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Exports, Exchange Rate Movements and the Credit Markets Imperfections: New Evidence from Threshold Regression Analysis

N.A.M. NASEEM[a*], W.N.W. AZMAN-SAINI[a] AND TAJUL ARIFFIN MASRON[b]

[a]*Department of Economics, Universiti Putra Malaysia,43400, Malaysia*
[b]*School of Managements, Universiti Sains Malaysia, 11800 Malaysia*

ABSTRACT

Based on an innovative threshold estimation technique, this study investigates whether the effect of exchange rate depreciation on exports is distinct with different channels of credit markets imperfections. The empirical results demonstrate the existence of a threshold effect in the relationship between exchange rate depreciation and exports flows. In particular, the impact of exchange rate depreciation on exports is negatively significant only after a certain threshold level of credit market imperfections has been attained. Until then, the exports effect of exchange rate depreciation seems to be non-existent. This finding suggests that the exchange rate depreciation-exports nexus is contingent on the level of credit market imperfection, thereby corroborating the view that credit market imperfection played an important role in impeding exports performance.

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*corresponding author. Tel: + 603-8946 7776. Email: naseemniaz@upm.edu.my.

INTRODUCTION

The response of exports to exchange rate depreciation still remains a major concern in economic circles. The rising interest in this brain area of research is consistent with the observation of some recent stylized facts that underscore the fluctuating manner in which exports react to a depreciation of exchange rate. Although the standard open macroeconomic theory conveys the message that exchange rate depreciation or devaluation helps to improve export performance[1], some recent studies in international trade have provided evidence on the absence or lack of response by exports to a depreciation of exchange rate. Of particular interest, a substantial depreciation of exchange rate leads to either stagnation or an actual fall in the level of exports, — this was found to be particularly true during the Asian financial crisis 1997 (Dwor-Frecaut *et al.*, 2000; World Bank, 2000; Duttagupta and Spilimbergo, 2004 and Berman, 2009). That means the traditional view of the competitiveness effect of exchange rate depreciation on exports does not seems to apply, albeit the occurrence of sharp declines in dollar-denominated export prices (Ghei and Pritchett, 1999; Halicioglu, 2008; Bahmani-Oskooee and Hegerty, 2011). This finding is further supported by Chatterjee *et al.* (2011) who, using heterogeneous multi-product firms, found sluggish response of exports to exchange rate depreciation. These conflicting sights about the impact of exchange rate depreciation on the level of exports, underlines the prominence of the phenomenon of the "exchange rate disconnect puzzle" as emphasized in Obstfeld and Rogoff (2000). Having such indication poses a number of questions and challenges to academic professionals and policy makers in terms of dealing with the effect of exchange rate depreciation on the volume of exports.

Arguably, one possible explanation for this ambiguous effect that has received considerable attention in recent years is the failure to date for contingent effect in the affiliation linking the exchange rate depreciation and the volume of exports. By and large, there is growing support for the view that recognizes the role of financial markets in international trade and that emphasises that exports are explicitly vulnerable to credit imperfections (Minetti and Zhu, 2011). Tornell and Westermann (2003) demonstrate the prevalent role played by the credit market imperfections (henceforth, CMI) in the boom-bust cycles as well as other macroeconomic patterns, especially across the middle-income countries via three core channels, the foreign currency borrowing (henceforth, FCB) associated with the currency mismatch, credit constraints (henceforth, CC), and systemic guarantees generating incentives to borrow in the foreign currency.

Forbes (2002), for example, illustrates the distortionary effect by which the credit market imperfections interact with the exports effect of exchange rate depreciation. According to the author, the credit frictions disproportionately increase the risk inherent in liquidity-constrained exporting firms in order to pay a large sunk or fixed cost up front at each period in order to penetrate the international market. This may force them to borrow from external lenders, and these are usually more exposed to currency shocks— if firms borrow in a foreign currency. In an economy where firms engage in risky foreign-currency borrowing, depreciation of domestic

[1] Bahmani-Oskooee and Ratha, (2004) documented that most of the empirical studies concluded that exchange rate depreciation appears to enhance the volume of trade. Bahmani-Oskooee and Goswami (2003), Narayan and Narayan (2004) and Gomes and Paz (2005), among others, support the existence of a positive relationship between exchange rate depreciation and trade flows.

currency reduces the firms' cash flow and so diminishes their ability to borrow further in order to survive unique liquidity-constraints and to act productively innovate in the export sectors.

