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NONLINEAR EFFECTS OF THE FINANCIAL CRISIS ON ECONOMIC GROWTH IN ASIAN COUNTRIES: EMPIRICAL EVALUATION WITH A PSTR MODEL

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ABSTRACT

The objective of this paper is to evaluate the effectiveness of fiscal policy in emerging countries in periods of crisis. We study the effect of fiscal policy on economic activity distinguishing between periods of recession and expansion periods. Our goal will be to explore the nonlinear effect of fiscal policy in Asian emerging countries on the activity during periods of crisis. We use the PSTR model. This model is used on annual data for the period 1990-2013 for a sample of 8 emerging Asian countries. Our main findings are the following: First, this study confirmed that the PSTR model is more robust comparing it to a simple linear model. Indeed, it can highlight the asymmetric effect of fiscal policy on economic activity. Second, the nonlinearity of fiscal policy is explained by the phases of cycles and the level of public debt.

Keywords: Business cycles, Financial crisis, Economic growth, PSTR model.
JEL Classification: C23, E32, E62, H63.

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Contribution/ Originality

The question of whether fiscal policy helps or hinders economic activity was widely discussed in the literature. This study uses a new method of estimating (model PSTR). This model highlights the asymmetrical effect of fiscal policy by distinguishing between two regimes.

1. INTRODUCTION

The purpose of this work is to investigate the strategic options available for emerging countries to deal with financial crises. We will evaluate the effectiveness of fiscal policy in emerging countries in crisis to provide answers to the following question: is that fiscal policy helps or hinders economic activity and how emerging markets are facing financial crises? This question is particularly relevant for emerging countries and has been extensively discussed in the literature Gavin *et al.* (1996); Talvi and Vegh (2005); Aizenman and Pasricha (2013). The economic literature suggests two different views on the impact of expansionary fiscal policy. First, some consider the most emerging countries suffer from a limited ability to strengthen their institutions and of an accumulation of budget deficits. Second, in a Keynesian perspective, fiscal policy may instead have a positive effect on growth by stimulating

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private demand through spending on infrastructure. In this context, it is appropriate to question the ability to maintain active fiscal policy in emerging markets during periods of crisis.

During periods of financial volatility, several studies International Monetary Fund (2003); Kaminsky *et al.* (2004); Braun (2001); Gavin *et al.* (1996); Gavin and Perotti (1997); Talvi and Vegh (2005); Vegh and Vuletin (2012) showed that in fiscal policy in emerging and developing markets is a pro cyclically. Indeed, in a downturn, the state takes a more restrictive fiscal policy by reducing public spending, thus amplifying cyclical instability in the whole economy. The objective of this policy is to avoid inflation broadening the debt and increasing uncertainty. However, the intervention of the state in a period of low economic activity is essential to ensure macroeconomic stability and boost activity. The literature provides explanations on the characteristics of emerging countries that complicate the reliability of fiscal policy.[1]The question that arises at this stage is how to justify theoretically the pro cyclicality observed in emerging countries?

Emerging countries are more exposed to external shocks (changes in terms of trade in particular). These are often amplified by the sudden stop of international capital flows. Episodes of sudden stop in capital flows seriously hinder fiscal policy to the extent that they are accompanied by pressure on funding opportunities through reduced access to capital markets and the rising cost of debt Calvo *et al.* (2003) and Reinhart and Reinhart (2009).

In this regard, institutional factors can be considered as a predominant cause of the pro cyclicality of fiscal policy. Indeed, emerging countries suffer from a lack of credibility in their fiscal policy is explained by structural rigidities observed in their public finances. More specifically, the government will be able to reduce a category of spending in a period of expansion for reuse in times of crisis. As mentioned by Daniel *et al.* (2006) pre-allocation of revenues can prevent the government to fiscal adjustment necessary. More specifically, the transfer of power from central government to local administrations can complicate the control of these and be the cause of bad governance. In addition, if the transfer permits local administrations the power to borrow without restrictions or conditions, this could have an impact on the central government budget. Under these conditions, macroeconomic stability could be threatened. In this context, Tornell and Lane (1999) and Talvi and Vegh (2005) showed the role of political pressures on public spending. According Talvi and Vegh (2005) these pressures are due to the deficiency in the structure of fiscal policy in emerging countries with high revenue volatility. Tornell and Lane (1999) and Lane (2003) suggest another explanation, called voracity effect, in which the pro cyclicality is an observed result in countries that suffer from a high degree of political fragmentation. Specifically, the pro cyclicality is correlated with the number of actors with the ability to access tax process. Thus, the pro cyclicality is related to the public debt. Indeed, emerging markets tend to have a deficit budget situation which leads to an unsustainable public debt levels. During the financial crisis, the government loses its access to the capital market.

