

I. INTRODUCTION

The substantial slowdown of economic growth since the global financial crisis of 2008-2009 is rekindling debate on whether developing Asia should use fiscal expansion to boost aggregate demand. A key factor in the debate is whether

countercyclical fiscal policy is effective or not in boosting demand in the region. Due to a history of fiscal prudence, episodes of concerted fiscal activism in the region have been few and far in between. However, very recently, during the global financial and economic crisis of 2008-2009, governments throughout the region pursued fiscal expansion to stave off a collapse of aggregate demand. According to conventional wisdom, the region-wide fiscal stimulus was a key factor behind the region's resilience and robust recovery from that crisis. Empirical evidence which confirms this conventional wisdom would strengthen the case for fiscal activism in the face of external shocks such as the euro crisis.

Despite the pronounced initial impact of the global crisis on exports and output, most evident in the 4th quarter of 2008 and 1st quarter of 2009, the Asia and the Pacific region has staged a remarkable V-shaped recovery. In the aftermath of the crisis, the region has far outperformed not only the advanced economies but also other parts of the developing world. What is all the more striking about the region's strong post-crisis performance is that it has taken place despite the fragile state of the US, EU and Japan. The key to developing Asia's surprisingly robust recovery is widely believed to be the sizable and effective fiscal stimulus measures implemented by the region's governments. Governments across the region aggressively boosted public spending and cut taxes in the face of weak exports and private domestic demand, and these measures are widely believed to have propped up aggregate demand and growth, thus laying the foundation for recovery.

Although the global crisis has rekindled developing Asia's interest in countercyclical fiscal policy, economists are deeply divided about the effectiveness of fiscal policy as a tool for countercyclical output stabilization. Interest in fiscal effectiveness has intensified as a result of heightened fiscal activism around the world during the global crisis. The flurry of recent studies include Baldacci, Gupta and Mulas-Granados (2009), Christiano, Eichenbaum and Rebelo (2011), Hall (2009), Romer and Bernstein (2009), OECD (2009), Cwik and Wieland (2009), Spilimbergo, Symansky, Blanchard and Cottarelli (2008), Horton, Kumar and Mauro (2009), Ilzetzki, Mendoza and Vegh (2013), Cogan, Cwik, Taylor and Wieland (2009), Feldstein (2009) and Auerbach and Gale (2009). The effectiveness of countercyclical fiscal policy depends on the extent to which fiscal expansion crowds out private investment and consumption. Different studies have produced a wide range of estimates about the size of the multiplier effect of the fiscal stimulus.

The central objective of this paper is to empirically test the conventional wisdom that the fiscal stimulus measures implemented by developing Asia's governments played a key role in the region's rapid, robust V-shaped recovery from the global crisis. Up to now, this conventional wisdom has been mostly accepted at face value with very little supportive evidence. Most existing empirical studies of fiscal effectiveness during the global crisis look primarily at evidence from the industrialized countries.[1] An exception is IMF (2010) which finds some evidence that the fiscal stimulus contributed to the recovery of developed and developing Asia and Pacific economies. The current study uses data from the crisis period to help remedy this void in the empirical literature by estimating the impact of fiscal policy on developing Asia's output during the crisis. While our analysis is far from definitive, it nevertheless marks a first step toward understanding the actual contribution of fiscal stimulus programs to developing Asia's strong recovery from the global crisis. As such, it will help us to understand the broader issue of whether countercyclical fiscal policy can protect the region from severe external shocks.

The rest of this paper is organized as follows. Section 2 *Data and Empirical Framework* outlines the data and empirical methodology used for analyzing the effectiveness of countercyclical fiscal policy. Section 3 *Empirical Results* reports and discusses the main findings of our empirical analysis. Section 4 *Concluding Observations* brings the paper to a close with some final observations.

II. DATA AND EMPIRICAL FRAMEWORK

In this section, we describe the empirical framework we use to evaluate the effectiveness of countercyclical fiscal policy in developing Asia during the global crisis. The empirical framework consists of two stages. The first stage involves estimation of a panel vector autoregression (PVAR) model using historical data to generate dynamic GDP forecasts of each sample country during the global crisis –

[1] Pyun and Rhee (2015) use the panel data for 21 OECD countries and compare the impulse responses of fiscal shocks between before- and after-the-crisis. They report significant increases in fiscal multipliers after the crisis.

i.e. 2008 Q4, 2009 Q1 and Q2. We choose those three quarters as the global crisis period because the negative impact of the global crisis on developing Asia reached its peak during those three quarters. The collapse of exports and trade, and the consequent slowdown of economic activity, climaxed during this period and recovery was already under way in many Asian countries in the 3rd quarter of 2009.