In turn, the exporting firms may have problems in servicing their debts contracted in foreign-currency in which depreciations of currency have led to a severe reduction in their level of solvency as underlined in Berman and Berthou (2009). This additional effect of the ER depreciation known as the balance-sheet effect of currencies mismatches phenomena, which is more severe in the absence of hedging instruments as consequence of the "original sin" (Eichengreen and Hausman, 2000)[2]. The decline in firms' collateral values and the rise in the cost of borrowing may diminish the net worth of exporting firms that leads to an acute collapse of firms' investment capacity, impeding the production of exporting firms. Since the liquidity-constraint plagued financial markets (Chaney, 2005 and Greenaway *et al.*, 2007), the tradable sector is disproportionately more detrimentally affected as exporting firms are typically more prone to foreign currency borrowing (Kawai *et al.*, 2000 and Aguiar, 2005). For example, Minetti and Zhu (2011) who used micro-level data from Italian manufacturing firms, highlights that credit frictions appear to depress the export capacity, especially for firms with high financial dependence or that have few collateral assets. This mechanism can therefore lead some of the exporting firms to exit or not to enter the exports market in the first instance as they may not be able to service their debts contracted in foreign currency; over time the firm's ability to service debts may diminish further and even compensate the traditional competitiveness effect of depreciation on exports[3].

Unfortunately, studies of the effect of credit market imperfections on the exchange rate-exports relation have been sparse, but it is worth reviewing the work by Berman and Berthou (2009) and Tang *et al.*, (2013). The authors find that the credit market imperfections play an important role in mediating the effect of ER depreciation on volume of exports. For instance, they argued that a lower level of financial development is associated with higher levels of credit friction, on average, detrimental to countries' exports more from foreign currency borrowing (FCB) and credit constraint (CC) than for those countries with a better capital development. The results obtained showed that the relationship between depreciation of ER on export volume is contingent on credit frictions, where the marginal impact of ER depreciation on exports is monotonically decreasing with CMI, specifically in developing countries[4]. However, a limitation with the use of a linear interaction model as in earlier studies (i.e. Berman and Berthou, 2009 and Tang *et al.*, 2013), is that the interaction term (constructed through the exchange rate and credit market imperfections) enforces a priori restriction that the effect of exchange rate depreciation on exports volume tends to be monotonically decreasing (or increasing) with credit imperfections. This attests that a certain level of credit market imperfections is required for exchange rate depreciation to influences the volume of exports. Particularly, a more flexible specification is needed to capture the dynamisms of different types of exchange rate-exports-credit imperfections interactions.

[2] This is attributable to the currency mismatching process that tends to decrease in the amount of domestic-currency dominated cash flow while increasing the amount of foreign-currency denominated debts (Deardroff, 2000).

[3] According to which the adjustment of the volume of exports to currency depreciations depends on the variation of the extensive margin of trade that significantly decrease the number of exporters (Blalock and Roy, 2007).

[4]Chor and Manova (2012) document that only exports that are specialized in more financially dependent industries are more sensitive to the disruptive effect of credit cost than exports of less dependence sector.

In line with this understanding, the present study employs a regression model based on a concept of the threshold effect to further investigate the role of credit market imperfections in mediating the exchange rate depreciation effects on exports. The flexibility of this model allows the relationship between exports and exchange rate depreciation to be piecewise linear with the indicators of credit market imperfections acting as switching triggers. The empirical result presents strong evidence for the presence of a threshold effect in the exchange rate-exports link. Specifically, the impact of exchange rate depreciation on exports only takes place after the credit market imperfections exceed a certain threshold level.