In a recession, the risk premium due to the public debt will be higher contributing to increase the cost of debt. In this case, the country affected by a negative shock will be penalized by the inability to access international credit. Therefore, the state may be forced to raise taxes and reduce expenses. In other words, it adopts a pro cyclical policy. Gavin *et al.* (1996) confirm the presence of restrictions on access to capital markets, volatility in tax revenues and differences in the efficiency of tax systems are the key elements of the pro cyclicality. In the same context, Gavin and Perotti (1997) show that, during periods of crisis, these countries are facing credit restriction which prevents them from taking on additional debt, while being forced to pay their debts coming at maturity. Thus, this credit restriction hampers the government's ability to conduct a countercyclical fiscal policy. In this respect, Frankel *et al.* (2011) show that fiscal policy in most developing countries is pro cyclical. The pro cyclicality of fiscal policy is exacerbated by the inability of developing countries to borrow in their own domestic currency (Eichengreen *et al.*, 2003).

[1]Daniel, Davis, Fouad and Rijckeghem (2006).

Eichengreen and Hausmann (1999) defined this phenomenon by the theory of "original sin". Recently, Hyun (2016) paper examines the evolution of credit reallocation from a geographical location perspective using data from Korean non-financial firms 1984 to 2013. He suggests that small firm's' financing is more affected by local financial market conditions.

Indeed, the accumulation of external liabilities denominated in foreign currency, while revenues are denominated in national currency which causes financial fragility in the balance sheet of economic sectors. Dollarization of debt confronts these countries to exchange rate risks. It may affect the solvency of the private sector whose debt was contracted in foreign currency. Indeed, if the depreciation of the domestic currency, the debt burden becomes too heavy. The solvency of banks will also be threatened by the crisis through the credit risk on their loans to the non-tradable sector. The state can intervene to guarantee deposits from households, exacerbating its budgetary situation. This situation may also prompt the central bank to tighten borrowing conditions. Economic activity will therefore be largely affected. Another type of sequence is linked the debt dynamics in the public sector. The phenomenon of "original sin" increases the risk premium that the state pays to going into debt which increases the burden of debt. Adler and Sebastián (2013) confirms that the structure of public debt (denominated in foreign currency) hampers the government's ability to adapt a countercyclical policy. Fiscal policy in developing countries is facing several challenges. However, despite their importance, the literature on fiscal policy in emerging countries is very limited. In this context, Baldacci *et al.* (2008) studied the effect of the fiscal policy in emerging and developed economies during periods of banking crises (1980-2012 and 140 crises). They show that tax responses were important during all periods of crisis. Public consumption was more significant during crises by comparing it with the public investment and tax reduction. They also show that these policies are limited in countries that suffer from significant budget constraint. Hutchison *et al.* (2010) examine the effect of fiscal and monetary policy on the rate of growth. They investigate 83 sudden-stop crisis in 66 countries using a baseline empirical model to control for the various determinants of output losses during sudden stops. Fiscal expansion is associated with smaller output losses following a sudden stop, but monetary expansion has no discernable effect. They also show the importance of using an expansionary fiscal policy, while the effect of monetary policy is neutral. Most empirical studies that have investigated the effect of fiscal policy on activity in general or in times of crisis are based on panel models or on SVAR models. However, these models do not take into account the nonlinearity of fiscal policy. To overcome this limitation, it is necessary to use econometric models able to generate different dynamics depending on the phase of the cycle. Recently, Kenourgios and Dimitriou (2015) show the contagion effects of the global financial crisis (2007–2009) by examining ten sectors in six developed and emerging regions during different phases of the crisis. Empirical evidence shows that the global financial crisis can be characterized by contagion effects across regional stock markets and regional financial and non-financial sectors. Further, the analysis on a crisis phase level indicates that the most severe contagion effects exist after the failure of Lehman Brothers limiting the effectiveness of portfolio diversification.

In this regard, we study the effect of fiscal policy on economic activity distinguishing between periods of recession and expansion periods. For this, we study the nonlinearity in the relationship between the budget deficit and economic activity using a switching regime model. We use a new empirical approach, the Panel Smooth Threshold Regression model (PSTR): the PSTR model recently developed by Gonzalez *et al.* (2005) and by Fok *et al.* (2005). The advantage of this model is that it assumes that the transition from one regime to another is based on a threshold variable.