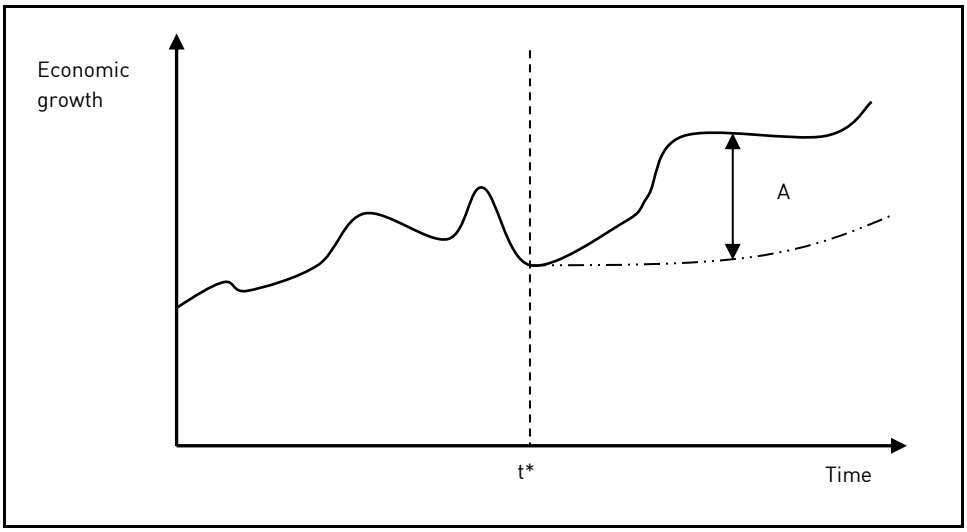
The choice of 2008 Q3 as the breakpoint also coincides with the bankruptcy of Lehman Brothers in September 2008 which triggered the global financial crisis. Subsequently, the global economic outlook deteriorated sharply, and in response countries around the world eased their monetary and fiscal policies. Concentrating our analysis on 2008 Q4 – 2009 Q2 thus allows us to assess whether the fiscal stimulus helped support demand and output precisely when the economy faced the greatest risk of a meltdown. The second stage involves a cross-country regression in which we regress the gap between actual GDP and forecast GDP on a number of explanatory variables. Of particular interest to us are the fiscal variables – government expenditures and revenues – since we are ultimately interested in the impact of fiscal policy on output.

In the first stage, before running a PVAR model, we first detrend the logarized real GDP series of each country by the Hodrick-Prescott (H-P) filter. For each country, we also compute "global" real GDP, which we define as the sum of the real GDP of all the other countries in the data set, and detrend the time series by the H-P filter. The global real GDP corresponding to a country captures its relative economic position vis-à-vis the rest of the world; if the said country is far behind the rest, it has a larger scope to catch up. The global real GDP is computed in three different ways: (1) simple sum, (2) sum weighted by the inverse of the geographical distance between all pairs of countries in the data set so that, for any given country, higher weights are assigned to its neighbors vis-à-vis distant countries in order to reflect trading opportunities, and (3) trade-weighted sum with the weights being bilateral trade volume, defined to be the sum of average exports and average imports during 2005-2007.

By repeating the above procedure for all countries, we build a bi-variate panel data set. Using the two variables - logarized real GDP and global real GDP - we estimate a bi-variate PVAR model with 4 lags (Model I). Based on the estimation results, we compute the dynamic GDP growth forecasts for each country for 2008 Q4, 2009 Q1 and Q2. In addition to the bi-variate PVAR model, we also build (1) a four-variable PVAR model which consists of detrended logarized real government

revenues and expenditures in addition to domestic GDP and global GDP (Model II) and (2) another four-variable PVAR model which is identical to (1) except that we replace global GDP with real effective exchange rate (Model III).

Figure 1. Forecast and Actual Post-Crisis Output Growth Path



Note: t* represents the time period when the crisis broke out

In the second stage, for each of the three PVAR models, we first subtract from the dynamic GDP forecasts generated by the PVAR models the actual GDP in 2008 Q4, 2009 Q1 and Q2. In Figure 1, t^* represents the time the global crisis broke out – i.e. 2008 Q3. The solid line represents the actual output path and the dotted line represents the forecast output path based on information until t^* and in the absence of additional shocks since t^*. The distance A thus represents the gap between actual and forecast output path during the global crisis. We run a cross-country regression of the distance A on a number of explanatory variables. Those variables include lagged domestic GDP growth, global GDP growth, government revenue, government expenditure, policy interest rate, term spread and real effective exchange rate. In particular, we are interested in the effect of the two fiscal variables – government revenues and expenditures – which will indicate the contribution of tax cuts and higher government spending to the recovery. We expect both lagged domestic GDP growth and global GDP to have a positive effect on A. Lower policy interest

rates and smaller term spreads are proxies for expansionary monetary policy. Finally, the depreciation of the real effective exchange rate should boost exports.