EMPIRICAL MODEL AND METHODOLOGY

The empirical model adopted in this study is motivated by and follows the model developed by Goldstein and Kahn (1985) and is further extended by Bermand and Berthou (2009) and Tang *et al.,* (2013), to accommodate the relevance of credit market imperfections to the effects of exchange rate depreciation on exports via the following linear cross-country exports equation:

$$EXPORTS_{it} = \beta_0 + \beta_1 ER_{it} + \beta_2 CMI_{it} + \beta_3 X_{it} \quad (1)$$

where, *EXPORTS* is the exports volume, *ER* is the real effective exchange rate (a decrease of ER refers to a depreciation of the local currency), *X* is a vector of conditional variables (domestic income, competitors-domestic price ratio and foreign demand), and $\mu_i$is an error term[5].

Arguably, the contingency effects are well captured in Eq (1). The equation models the influence of credit market imperfections on the dynamic relationship of exchange rate and exports. This study utilizes the threshold specification established by Hansen (1996, 2000) as illustrated as follows:

$$EXPORTS_i = \theta X_i + \begin{cases} \beta_1 ER_i + \mu_i, & CMI \leq \tau \\ \beta_2 ER_i + \mu_i, & CMI > \tau \end{cases} \quad (2)$$

where CMI is the threshold variable which splits the sample into two regimes, high and low-regimes, and $\tau$is the unknown threshold parameter. This allows the effects of ER on exports to take on two corresponding values, conditional on the level of CMI, whether it is below or above the threshold value, τ, through the estimation from Eq (2). If the value of threshold is in high (low) regime, the impact of ER on exports will be $\beta_2(\beta_1)$.

The estimated value of τ is computed with all possible values of τ by calculating a Wald or LM statistics through which the computation is conducted on the supremum of the Wald or LM across each possible τ. The obtained value of $\hat{\tau}$ is the minimizer of the sum of squared errors calculated for each possible value of τ, which is trivially followed with the estimates of slope parameters as$\hat{\beta}(\hat{\tau})$. Next, a model based bootstrap developed by Hensen (1996) is employed to test the significance of the threshold parameter τ as under the null hypothesis the value of τ is

[5] For a detailed construction of each country's competitors-domestic price and foreign demand please refer to Berman and Berthou (2009).

not identified. A least squares (LS) technique is used in performing the estimation of (1), given that $\tau$is linear in its parameter.

SOURCES OF DATA

In favour to estimate the above equation, this study used two data sets that correspond to two channels of credit market imperfections. For foreign currency borrowing (henceforth, FCB) as a measure of CMI, the number of countries was fifty-five while for credit constraints (henceforth, CC) as a proxy of CMI, the number of countries was eighty-eight. Both the sample periods cover the datasets from 1980 to 2009. The real effective exchange rate (ER) is extracted from IMF, *International Financial Statistics* (IFS). The exports volume, real GDP and GDP deflator are collected from World Development Indicator (WDI). The competitors' price and foreign demand variables are constructed using data taken from IMF, *Direction of Trade Statistics* (DOTS) and WDI[6].

Based on Berman and Berthou (2009) and Tang, *et al.,* (2013), two channels of variables are used to measure the level of credit market imperfections. The first indicator is the foreign currency-borrowing (FCB) obtained from the World Business Environment Survey (WBES) in the year 2000. This variable is only available for the year 2000, which measures an average of the proportion of firms' debt denominated in the foreign currency, for each country in the sample study. An observation from the study sample indicates that some economies in South America and Southeast Asia, namely Argentina, Singapore, and Indonesia are characterized by a high degree of foreign currency borrowing, whereas this ratio is much lower in financial centres like the United Kingdom and the United States. The second observation is the credit constraints (CC), which are measured as in Levine *et al.* (2000) by the private credit ratio (henceforth, PC), and of issues by financial institutions as a share of GDP extracted from the Financial Structure Database of the World Bank. In this case,the variables are structured such that a higher value implies a higher level of financial development which has higher exports: so there is a positive relationship between both variables. As such, the variable requires the inversion of the well-known ratios based on the Bhandari (2011), which was therefore first converted to (1/PC). Accordingly, the inverse of this variable is taken in order to have a consistent negative relationship of credit constraint on exports. In other words, a higher level of this variable denotes a lower level of financial development, suggesting a higher level of credit constraint and this means poor credit availability for financing the activities and its output of exporting firms[7].