This article extends the previous literature by analyzing the effect of fiscal policy on business cycles during the periods of economic instability over the period 1990 to 2013 for a sample of 8 emerging Asian countries. Our main findings are the following**:** firstly is to contribute to the economic literature on the topic; and secondly is to have a more reliable yardstick available in order to analyze the effects of fiscal policy responses in emerging economies to

international financial crises. The paper is organized as follows: Section 2 describes the methodology and introduces the dataset. Main estimations results are presented in section 3 and finally, section 4 concludes.

2. EMPIRICAL METHODOLOGY

The PSTR model can highlight the potentially asymmetric effect of fiscal policy on activity by distinguishing between two regimes. This model also captures structural breaks from an exogenous variable. The choice of this model is based on the intuition that, during periods of economic downturn, the effect of fiscal policy on economic activity different to that observed during normal periods. In addition, the advantage of this model is that it assumes that the transition from one regime to another is based on a threshold variable. Before estimating the PSTR model, we consider a simple fixed effect panel model. The objective of this approach is to compare the results of these two models and to show the importance of taking into account the non-linear effect of fiscal policy on economic activity.

2.1. The Database

We use this model PSTR on annual data from Asian region and cover the period from 1990 to2013.The contribution of our estimates is to provide a detailed and specific explanation for the emerging Asia region(Mainland China, India, Indonesia, Korea, Malaysia, Philippines, Singapore and Thailand). We use the database the IMF (International Financial Statistics (IFS)). For missing data we used the annual base given by the World Bank, Honig (2006); Reinhart and Rogoff (2010) and Lane and Ferretti (2007). Years of identified sudden stops are based on the definition ofHonig (2006)[2].We use the output variable GAP as a dependent variable representing economic activity. Potential GDP is calculated using the HP filter (Hodrick and Prescott, 1980). Fiscal variable "effective public balance" and a selected set of control variables based on the empirical literature are considered as independent variables. The empirical literature, especially as Hutchison *et al.* (2010) proposes to break down "the actual budget balance" in a cyclical component and a structural component. Specifically, the so-called structural fiscal policy will be calculated on the basis of the difference between the actual balance and the cyclical balance. It shall be determined as follows: $bb_t = \alpha GAP_{it} + \varepsilon_{it}$. In this specification, this bb_t the actual balance which is the budget balance as a percentage of GDP. In addition, we introduce a number of control variables that can explain the adoption of procyclical policies. We have chosen the building on previous research Calvo *et al.* (2004); Frankel and Cavallo (2004). We introduced the variable external debt as a percentage of GDP "liability dollarization". We also introduced the index of trade openness and the rate of credit growth in percentage of GDP and the inflation rate. Finally, we introduced two foreign variables namely; the US interest rate and the US output gap(US GDP). Indeed, these two variables allow taking into account of the possible effects of the international environment on the economies studied. For more details, concerning the definition of variables see table 1 and we use Gauss Program for estimation.

2.2. Panel Smooth Transition Regression Model

We study the nonlinearity in the relationship between the budget deficit and economic activity using a model of regime change. Specifically, we use a new empirical approach, the threshold model with smooth transition panel: the (PSTR) model recently developed by Gonzalez *et al.* (2005) and by Fok *et al.* (2005).It allows us to estimate the non-linear effect of fiscal policy on economic activity. The (PSTR) model with two extreme regimes and fixed effect is defined as follows:$GAP_{it} = \alpha_i + (\beta_0 X_{it}) + (\beta_1 X_{it}) * g(q_{it}, \gamma, c) + u_{it}$ (1)

The dependent variable GAP_{it} is the output variable GAP which is considered a proxy of the activity. The vector X_{it} is a k-dimensional vector of time-varying exogenous variables includes a set of exogenous variables whose fiscal

[2]Mainland China (1998), India (1995, 2001 and 2009), Indonesia (1997), Korea (1997 and 2008), Malaysia (1994 and 1997), Philippines (1997 and 2009), Singapore (2009), Thailand (1997 and 2009).

variable, α_i presents the individual fixed effect and u_{it} are the errors.