In addition to the explanatory variables listed above, we also include three interaction variables for government expenditures and revenues. Of these, the most important for our purposes is the dummy for developing Asia which captures the impact of fiscal policy for the developing Asian subsample. A positive and significant coefficient would indicate that fiscal stimulus has contributed to developing Asia's recovery. A second variable captures the interaction between a country's historical fiscal soundness, which is defined as the fiscal balance-GDP ratio and countercyclical effectiveness of fiscal policy. It is unclear whether fiscal soundness renders fiscal stimulus more or less effective. On the one hand, as noted earlier, fiscal discipline is associated with low levels of public debt, which lessens the adverse reaction of financial markets to fiscal deficits and thus makes the stimulus more effective. On the other hand, fiscally responsible governments are more likely to raise taxes in the future to offset the budget deficits but this would induce households and firms to save for higher future taxes. A third variable captures the interaction between a country's economic openness, defined as the ratio of trade volume to GDP, and effectiveness of fiscal policy. In principle, higher openness should reduce the impact of fiscal stimulus measures since more of the additional spending is spent on imports or is transferred as remittances and thus leaks out of the domestic economy.

The second stage estimation is closely related to a single equation approach, such as in Barro and Redlick (2011), which usually assumes contemporaneous relationship between a dependent variable and explanatory ones and needs good instrumental variables for unbiased estimators. Our model, however, tries to circumvent the endogeneity issue by giving one-period lag to the explanatory variables. Of course, lagging the explanatory variables is not a panacea and it may ignore the contemporaneous effects between the fiscal variables and the GDP growth. Furthermore, one period lagging cannot exhibit the dynamics of the aggregate economy over a longer horizon but inclusion of higher order lagged variables could not be attempted due to the narrow window of analysis from 2008 Q4 to 2009 Q2 as well as the shortage of observations. Such technical limitations inevitably put some reservations about the interpretations of estimation results.

Our sample consists of the G20 economies – Argentina, Australia, Brazil, Canada, PRC, European Union, France, Germany, India, Indonesia, Italy, Japan, Korea,

Mexico, Russia, Saudi Arabia, South Africa, Turkey, United Kingdom and United States – plus six developing Asian countries – Hong Kong, China; Malaysia; Philippines; Singapore; Taipei, China; and Thailand. The G20 collectively accounts for about 85% of global output, 80% of global trade and two-thirds of global population. Since the G20 includes four developing Asian countries – PRC, India, Indonesia and Korea – our total sample of 26 countries includes 10 developing Asian countries altogether. The data set is an unbalanced panel of quarterly data. The length of each country's data is determined by data availability.[2] All the variables used in the empirical analysis – GDP, government expenditures, government revenues, policy interest rate, term spread, exchange rate, trade volume, geographical distance, fiscal soundness and economic openness – and their data sources are listed in Appendix 1. All variables other than interest rates are seasonally adjusted.

III. EMPIRICAL RESULTS

In this section, we report and discuss the main findings which emerge from the empirical analysis. Before we performed our empirical analysis, we briefly examined the relative magnitude of the anti-crisis fiscal stimulus packages.3 The examination reveals two stylized facts. First, fiscal revenues have fallen and expenditures have risen since 2008 Q3. Second, in most countries the fall in revenues is more pronounced than the rise in expenditures. Broadly speaking, the evidence supports the conventional wisdom that governments around the world actively pursued countercyclical fiscal policy to support aggregate demand. The empirical analysis is based on the bi-variate PVAR model and the two 4-variable PVAR models (Models I, II and III) outlined in the previous section. Please refer to Appendix 2 for the notations for the variables used in the analysis and their definitions.

[2] The length of each country's data is noted in Appendix 3.

[3] We examine Kernel densities before and after Q3 2008 and mean and standard deviations before and after Q3 2008. We also performed Kolmogorov-Smirnov equality-of-distribution tests. All the results are available from authors upon request.