EMPIRICAL RESULTS

Table 1 presents the main results on the effects of exchange rate depreciation on exports with the credit market imperfections acting as a threshold variable. For this purpose, the foreign currency borrowing (FCB) and credit constraints (CC) are used as a proxy of the credit market

[6] The specifications of data are briefly explained in Appendix 1.
[7] For a list of countries for FCB and CC, please refer to Appendix II and Appendix III, respectively.

imperfections threshold effect in mediating the exports effect of exchange rate depreciation. Under this approach, the impact of exchange rate depreciation on export volume is based on regime specific with the indicators of CMI act as a regime switching trigger of splitting the sample into high- and low- regimes. The statistical significance of the threshold estimate $\hat{\tau}$ was evaluated by *p*-value calculated using bootstrap method with 1000 replications and 10% trimming percentage. As shown in all models the bootstrap *p*-value indicates that the estimate of no threshold effect can be rejected, suggesting the sample can be split into two different regimes. Empirical results indicate that both channels of credit market imperfection point to a threshold effect in the relationship between the exchange rate depreciation and exports. The point estimate of the threshold value for both channels of CMI: FCB is 0.177 and CC is 0.301, appear to be significant at 5 per cent level as indicated by the bootstrap *p*-value. This clearly suggests that the sample of countries under review can be divided into two groups based on the threshold value: those countries that have a FCB above 17.7 per cent and CC greater than 30.1 per cent are classified as the group with high credit imperfections while those that are below the threshold values fall into the group with low credit imperfections[8].

The existence of a credit market imperfections threshold, lead the way to the next question on how credit market imperfections may affect the relationship between exchange rate depreciation and exports. As the first channels of credit imperfections (i.e. FCB), the coefficient on ER is statistically insignificant for countries that fall below the threshold level. In contrast, when those countries move to a level above the threshold, the effect of exchange rate depreciation on exports becomes negative and statistically significant (β_2= -0.054; s.e. = 0.014). On the other hand, when the credit constraints are used as a channel of credit market imperfections, the results reveal that below the threshold value, exchange rate depreciation is negative and an insignificant determinant of exports but appears to be negatively significant (β_2= -0.032; s.e. = 0.015) in influencing exports above the threshold level. It is also noticed that all the control variables (log (domestic income and competitors-domestic price ratio) carry the expected sign and are significant at the 5 per cent level or higher, except for the relative price. Moreover, the magnitudes of the coefficients of these variables appear to be fairly robust across the two specifications of credit market imperfections (i.e. FCB and CC). An appealing part of the result is that exchange rate depreciation different effects on exports given the levels of credit market imperfections, which suggests the presence of a stable nonlinear process.

This finding is not surprising and in fact is in agreement with Duttagupta and Spilimbergo (2004) and Berman and Berthou (2009) who have also discovered that not all the countries' exports may benefit from exchange rate depreciation. This is also consistent with Berman and Berthou (2009) and Tang *et al.,* (2013), which confirms that the impact of exchange rate depreciation on exports is deteriorated by the level of foreign currency borrowing and credit constraints. This means that those countries may detriment from exchange rate depreciation, showing that considerable depreciation of local currency leads to lower exports, especially in countries that experience credit imperfections.

[8]For a classification of countries into the low-and high FCB and CC regimes, please refer to Appendix II and Appendix III, respectively.

Table 1 Threshold estimate.

	Linear model	Threshold model			
		Panel A: CMI=FCB		**Panel B:** CMI=CC	
	OLS without threshold	Low-regime FCB ≤ 0.177	High-regime FCB > 0.177	Low-regime CC ≤ 0.301	High-regime CC > 0.301
Constant	-0.268	-0.554	-0.468	-0.204	-0.212
	(0.097)	(0.137)	(0.107)	(0.060)	(0.051)
	[-2.767]	[-4.044]	[-4.374]	[-3.386]	[-4.141]
Domestic Income	0.062	0.096	0.089	0.064	0.055
	(0.021)	(0.021)	(0.026)	(0.018)	(0.018)
	[3.024]	[4.571]	[3.423]	[3.657]	[3.056]
Competitors/domestic price	0.011	-0.001	0.016	0.006	0.012
	(0.003)	(0.003)	(0.005)	(0.009)	(0.005)
	[3.231]	[-0.333]	[3.200]	[0.667]	[2.401]
Foreign Demand	0.133	0.328	0.207	0.171	0.141
	(0.054)	(0.156)	(0.082)	(0.050)	(0.053)
	[2.447]	[2.103]	[2.524]	[3.442]	[2.636]
ER	-0.022	-0.041	-0.054	-0.028	-0.032
	(0.059)	(0.033)	(0.014)	(0.035)	(0.015)
	[-0.375]	[-1.242]	[-3.857]	[-0.799]	[-2.047]
R-*sq*	0.595				
Heteroscedasticity test (*p*-value)	0.430				
LM test for no threshold		30.826		24.890	
Bootstrap *p*-value		0.035		0.026	
Threshold Estimate:		0.177		0.301	
Number of Countries		18	37	38	50