$g(q_{it}, \gamma, c)$: is the transition function of the observed variable q_{it} and takes values between 0 and 1.

$$g(q_{it}, \gamma, c) = \frac{1}{1 + exp\left(-\gamma(q_{it} - c)\right)}, \gamma > 0 \quad (2)$$

Table-1. Definition of variables

Variables	Definition	Sources
Variable interest Growth rate	Log real GDP (in dollars based on 2000).	Word Bank (WB)
Budget deficit	The deficit of the Central Government as a percentage of GDP	IMF: Government Financial Statistics
Sudden Stops	1 if there is a Sudden Stops 0 otherwise.	Calculated on the basis of these three variables namely the financial account, the balance of current account balance and growth of annual GDP per capita (Honig, 2006).
Financial Account	The sum of direct investment with investment portfolios, financial derivatives and other investments.	Balance of Payments Statistics IMF
Balance of the current account		IFS
Annual GDP growth per capita		WB
Control variables		
Trade openness (% of GDP)	(X + M) /GDP.	WB
Domestic credit growth rate as a percentage of GDP	Percentage of annual variation in domestic credit.	WB
Inflation	Percentage of the annual change in the price index for consumption.	IFS and WB
The external debt of the private sector / GDP (%)	External debt in bank deposits / GDP (%). (Foreign Liabilities of Deposit Money Banks).	IFS
Interest rate	Money market rates or discount rates (threshold variables).	IFS
Public debt (% of GDP)	Total of public debt.	WB and Reinhart and Rogoff (2010).
Net capital flows (% of GDP)	Input capital in the form of direct investment and portfolio. investment as a percentage of GDP + other investments (FDI liabilities + portfolio equity liabilities + debt liabilities +derivatives liabilities)	Base of Lane and Ferretti (2007) and IFS.
Output gap	The difference between actual GDP and potential GDP calculated with HP (Hodrick and Prescott, 1980).	

Source: Data compilations

q_{it} is the variable threshold, c the parameter threshold, $\gamma > 0$ the parameter that determines the speed of transition from one regime to another. When $\gamma \to \infty$, the transition function becomes an indicator function I ($q_{it} > c$) taking1as the value if ($q_{it} > c$). More precisely, when γ it is very high, the PSTR model is reduced to a model Panel transition regression (PTR) between two regimes, developed by Hansen (1999). Gonzalez *et al.* (2005) propose two preliminary steps. The first is to test the linearity against the model (PSTR) described by equation (1). The second step determines the number of regimes in the transition function. In both cases, the test does not have a standard for distribution under the null hypothesis (H_0: $\gamma = 0$ or H_0':$\beta_1 = 0$); the (PSTR) model contains unidentified parameters called: nuisance parameters. Gonzalez *et al.* (2005) propose to replace the transition function $g(q_{it}, \gamma, c)$

of equation (1) by its first-order Taylor expansion around $\gamma = 0$ and test a similar hypothesis in the following auxiliary regression:

$$GAP_{it} = \alpha_i + \theta_0 X_{it} + \theta_1 X_{it} q_{it} + \mu^*_{it} \quad (3)$$

The linearity test is to test H_0: $\theta_1 = 0$ using the LM test, the F-version LM_F and LR. This test identifies the key economic variable that explains the nonlinearity of fiscal policy (q_t).In this study; we used three transition variables, ie, the output gap, the ratio of public debt to GDP and the variation of capital inflows in the form of direct investment and portfolio investment as a percentage of GDP. In this case, these tests are estimated for all the transition variables and the variable that rejects most linearity will be selected as transition variable. To test the number of regimes, the same logic is used. Specifically, it is assumed that the test rejects the hypothesis of linearity. In this case, one should test the existence of a single regime against the existence of two regimes. Following the same approach than the previous one our model to two regimes will be as follows:

$$GAP_{it} = \alpha_i + (\beta_0 X_{it}) + (\beta_1 X_{it}) * g_1(q_{it}, \gamma_1, c_1) + (\theta_1 \beta_2 X_{it}) * g_2(q_{it}, \gamma_2, c_2) + u_{it} \quad (4)$$

Replacing this equation by its first-order Taylor expansion around γ_2, the model will become:

$$GAP_{it} = \alpha_i + (\beta_0 X_{it}) + (\beta_1 X_{it}) * g_1(q_{it}, \gamma_1, c_1) + (X_{it}) * q_{it} + \mu^*_{it} \quad (5)$$

In this case, the null hypothesis of non-linearity is not defined as H_0: $\theta_1 = 0$. LM, LMF and LR test are recalculated. If they are rejected, the model is estimated with three regimes. The test procedure continues until the acceptance of H_0. We use the method of nonlinear least squares to estimate the model parameters ($\beta_0, \beta_1, \gamma, c$). This method is equivalent to the maximum likelihood estimation with the error terms that are normally distributed. The model can be rewritten as follows: $GAP_{it} = \alpha_i + \beta' X_{it}(\gamma, c) + u_{it}$ (6)