We estimated the bi-variate PVAR model as well as the two 4-variable PVAR models using the methodology described in the previous section. Table 1 reports the results of the cross-country regressions on the gap between actual output and dynamic output forecasts generated by Model I, the bi-variate PVAR model. Lagged domestic GDP growth ($\ln GDP_{it-1}^{det}$), or more precisely lagged growth which cannot be explained by PVAR, has a positive and significant effect on the gap between actual and forecast output. Global GDP growth ($\ln global\_GDP_{t-1}^{det}$) does not have a significant effect on the gap between actual and forecast output. Monetary policy variables – policy interest rate ($Policy_{t-1}^{diff} \equiv policy_{t-1} - policy_{t-2}$) and term spread ($TS\_1yr_{t-1}^{diff}$ and $TS\_1yr_{t-1}^{diff}$) – have a negative and significant effect on the gap. On the other hand, neither fiscal policy variables – government expenditures ($\ln EXP_{t-1}^{det}$) and revenues ($\ln REV_{t-1}^{det}$) – nor the real effective exchange rate ($REER_{t-1}^{diff}$) have a significant impact on the actual-forecast output gap. However, significantly and interestingly for our purposes, the interaction term4 between government expenditures and the dummy variable for developing Asian countries (Asia $\times \ln EXP_{t-1}^{det}$) is positive and significant at the 10% level of confidence. Therefore, although government expenditures are insignificant for the whole sample, they are positive and significant for developing Asian subsample. In contrast, the interaction term between government revenues and the developing Asia dummy (Asia $\times \ln REV_{t-1}^{det}$) is insignificant. The interaction terms between fiscal variables and historical fiscal soundness ($\mathrm{FS_i} \times \ln REV_{t-1}^{det}$ or $\mathrm{FS_i} \times \ln EXP_{t-1}^{det}$) are insignificant, as are the interaction terms between fiscal variables and economic openness ($\mathrm{Open_{i,t-1}} \times \ln REV_{t-1}^{det}$ or $\mathrm{Open_{i,t-1}} \times \ln EXP_{t-1}^{det}$).

[4] In Tables 1-3, interaction terms of fiscal variables with Asia dummy and the measures for fiscal soundness and market openness are repeatedly used, but these variables themselves are not included for a couple of reasons. First, we would like to save the number of variables in consideration of small observations available. Second, we implicitly assume that the country specific factors (or regional and institutional factors) have been eliminated somehow in levels in the first stage. Though, it should be noted that their inclusion would weaken the validity of Table1-3.

Table 1. Pooled Regression Results in the Second Stage Using the Estimates from the 2-Variable PVAR (Model I)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\ln GDP_{it-1}^{det*}$	**0.642*****	**0.706*****	**0.564*****	**0.625*****	**0.563*****	**0.638*****	**0.565*****	**0.643*****
	(0.13)	**(0.13)**	**(0.13)**	**(0.14)**	**(0.15)**	**(0.15)**	**(0.16)**	**(0.17)**
$\ln global\_GDP_{it}^{det*}$	0.067	0.054	0.052	0.039	0.049	0.039	0.050	0.041
	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)
$\ln REV_{it-1}^{det}$	-0.004	0.012	0.042	0.058	0.046	0.058	0.047	0.059
	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)
$\ln EXP_{it-1}^{det}$	0.033	0.038	-0.176	-0.165	-0.178	-0.163	-0.179	-0.166
	(0.05)	(0.05)	(0.12)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)
$TS\_1yr_{it-1}^{diff}$		**-1.208*****		**-1.112****		**-1.077****		**-1.039****
		(0.43)		**(0.44)**		**(0.47)**		**(0.50)**
$TS\_3yr_{it-1}^{diff}$	**-1.310*****		**-1.234*****		**-1.204****		**-1.168****	
	(0.44)		**(0.45)**		**(0.46)**		**(0.49)**	
$POLICY_{it-1}^{diff}$	**-1.731*****	**-1.627*****	**-1.588*****	**-1.482*****	**-1.507*****	**-1.384****	**-1.490****	**-1.385****
	(0.51)	**(0.50)**	**(0.51)**	**(0.50)**	**(0.55)**	**(0.55)**	**(0.59)**	**(0.59)**
$\ln REER_{it-1}^{diff}$	0.017	0.021	0.012	0.015	0.006	0.009	0.0043	0.007
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
$ASIA_i * \ln REV_{it-1}^{det}$			-0.070	-0.072	-0.053	-0.063	-0.054	-0.063
			(0.07)	(0.08)	(0.10)	(0.10)	(0.10)	(0.10)
$ASIA_i * \ln EXP_{it-1}^{det}$			**0.229***	0.221	**0.276***	**0.253***	**0.290***	**0.277***
			(0.13)	(0.13)	**(0.15)**	**(0.15)**	**(0.16)**	**(0.16)**
$open_{i,t-1} * \ln REV_{it-1}^{det}$					-0.143	-0.038	-0.138	-0.026
					(0.63)	(0.64)	(0.64)	(0.65)
$open_{i,t-1} * \ln EXP_{it-1}^{det}$					-0.342	-0.217	-0.391	-0.294
					(0.62)	(0.63)	(0.65)	(0.67)
$FS_i * \ln REV_{it-1}^{det}$							-0.133	-0.400
							(1.80)	(1.84)
$FS_i * \ln EXP_{it-1}^{det}$							-0.239	-0.408
							(0.97)	(0.97)
Constant	-0.119	-0.135	-0.096	-0.109	-0.071	-0.084	-0.062	-0.074
	(0.14)	(0.14)	(0.14)	(0.14)	(0.15)	(0.15)	(0.16)	(0.16)
Observations	60	60	60	60	57	57	57	57
R-squared	0.43	0.43	0.47	0.46	0.49	0.47	0.49	0.48