Note: H0: No threshold effect. The bootstrap *p*-value is calculated with 1000 replication and 10% trimming percentage. FCB is foreign liability and CC is credit constraint. Figure in ( ) are standard error (White corrected for heteroscedasticity. Figure in [ ] are *t*-statistics.

By and large, the results demonstrate that countries that are financially underdeveloped may be disproportionately influenced by the credit market imperfections through the different channels, namely foreign currency borrowing and credit constraints, which seem to be detrimental from exchange rate depreciation and to reduce exports. There is, however, for countries that possessa well-developed financial sector leads to be unimportant, consistent with the study advanced by Garber and Svensson (1995) and Aghion *et al.* (2009). Typically, countries like Indonesia, Mexico and Colombia are among those characterized by an intermediate level of financial development and are subject to a high level of repaying existing foreign-currency debt burdens, and these countries will react negatively to ER depreciation due to the experience of greater balance-sheet effects of the currency mismatch phenomenon. Thus, it can be argued that the negative effect of ER on exports is to take place only after the FCB and CC (i.e. credit market imperfections) pass beyond the threshold level of 0.177 and 0.301, respectively. For observations that fall in this high-regime, for example, referring to FCB, a one-percentage increase in exchange rate movements reduce the level of exports by approximately 0.05 percentage points. In the interim, countries that are below the critical level, the effect of exchange rate depreciation is negative while it is small and economically negligible.

ROBUSTNESS CHECKS

The robustness of the estimated threshold value is ascertained via a number of sensitivity analyses. First, the high-CMI group for both the channels (i.e. high-FCB and CC group) are tested to determine whether they could be further split into sub-regimes. The bootstrap *p*-value split is found to be insignificant for the second sample split, signifying the single threshold in Eq (2) model seem to be adequate for all models (see Appendix IV). The second sensitivity test of the threshold effect is to make use of different sub-samples of the data. For the sake of comparison, a different time period set is applied. The period of 1990-2009 is selected to capture the importance of liberalizations process as most the countries began intensified economic reform programmes in the 1990s, marched towards actively flexible exchange rate arrangement and to ease restrictions on the international capital flows[9]. The results for both channels of CMI (i.e. FCB and CC) support that the estimates of threshold parameter $\hat{\tau}$remain statistically significant at 5% level, rejecting the null hypothesis of no threshold effect (see Appendix V). Finally, a different combination of trimming percentage and the bootstrap replications are used to appraise the *p*-value for both the FCB and CC, in which it is found that the threshold effect of ER on exports volume remains valid (see Appendix V). All in all, the findings obtained from re-estimating the threshold regression reveals variations around the threshold consistent with the main empirical results.

CONCLUSIONS

This paper presents new empirical results on the credit market imperfections in influencing the effects of exchange rate depreciation on exports for the developed and emerging market economies. Basically, this study improves on earlier studies by supplying additional insight on the existence of two distinct channels of credit market imperfections, namely foreign currency borrowing (FCB) and credit constraints (CC), which condition the nonlinear effects of exchange rate depreciation on exports flows. The main contribution of the paper is the adoption of the regression model based on the concept of threshold effect as developed by Hansen (2000) in order to capture the rich dynamics in the relationship between exchange rate depreciation, exports and credit market imperfections. Specifically, the empirical results indicated the existence of a significant threshold in credit imperfections of the exchange rate depreciation and exports nexus.