Where $X_{it}(\gamma, c) = \left(X'_{it}, X'_{it} g_1(q_{it}, \gamma, c)\right)'$ and $\beta = (\beta'_0, \beta'_1)'$

3. ESTIMATION RESULTS

3.1. Estimation Results of the Panel Fixed Effect Model

Tables 2 and 3 show the results of the estimates. In the first table, the model is estimated only with the variable restrictive fiscal policy and the binary variable "sudden stops". In the second table, we have included the entire control variables. The effect of the restrictive fiscal policy on growth is positive and statistically significant. This result appears interesting to the extent that the restrictive fiscal policy appears more beneficial to support economic growth. Contrary to what was expected, the restrictive fiscal policy appears to support the economy and not an expansionary fiscal policy. Regarding the variable sudden stops, the coefficient is negative and statistically significant. Sudden stop in capital flows is not a very relevant variable to explain the GAP output. To increase the explanatory power of the regression, we introduce other macroeconomic variables that influence economic activity.

Table-2. Estimation of Panel model with fixed effect

	Asian countries
C	0 ,002***
	(0,016)
GAP (-1)	0.005***
	(0,000)
fiscal policy (-1)	0.004***
	(0,000)
Sudden stops	-0.012
	(0.219)
Number of observations	152
Adjusted R^2	0,473

Source: Author's estimations. r: number of regime, numbers in parenthesis are t-student.

****** respectively denote significance at the 10%,5 % and 1 % levels.

According to the second column of table 3, all the coefficients are statistically significant. Indeed, trade openness has a significant impact on the output gap. As the table shows, a 1% increase in the degree of openness reduces the output gap of 0.13%. Inflation and the variation in domestic credit have no influence on the activity. This result is consistent with the stylized facts; insofar the recourse to loans in Asian countries remains modest. The dollarized debt has a negative effect on the economy of these countries. This result is consistent with the literature. As we have already mentioned, the recourse to foreign currency borrowing increases the relative burden of debt. As a result, increases the risk of insolvency threatening economic growth. Concerning foreign variables and specifically the US interest rates and the rate of US economic growth, the first does not affect the activity of these countries, but the second the influence positively. The latter contributes 0.2% in the explanation of the growth of the Asian activity.

Table-3. Estimation of panel fixed effect model with control variables

	Asian countries
C	0.0138 (0.517)
GAP(-1)	0,006*** (0.000)
Fiscal policy (-1)	0,004* (0.07)
Credit variation (-1)	-0.0004*** (0.008)
US interest rate (-1)	-0.004* (0.07)
Dollarization (-1)	-0.002*** (0.008)
Inflation (-1)	-0.003*** (0.001)
Trade openness rate (-1)	0.0005*** (0.002)
GAP American output (-1)	0.007* (0.057)
Sudden stops	-0,019* (0.07)
Number of observations	135
Adjusted R^2	0,630

Source: Author's estimations. r: number of regime, numbers in parenthesis are t-student.

*,**,*** respectively denote significance at the 10%, 5 % and 1 % levels.

3.2. Result of PSTR Model

The expansionary fiscal policy is not consistently an obstacle to investments and growth. Indeed, when the country less indebted or in phase of recession, government intervention is needed to stimulate growth. However, from a certain threshold, the increase of public debt can harm growth. Indeed, beyond this threshold, the chances of repayment decreases and the ability to get loans become difficult. However, a simple linear estimation does not determine this threshold and does not allow studying the asymmetric effect of fiscal policy on economic growth. The objective of this section is to determine the critical threshold from which the expansionist policy becomes ineffective. To this end, we use an analysis based on the PSTR model introduced by Gonzalez *et al.* (2005). First, we start by testing the existence of nonlinearity and determining the number of threshold. Based on these results, we estimate the PSTR model. Table 2 contains the results of linearity tests with different threshold settings. More precisely, it presents the critical value of the LM test and the Fisher test. Based on LM and Fisher tests, linearity is rejected only for the two transition variables: output gap delayed and debt as a percentage of GDP. The low critical value confirms the existence of high nonlinearity between the output GAP and fiscal policy in Asia. The null hypothesis of linearity

between fiscal policy and the activity is not rejected at the 5% level for the output gap variable and 10% for the variable of public debt ratio. This result confirms that there is a non-linear relationship between fiscal policy and economic activity. However, the variable change in capital inflows is unable to explain the nonlinearity of fiscal policy.