Notes: 1) Standard errors in parentheses. 2) *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' estimates

Table 2. Pooled Regression Results in the Second Stage Using the Estimates from the 4-Variable PVAR (Model II)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\ln GDP_{it-1}^{\det *}$	**0.904*** **	**0.960*** **	**0.840*** **	**0.894*** **	**0.845*** **	**0.917*** **	**0.847*** **	**0.930*** **
	(0.11)	**(0.11)**	**(0.11)**	**(0.11)**	**(0.13)**	**(0.13)**	**(0.14)**	**(0.15)**
$\ln global\_GDP_{it}^{\det *}$	**0.116*** **	**0.115*** **	**0.101*** **	**0.101*** **	**0.095** **	**0.099** **	**0.095** **	**0.101** **
	(0.04)	**(0.03)**	**(0.04)**	**(0.03)**	**(0.04)**	**(0.04)**	**(0.04)**	**(0.04)**
$\ln REV_{it-1}^{\det}$	-0.015	-0.0001	0.026	0.036	0.027	0.034	0.104	0.192
	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.43)	(0.43)
$\ln EXP_{it-1}^{\det}$	0.042	0.049	-0.121	-0.112	-0.123	-0.109	-0.024	0.007
	(0.04)	(0.04)	(0.10)	(0.10)	(0.11)	(0.10)	(0.30)	(0.29)
$TS\_1yr_{it-1}^{diff}$		**-1.089*** **		**-1.014*** **		**-0.978** **		**-0.983** **
		(0.34)		**(0.35)**		**(0.37)**		**(0.39)**
$TS\_3yr_{it-1}^{diff}$	**-0.952** **		**-0.866** **		**-0.819** **		**-0.800***	
	(0.36)		**(0.37)**		**(0.38)**		**(0.40)**	
$POLICY_{it-1}^{diff}$	**-1.210*** **	**-1.242*** **	**-1.073** **	**-1.114** **	**-0.924** **	**-1.000** **	**-0.919***	**-1.034** **
	(0.44)	**(0.42)**	**(0.44)**	**(0.42)**	**(0.45)**	**(0.44)**	**(0.50)**	**(0.49)**
$\ln REER_{it-1}^{diff}$	0.014	0.019	0.009	0.015	0.000	0.009	-0.0004	0.009
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
$ASIA_i * \ln REV_{it-1}^{\det}$			-0.070	-0.061	-0.088	-0.073	-0.086	-0.070
			(0.06)	(0.06)	(0.07)	(0.07)	(0.07)	(0.07)
$ASIA_i * \ln EXP_{it-1}^{\det}$			0.176	0.176	0.200	0.182	0.213	0.194
			(0.11)	(0.11)	(0.13)	(0.12)	(0.13)	(0.13)
$open_{i,t-1} * \ln REV_{it-1}^{\det}$					0.392	0.333	0.398	0.354
					(0.62)	(0.61)	(0.64)	(0.62)
$open_{i,t-1} * \ln EXP_{it-1}^{\det}$					-0.023	0.100	-0.053	0.077
					(0.54)	(0.53)	(0.56)	(0.55)
$FS_i * \ln REV_{it-1}^{\det}$							-6.389	-13.160
							(36.00)	(35.50)
$FS_i * \ln EXP_{it-1}^{\det}$							-8.405	-9.781
							(23.80)	(23.10)
Constant	-0.100	-0.124	-0.077	-0.104	-0.036	-0.074	-0.032	-0.075
	(0.12)	(0.11)	(0.12)	(0.12)	(0.12)	(0.12)	(0.13)	(0.13)
Observations	60	60	60	60	57	57	57	57
R-squared	0.6	0.62	0.63	0.64	0.64	0.65	0.64	0.65

Notes: 1) Standard errors in parentheses. 2) *** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' estimates