Indeed, the findings show that for both the channels of credit market imperfections below the threshold, exchange rate depreciation has an insignificant effect on exports. However, the exports effect of exchange rate depreciation turns out to be significant and negative for credit market imperfections above the threshold level. These findings suggest that the exchange rate depreciation-exports nexus seems to be contingent on credit market imperfections, in which depreciation of exchange rate detriments exports after the credit market imperfections exceed a certain threshold level. The results are also found to be robust to a number of robustness checks

[9] It is noticed that countries with more flexible exchange rates experienced unusually large depreciations, such as in Mexico and South Africa in 1998 (Forbes, 2002).

including different study time period (i.e. 1990-2009), further threshold effect split estimation, and through different trimming percentage and bootstrap replications.

The empirical results suggest financial underdevelopment leads to higher credit market imperfections for channelling resources to finance productive activities efficiently. This finding seems to indicate that the balance sheet — through the foreign liability and bank-lending channel — matters for exchange rate depreciation, where worse the credit accessibility tends to distort the ability of being competitive for exchange rate depreciation and hence in sustaining long–run exports progress. Instead of negative impacts, no significant relationship is determined in the low credit frictions group. As mentioned by Garber and Svensson (1995) and Aghion *et al.* (2009) this is not an issue for countries with better-developed foreign exchange markets; countries such as Australia, Singapore and others are able to manage their foreign debt carefully, any foreign currency debt is hedged and the position is covered with less exposure to the foreign exchange risk. This also explains as in Kletzer and Bardhan (1987) and Beck (2002) that economies with better-developed financial sectors have comparative advantage in sectors that rely on external finance.

The evidence provided in this paper, therefore, underlies a novel rational interpretation for the "currency-exports dilemma" as acknowledged of credit market imperfections lead to distort the ability of pro-competitive effect of exchange rate depreciation to sustain productive exports. This offers some significant insight into the policy makers' preparedness in stimulating the competitiveness effect of exchange rate depreciation versus those that seek for the betterment of credit market imperfections. The espousal of policies having a pro-competitive effect of exchange rate depreciation should integrate with the strategies of promoting credit accessibility because greater credit friction is likely to be detrimental to trade flows. As a result, it is essential for the policymakers to calculate the cost of policies aimed at taking appropriate measures that lead to a reduction in the exchange rate fluctuations as well as restoring the equilibrium of exchange rate while endorsing greater reforms in the credit markets to make the export sectors, as well as the economy at large, more fruitful.

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APPENDIX

Appendix I Description of data

Variables	Descriptions	Measurement	Sources
EXPORTS	Exports	Volume of Export	WDI
Y	Domestic income	Real GDP (Constant 2000 USD)	WDI
FD	Foreign demand	Foreign demand index is constructed based on income of all *i*'s trade partner countries: $FD_i = \sum_{n=1}^{N} \varphi_{ij} X_{ij}$ $with$ $\varphi_{ij} = \frac{X_{ij}}{X_i}$, where X_{ij} denotes the total exports of country *i* to country *j*, and φ_{ij} the trade share of country *j* with respect to the exports of country *i*.	IFS and DOTS, IMF WDI
PR	Price Ratio	Ratio of competitors price (CP) over the domestic price (GDP deflator): $CP_i = \sum_{k=1}^{K} \sigma_{ik} PM_k$ $with$ $\sigma_{ik} = \frac{X_{ik}}{X_i}$, where PM_k is country *k*'s import price and σ_{ik} is the share of country *k* in *i*'s total exports	DOTS, IMF
ER	Exchange Rate	Real Effective Exchange Rate. An increase in ER indicates real depreciation.	IFS, IMF
FCB	Foreign Currency Borrowing	World Business Environment Survey (WBES) in year 2000.	WBES
CC	Credit Constraints	Private credit ratio as a share of GDP (PC): converted to (1/PC)	FSD

Note: WDI is the World Development Indicator while IFS is the International Financial Statistics, DOTS is the Direction of Trade Statistics published by International Monetary Fund (IMF) and FSD is the Financial Structure Database of the World Bank. All variables are in the logarithmic form.