In the following, we will consider the variable delayed output gap to estimate our basic model. Indeed, as shown in table 4, it detects robustly the nonlinearity with a critical value that is equal to 0.002. This result is consistent with the theory that focuses on the existence of a critical regime beyond which the effect of fiscal policy changes, which shows the need for the threshold model. For this we estimate our model with this transition variable. In fact, we test the null hypothesis of a single regime in the PSTR model against the alternative of the existence of two regimes in the model. Our results do not reject the null hypothesis and thus confirm that a single threshold is appropriate to capture the nonlinearity of fiscal policy. (The estimation results are reported in table 5).

Table-4. Linearity test

	Capital inflow variation	**Gap(-1)**		**Debt ratio**
H0 :r = 0 vs H1 :r =1 Test LM	0,364 (0,546)	9,693 (0,002)		3.333 (0.068)
Test of Fisher	0,344 (0,558)	9,736 (0,002)		3.269 (0.072)
Test LRT	0,364 (0,547)	9,988 (0,002)		3.351 (0.068)
H0 :r=1vs H1 :r=2 Test LM		0.595 (0.441)		0.072 (0.789)
Test of Fisher Test LRT		0.557 (0.456) 0.596 (0.440)		0.069 (0.793) 0.072 (0.789)
r B0	1 -0,0004 (-0,366)	1 0,0009 (0,877)		1 -0,001*** (-2,846)
B1	0,005 (1,097)	-0,03* (-2,698)		0,042*** (3,1574)
Location Parameters c	24,258	0,04		80,804
Slopes Parameters γ	97,627	205,974		7,335

Source: Author's estimations. r: number of regime, numbers in parenthesis are t-student.

*,**,*** respectively denote significance at the 10%,5 % and 1 % levels.

Concerning the fiscal policy variable, the table shows the cycle phases also affect the influence of fiscal policy on economic activity. The result is consistent with economic intuition. Indeed, in there cession regime in which the output gap is less than1.4%, the coefficient of fiscal policy is positive and statistically significant. This result suggests that fiscal policy is procyclical that means that, the state does not intervene to stimulate economic growth during recession. This result confirms the study Aghevli (1999) shows that during the Asian crisis, fiscal policy in these countries was prudent; they promoted monetary policy to boost economic activity. Means that the monetary authorities have reduced interest rates and let the currency depreciate. By against beyond the critical regime, the coefficient is negative and significant. This result shows that in case that expansionary fiscal policy is recommended.

The introduction of the control variables does not call into question the validity of the estimated threshold. Regarding the control variables, based on the model, the coefficient of dollarization variable is statistically significant in both regimes. It is positive in the first regime and negative in the second. This suggests that in the recession phase, dollarization has a positive effect on economic activity, but this effect will be negative in the expansion phase. We obtain a result contrary to economic intuition. Such a result can be based on the fact that, since the Asian crisis,

countries in the region have taken many measures limiting the degree of dollarization of private commitments. The coefficient of trade openness is negative and statistically significant in the first regime and positive in the second regime. This implies that trade liberalization is beneficial to the economy when the economy is expanding. About the US interest rate, its increase only negatively influences the activity in the recession. This confirms that the influence of the international environment on activity is higher when the economy is in recession. Regarding inflation, the coefficient has a negative sign in the first regime. In fact, the negative effect of inflation occurs more when the output gap is below the critical threshold. The effect of the variable sudden stops is not statistically significant and insignificant on Asia in economic activity in both regimes.

Table-5. Estimation result of the PSTR model

	Asian countries	
Variables de transition	Gap(-1)	
r* Location Parameters c Slopes Parameters γ	1 0,04 12,512	
Fiscal Policy (restrictive)	0.0065 (4.1866)	-0.0034 (-1.7649)
Sudden Stops	-0,05 (0.46)	0,08 (0.86)
Trade openness	-0,001*** (-5.503)	0,002*** (5.872)
inflation	-0,008*** (-3.464)	0,003*** (6.2)
Variation of credit	-0,003 (0.046)	0,005 (-0.023)
dollarisation	0,003*** (3.259)	-0,002*** (-2.584)
American interest rate	-0,0074** * -3.09	0,006*** 2.835
US Gap	-0.0071*** (4.367)	0.0116 *** (2.9127)

Source: Author's estimations.