Table 3. Pooled Regression Results in the Second Stage Using the Estimates from the 4-Variable PVAR (Model III)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\ln GDP_{it-1}^{det*}$	**0.750*****	**0.777*****	**0.670*****	**0.703*****	**0.657*****	**0.705*****	**0.640*****	**0.695*****
	(0.11)	**(0.10)**	**(0.11)**	**(0.10)**	**(0.12)**	**(0.11)**	**(0.13)**	**(0.13)**
$\ln global\_GDP_{it}^{det*}$	-4.1e-10	-5.0e-10	-1.1e-09	-1.2e-09	-1.1e-09	-1.1e-09	-1.1e-09	-1.1e-09
	(1.2e-9)	(1.2e-9)	(1.2e-9)	(1.2e-9)	(1.2e-9)	(1.2e-9)	(1.2e-9)	(1.2e-9)
$\ln REV_{it-1}^{det}$	-0.009	0.001	0.041	0.047	0.051	0.056	-0.061	0.017
	(0.04)	(0.03)	(0.05)	(0.05)	(0.05)	(0.05)	(0.46)	(0.46)
$\ln EXP_{it-1}^{det}$	0.045	0.052	-0.212*	-0.206*	-0.216*	-0.205*	-0.197	-0.171
	(0.05)	(0.04)	(0.12)	(0.11)	(0.12)	(0.11)	(0.32)	(0.31)
$TS\_1yr_{it-1}^{diff}$		**-0.715***		**-0.774****		**-0.738***		**-0.721***
		(0.37)		**(0.37)**		**(0.38)**		**(0.39)**
$TS\_3yr_{it-1}^{diff}$	-0.514		-0.596		-0.626		-0.605	
	(0.39)		(0.40)		(0.39)		(0.41)	
$POLICY_{it-1}^{diff}$	**-1.198****	**-1.278*****	**-1.058****	**-1.121****	**-1.147****	**-1.189****	**-1.088****	**-1.157****
	(0.48)	**(0.47)**	**(0.47)**	**(0.45)**	**(0.50)**	**(0.49)**	**(0.54)**	**(0.53)**
$\ln REER_{it-1}^{diff}$	0.007	0.011	0.004	0.009	0.004	0.010	0.0024	0.008
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
$ASIA_i * \ln REV_{it-1}^{det}$			-0.073	-0.063	-0.007	0.000	-0.009	-0.001
			(0.07)	(0.07)	(0.09)	(0.08)	(0.09)	(0.09)
$ASIA_i * \ln EXP_{it-1}^{det}$			**0.283****	**0.286****	**0.331****	**0.318****	**0.339****	**0.326****
			(0.13)	**(0.12)**	**(0.14)**	**(0.13)**	**(0.14)**	**(0.14)**
$open_{i,t-1} * \ln REV_{it-1}^{det}$					-0.748	-0.718	-0.774	-0.730
					(0.55)	(0.54)	(0.57)	(0.56)
$open_{i,t-1} * \ln EXP_{it-1}^{det}$					-0.452	-0.344	-0.479	-0.367
					(0.56)	(0.55)	(0.58)	(0.57)
$FS_i * \ln REV_{it-1}^{det}$							9.508	3.289
							(38.60)	(38.30)
$FS_i * \ln EXP_{it-1}^{det}$							-2.062	-3.145
							(25.40)	(24.90)
Constant	-0.072	-0.092	-0.060	-0.084	-0.061	-0.085	-0.052	-0.079
	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.14)	(0.14)
Observations	60	60	60	60	57	57	57	57
R-squared	0.56	0.57	0.61	0.62	0.63	0.64	0.63	0.64

Notes: 1) Standard errors in parentheses. 2) *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' estimates

Tables 2 and 3 report the results of cross-country regressions on the gap between actual output and dynamic output forecasts for the crisis period generated by 4-variable PVAR models, Models II and III. The models of both tables include domestic GDP, government expenditures and revenues. The only difference is that the global GDP is used as the fourth variable in PVAR estimation for Table 2 while the real effective exchange rate (REER) the fourth one for Table 3. The estimation results for the two models are broadly similar to those for the bi-variate PVAR (Model I). For both 4-variable models, the effect of lagged domestic GDP on the gap between actual and forecast is positive and highly significant. For both models, monetary policy variables have a negative and significant effect whereas fiscal policy variables and the real effective exchange rate are insignificant. An important difference between the two models is that the interaction term between government expenditures and developing Asia becomes insignificant in Table 2 but remains positive and significant in Table 3. In the latter model, in fact the significance of the positive coefficients increases to 5%, up from the 10% in the bi-variate model. The interaction terms between fiscal variables and historical fiscal soundness, as well as interaction terms between fiscal variables and economic openness, remain insignificant as in the bi-variate model

Overall, our empirical results lend limited support to the popular belief that countercyclical fiscal policy boosted aggregate demand and output in Asia during the global crisis.[5] The supportive evidence is limited at best because the positive effect of government expenditures on output is significant at only 10% level of confidence for the bi-variate PVAR model and altogether insignificant for one of the two four-variable models, although significant at the 5% level for the other four-variable model. As such, evidence of countercyclical effectiveness of fiscal policy in the region is far from overwhelming or definitive. Moreover, tax cuts did not have a positive impact on the region's output, perhaps because they were largely saved rather than spent. Interestingly, for the whole sample of G20 plus six

[5] To gauge the countercyclical effectiveness of fiscal policy in developing Asia during the global crisis, we limit our analysis to the period when the negative impact of the global crisis on the region peaked – i.e. 2008 Q4 to 2009 Q2. When we re-define and extend the crisis period to include up to 2009 Q3, our most important result – i.e. significant positive impact of fiscal policy on developing Asia – still remains, even though some results change. The results under the alternative definition of the crisis period are available from the authors upon request.

developing Asian countries, our empirical results fail to yield any evidence that fiscal policy helped to stabilize output. This finding is somewhat puzzling in light of the big fiscal stimulus packages put in place by both industrialized countries and developing countries around the world. At the same time, it also suggests that countercyclical fiscal policy may have been more effective in developing Asia than elsewhere.

With respect to the non-fiscal variables, perhaps the most striking result is the consistently positive and significant effect of the monetary policy variables. This implies that low interest rates and quantitative monetary easing made a bigger contribution to global recovery than tax cuts and higher government spending. This is somewhat puzzling in light of the fact that according to conventional wisdom, fiscal stimulus measures, especially government purchases of goods and services, have a more immediate and direct impact on aggregate demand. Monetary policy influences aggregate demand only indirectly through the interest rate mechanism and its effectiveness depends on consumer and business confidence, which tends to be low during a crisis. In addition to the policy interest rate, the estimated coefficient of the term spread is also consistently negative and significant. Low term spreads, which reflect public expectations that the accommodative monetary policy stance will persist for some time, may encourage investment and household purchase of durable goods.

IV. CONCLUDING OBSERVATIONS

According to conventional wisdom, which has been accepted as a matter of faith without any evidence, the region-wide fiscal stimulus played a decisive role in preventing collapse of aggregate demand and growth in developing Asia during the global crisis of 2008-2009. The central objective of our paper is to empirically test for the effectiveness of countercyclical fiscal policy in the region during the global crisis. Our empirical analysis yields some limited evidence in favor of fiscal effectiveness in developing Asia. More precisely, while tax cuts do not seem to have had any effect on output, our results indicate that higher government spending did have a positive impact in the region. This suggests that the region's fiscal expansion contributed to the region's rapid, robust recovery. Nevertheless, we must exercise our results are far from robust since the level of confidence that can

be attached to the positive impact is limited on the whole and varies across our different models.

The immediate policy implication for developing Asia is that proactive use of countercyclical fiscal policy can limit the slowdown of economic activity arising from severe external shocks. Our evidence indicates that the regional governments' fiscal efforts to boost sagging aggregate demand in the face of the global crisis have been effective and contributed to the region's remarkable recovery. However, it would be a mistake to interpret our results as a blanket call for greater fiscal activism beyond the global crisis. The region's decisive fiscal expansion was an exceptional response to an exceptional shock. At a minimum, we must be careful not to over-generalize the implications of our findings from the crisis period to the non-crisis period. At the same time, our evidence implies that should there be another severe external shock, for example if the euro crisis tailspins into another global crisis, fiscal stimulus, especially expansion of spending, can provide some relief for Asia.

The broader, more fundamental implication for regional policymakers is that the region's long-standing commitment to fiscal discipline can yield significant benefits beyond macroeconomic stability. An important consequence of this commitment – relatively healthy fiscal balance sheets – enabled the region's governments to quickly and decisively embark upon fiscal stimulus programs. That is, a tradition of sound and responsible fiscal policy had left the region with enough fiscal space to aggressively cut taxes and increase government spending to cushion the collapse of external demand. Furthermore, it should be noted that some of the region's relatively ample fiscal space has been used up by the fiscal stimulus programs implemented during the global crisis. The bottom line is that Asia would do well to stick to the tradition of fiscal sustainability which served it well during the global crisis and which will serve it well in severe external shocks in the future. This should give the region a measure of self-confidence in the face of persistent uncertainties over the euro crisis.

Appendix 1. List of Variables and Their Data Sources

The data used in the empirical analysis are from G-20 economies plus 6 developing Asian countries - Hong Kong China, Malaysia, Philippines, Singapore, Taipei, China, and Thailand. The quarterly values of the following variables are included in the data set.