4. CONCLUDING REMARKS

The main objective of this paper is to analyze the effect of fiscal policy in emerging countries on economic growth during the period of economic instability in a sample 8 Asian countries covers the period from 1990 to 2013.The contribution of our estimates is to provide a detailed and specific explanation for the emerging Asia region (Mainland China, India, Indonesia, Korea, Malaysia, Philippines, Singapore and Thailand). We used the approach developed by Gonzalez *et al.* (2005).The PSTR model. This model is more appropriate than a panel model to explain the effect of fiscal policy on economic growth in emerging countries. Indeed, it takes into account the asymmetry in fiscal policy. We implement two sets of estimates. In the first step, the application of this model has been empirically confirmed by the test of linearity. In the second step, we estimated the PSTR model. The originality of our research is that we have not limited to a single threshold variable. In addition to the output gap variable that represents the economic cycle, we introduced other variable ie, the variable public debt ratio and the variation in capital inflows.

This study follows two main results. First, the non-linearity of fiscal policy is explained by the phases of cycles and the level of public debt. The variable variation in capital inflows do not appear to be relevant to explain the nonlinearity. Second, the behavior of fiscal policy differs according to the threshold variable but it gave almost the same result for the different countries studied. Our results show that in a crisis, when the output gap is less than the critical threshold, the restrictive fiscal policy is more beneficial to economic recovery in emerging countries. From this point of view, our results converge with the literature. This study allowed us to confirm the hypothesis that fiscal

policy is procyclical in times of economic downturn or when public debt is high. In other words, the initial public finance conditions affect fiscal performance during the crisis Aizenman and Jinjarak (2010). It is necessary therefore, according to our result sets, It should therefore be set policies to improve fiscal and macroeconomic situation during non-crisis to limit the risk of crises and to avoid being faced with high interest rates in periods of crises Tavares and Rossen (2001).

In terms of policy implications, emerging countries should pay particular attention to strengthening their financial institutions, try to reduce political risk and improve the fiscal situation so they can benefit countercyclical fiscal policies. The intervention of the State when the economy is in crisis results in worsening the crisis. However, beyond this threshold, in the period of non-crisis expansionary fiscal policy is recommended. Our results do not support the idea that fiscal policy in emerging countries is countercyclical which allowed us to confirm the hypothesis that fiscal policy is procyclical in periods of economic downturn or when public debt is high.

This document could be extended in two directions: one hand, the adoption of a broader comparative perspective, including emerging markets in different regions, to assess the question of the relative efficiency of public expenditure and taxation which remains an area of research remains largely unexplored in developing countries during periods of financial and economic instability; and secondly, this study can be further improved in terms of methodology. The implementation of econometric approaches developed as the use of Bayesian vector autoregressive structural (SBVAR) models over two crises periods Josifidis *et al.* (2014). Thus, the study will be interesting if to compare with the methodology of Panel A Bayesian Markov-Switching VAR Model developed by Kaufmann (2011) and Billio *et al.* (2013).

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REFERENCES

Adler, G. and S. Sebastián, 2013. External conditions and debt sustainability in Latin America. IMF Working Paper No. WP/13/27.

Aghevli, B.B., 1999. Asian crisis: causes and remedies. The Asian Financial Crisis: Origins, Implications, and Solutions. Springer US: 157-166.

Aizenman, J. and Y. Jinjarak, 2010. De facto fiscal space and fiscal stimulus: Definition and assessment. NBER WP/16539.

Aizenman, J. and G. Pasricha, 2013. Why do emerging markets liberalize capital outflow controls? Fiscal versus net capital flows concerns. Journal of International Money and Finance, 39: 28-64.

Baldacci, E., S. Gupta and A. Mati, 2008. Is it still mostly fiscal? Determinants of sovereign spreads in emerging markets. IMF Working Paper No. 08/259.

Billio, M., R. Casarin, F. Ravazzolo and H.K. Dijk, 2013. Interactions between Euro zone and US booms and busts: A Bayesian panel Markov-switching VAR model. Norges Bank Working Paper No. 20.

Braun, M., 2001. Why is fiscal policy procyclical in developing countries? Mimeo: Cambridge, Massachusetts: Harvard University.

Calvo, G.A., A. Izquierdo and L.F. Mejía, 2004. On the empirics of sudden stops: The relevance of balance-sheet effects. NBER Working Paper No. 10520.

Calvo, G.A., A. Izquierdo and E. Talvi, 2003. Sudden stops, the real exchange rate, and fiscal sustainability: Argentina's lessons. NBER Working Papers No. 9828.

Daniel, J., J. Davis, M. Fouad and C.V. Rijckeghem, 2006. Fiscal adjustment for stability and growth. Washington, D.C: International Monetary Fund.

Eichengreen, B. and R. Hausmann, 1999. Exchange rates and financial fragility. NBER Working Papers No. 7418.