(1) GDP and GDP deflator: IFS (mostly in local currency unit)

(2) Interest rates: policy rate, term spread, credit spread, CDS premium (central banks, Bloomberg)

(3) Exchange rates: real effective exchange rate (BIS) and local currency unit per US dollar (IFS)

(4) Trade volume: export and import between any pair of countries (IMF DOTS)

(5) Government fiscal statistics (IFS, Bloomberg and OECD STAT): Total government revenues and expenditures

(6) Geographical Distance (CEPII, www.cepii.fr)

(7) Fiscal soundness, defined as fiscal balance/GDP

(8) Economic openness, defined as trade volume/GDP

Appendix 2. Notations for Variables and their Definitions

(1) i : country, t : time

(2) $X_{it}^{\det} \equiv X_{it} - X_{it}^{hp}$

$X_{it}^{\det}$ refers to the detrended time-series obtained by subtracting HP-filtered X_{it}^{hp} from the original time-series X_{it}

(3) $TS_{it}^{t} \equiv GOV\_BOND_{it} - POLICY_{it}^{hp}$

Term spread refers to the yield of 1-year or 3-year government bonds minus the policy interest rate (e.g. Federal fund rate in the US).

(4) $global\_GDP_{jt} = \sum_{i \neq j} GDP_{it}$

From country j's perspective, the global GDP is the sum of GDPs of all countries in the data set except herself. The global GDP could be defined otherwise, either weighted by the inverse of geographical distance (D_{ij}) as in (4-1) or bilateral trade volume as in (4-2).

(4-1) $global\_GDP_{jt} = \sum_{i \neq j} \frac{GDP_{it}}{D_{ij}}$

(4-2) $global\_GDP_{jt} = \sum_{i \neq j} Trade\_Volume_{ij} GDP_{it}$

The estimation results are similar for (4), (4-1) and (4-2), so we only report the results for (4).

(5) REV_{it}, EXP_{it}, $BALANCE_{it} \equiv REV_{it} - EXP_{it}$

Government revenue, government expenditure and fiscal balance

(6) $openess_{it}$

Economic openness is defined as trade volume – i.e. sum of imports and exports – divided by GDP.

(7) FS_{i}

Historical fiscal soundness is defined as the average of quarterly fiscal balance divided by quarterly GDP up to 2008 Q3.

(8) $Trade\_Volume_{ij}$

$Trade\_Volume_{ij}$ is the average bilateral trade volume between country *i* and *j* during 2005-2007.

(9) *Asia*

A dummy variable which takes on the value of 1 if the observation belongs to a developing Asian country – China, Hong Kong, China, India, Indonesia, Korea, Malaysia, Philippines, Taipei, China, Singapore or Thailand – and 0 otherwise.

(10) $X_{it}^{\det *} \equiv X_{it}^{\det} - X_{it}^{pred}$

For any quantity variable $X_{it}^{\det}$, $X_{it}^{\det *}$ is defined as the part which cannot be explained by PVAR since X_{it}^{pred} is the value of X_{it} predicted by PVAR.

(11) $X_{it}^{diff} \equiv X_{i,t} - X_{i,t-1}$

For price variables such as interest rate, term spreads and real effective exchange rate, first order differences are noted as above.

Appendix 3. Availability of Quarterly Data

Table A3-1. Availability of Quarterly Data, Bi-Variate PVAR

Country	Start	End
Argentina	1993Q1	2009Q2
Austraila	1979Q1	
Brazil	1995Q1	
Canada	1979Q1	
China	1999Q1	
France	1997Q1	
Germany	1997Q1	
HK	1979Q1	
India	1996Q2	
Indonesia	1993Q1	
Italy	1997Q1	
Japan	1980Q1	
Korea	2000Q1	
Malaysia	1991Q1	
Mexico	1981Q1	
Philippines	1981Q1	
Russia	1993Q1	
Singapore	2003Q1	
South Africa	1979Q1	
Taiwan	1979Q1	
Thailand	1993Q1	
Turkey	1997Q1	
UK	1997Q1	
US	1979Q1	

Table A3-2. Availability of Quarterly Data, 4-Variable PVAR

Country	Start	End
Argentina	1994Q1	2009Q2
Austraila	2002Q4	2009Q2
Brazil	1998Q4	2009Q2
Canada	2002Q1	2009Q2
China	1995Q1	2009Q2
France	1991Q1	2008Q4
Germany	1999Q1	2008Q4
HK	1994Q3	2009Q2
India	1997Q2	2009Q2
Indonesia	2001Q1	2009Q2
Italy	1999Q1	2009Q2
Japan	1999Q2	2009Q2
Korea	2000Q1	2009Q2
Malaysia	1991Q1	2009Q2
Mexico	1991Q1	2009Q2
Philippines	1991Q1	2009Q2
Russia	1995Q1	2009Q2
Singapore	1998Q2	2009Q2
South Africa	1991Q1	2009Q2
Taiwan	2003Q3	2009Q2
Thailand	2003Q1	2009Q2
Turkey	2006Q1	2009Q2
UK	1991Q1	2009Q2
US	1991Q1	2009Q2

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