Eichengreen, B., R. Hausmann and U. Panizza, 2003. Currency mismatches, debt intolerance and original sin: Why they are not the same and why it matters. NBER Working Papers No. 10036.

Fok, D., D.D. Van and P.H. Franses, 2005. A multi-level panel star model for US manufacturing sectors. Journal of Applied Econometrics, 20(6): 811-827.

Frankel, J.A. and A.E. Cavallo, 2004. Does openness to trade make countries more vulnerable to sudden stops, or less? Using gravity to establish causality. NBER Working Paper No. 10957, Issued in December 2004.

Frankel, J.A., C.A. Végh and G. Vuletin, 2011. On graduation from fiscal procyclicality. NBER Working Papers No. 17619.

Gavin, M., R. Hausmann, R. Perotti and E. Talvi, 1996. Managing fiscal policy in Latin America and the Caribbean: Volatility, procyclicality, and limited credit worthiness. Research Department Publications 4032, Inter-American Development Bank.

Gavin, M. and R. Perotti, 1997. Fiscal policy in Latin America. NBER Macroeconomics Annual, 12: 11–72. Cambrige, MA: MIT Press.

Gonzalez, A., T. Terasvirta and D. Van Dijk, 2005. Panel smooth transition regression models. SSE/EFI Working Paper Series in Economics and Finance No. 604.

Hansen, B.E., 1999. Threshold effects in non-dynamic panels: Estimation, testing, and inference. Journal of Econometrics, 93(2): 345- 368.

Hodrick, R.J. and E.C. Prescott, 1980. Postwar U.S. Business cycles: An empirical investigation. Carnegie Mellon University Discussion Paper No. 451.

Honig, A., 2006. A model of liability dollarization and myopic governments. International Economic Journal, 20(3): 343-355.

Hutchison, M.M., I. Noy and L. Wang, 2010. Fiscal and monetary policies and the cost of sudden stops. Journal of International Money and Finance, 29(6): 973-987.

Hyun, J., 2016. Financial crises and the evolution of credit reallocation: Evidence from Korea. Economic Modelling, 56: 25-34. DOI 10.1016/j.econmod.2016.03.019.

International Monetary Fund, 2003. Public debt in emerging markets: Is it too high? Chapter III in world economic outlook, september 2003; Public debt in emerging markets, world economic and financial surveys. Washington: International Monetary Fund.

Josifidis, K., J.P. Allegret, C. Gimet and P.E. Beker, 2014. Macroeconomic policy responses to financial crises in emerging European economies. Economic Modelling, 36(1): 577–591.

Kaminsky, G., C. Reinhart and C. Végh, 2004. When it rains, it pours: Procyclical capital flows and macroeconomic policies. NBER, WP 10780.

Kaufmann, S., 2011. K-state switching models with endogenous transition distribution. Swiss National Bank, Working Paper No. 2011-13.

Kenourgios, D. and D. Dimitriou, 2015. Contagion of the global financial crisis and the real economy: A regional analysis. Economic Modelling, 44(1): 283-293.

Lane, P.R., 2003. Business cycles and macroeconomic policy in emerging market economies. Trinity Economics Papers 20032, Trinity College Dublin, Department of Economics.

Lane, P.R. and M. Ferretti, 2007. The external wealth of nations mark II: Revised and extended estimates of foreign assets and liabilities, 1970–2004. Journal of International Economics, 73(November): 223-250.

Reinhart, C. and V. Reinhart, 2009. Fiscal stimulus for debt intolerant countries? MPRA Paper 16937, University Library of Munich, Germany.

Reinhart, C.M. and K. Rogoff, 2010. From financial crash to debt crisis. NBER WP/15795.

Talvi, E. and C.A. Vegh, 2005. Tax base variability and procyclical fiscal policy in developing countries. Journal of Development Economics, 78(1): 156-190.

Tavares, J. and V. Rossen, 2001. The neglected effect of fiscal policy on stock and bond returns. FEUNL Working Paper Series 413, Universidade Nova de Lisboa, Faculdade de Economia.

Tornell, A. and P. Lane, 1999. The voracity effect. American Economic Review, 89(1): 22–46.

Vegh, C.A. and G. Vuletin, 2012. How is tax policy conducted over the business cycle? NBER Working Papers No. 17753.

APPENDICES

Table-1. The years of sudden stops in Asia region

Mainland China	1998	
India	1995	2001 2009
Indonesia	1997	
Korea	1997	2008
Malaysia	1994	1997
Philippines	1997	2009
Singapore	2009	
Thaïland	1997	2009

Source: Author's compilations and Honig (2006)