Appendix II Classification of Countries (FCB)

Country	Code	CMI Regime	Country	Code	CMI Regime
Argentina	ARG	High	Israel	ISR	Low
Bangladesh	BGD	High	Kenya	KEN	High
Bolivia	BOL	High	Madagascar	MAC	High
Botswana	BWA	High	Malawi	MWI	High
Brazil	BRA	High	Malaysia	MYS	Low
Cameroon	CMR	High	Mexico	MEX	High
Canada	CAN	Low	Nigeria	NGA	High
Chile	CHL	High	Pakistan	PAK	High
Colombia	COL	High	Panama	PAN	High
Costa Rica	CRI	High	Peru	PER	High
Cote d'Ivoire	CIV	High	Philippines	PHL	High
Dominica	DMA	Low	Poland	POL	Low
Ecuador	ECU	High	Portugal	PRT	Low
Egypt, Arab Rep.	EGY	High	Senegal	SEN	High
El Salvador	SLV	High	Singapore	SGP	Low
Ethiopia	ETH	High	South Africa	ZAF	Low
France	FRA	Low	Spain	ESP	Low
Gabon	GAB	High	Sweden	SWE	Low
Germany	GER	Low	Thailand	THA	High
Ghana	GHA	High	Trinidad and Tobago	TTG	Low
Guatemala	GTM	High	Tunisia	TUN	High
Guyana	GUY	High	Turkey	TUR	High
Haiti	HTI	High	United Kingdom	GBR	Low
Honduras	HND	Low	United States	USA	Low
Hungary	HUN	Low	Uruguay	URY	High
India	IND	High	Venezuela	VEN	High
Indonesia	IDN	High	Zambia	ZMA	High
Italy	ITA	Low			

Notes: Countries that are in Low and High FCB-regimes reflect the above and below of FCB index 0.177, respectively.

Appendix III Classification of Countries (CC)

Country	Code	CMI Regime	Country	Code	CMI Regime
Algeria	DZA	High	Jamaica	JAM	High
Argentina	ARG	High	Japan	JPN	Low
Australia	AUS	Low	Kenya	KEN	High
Austria	AUT	Low	Kuwait	KWT	Low
Bahamas	BHS	Low	Madagascar	MAC	High
Bangladesh	BGD	High	Malawi	MWI	High
Belgium	BEL	Low	Malaysia	MYS	Low
Bolivia	BOL	High	Mexico	MEX	High
Botswana	BWA	High	Morocco	MAR	High
Brazil	BRA	High	Netherlands	NLD	Low
Burkina Faso	BFA	High	New Zealand	NZL	Low
Burundi	BDI	High	Nigeria	NGA	High
Cameroon	CMR	High	Norway	NOR	Low
Canada	CAN	Low	Pakistan	PAK	High
Central African Rep	CAF	High	Panama	PAN	Low
Chile	CHL	High	Papua New Guinea	PNG	High
Colombia	COL	High	Paraguay	PRY	Low
Costa Rica	CRI	High	Peru	PER	High
Cote d'Ivoire	CIV	High	Philippines	PHL	High
Denmark	DNK	Low	Poland	POL	Low
Dominica	DMA	Low	Portugal	PRT	Low
Ecuador	ECU	High	Rwanda	RWA	High
Egypt, Arab Rep.	EGY	High	Saudi Arabia	SAU	Low
El Salvador	SLV	High	Senegal	SEN	High
Ethiopia	ETH	High	Sierra Leone	SLE	High
Fiji	FJI	High	Singapore	SGP	Low
France	FRA	Low	South Africa	ZAF	Low
Gabon	GAB	High	Spain	ESP	Low
Germany	GER	Low	Sri Lanka	LKA	High
Ghana	GHA	High	Sudan	SDN	High
Greece	GRC	Low	Sweden	SWE	Low
Guatemala	GTM	High	Switzerland	CHE	Low
Guyana	GUY	High	Syrian Arab Rep	SYR	High
Haiti	HTI	High	Thailand	THA	High
Honduras	HND	Low	Togo	TGO	High
Hong Kong	HKG	Low	Trinidad and Tobago	TTG	Low
Hungary	HUN	Low	Tunisia	TUN	High
Iceland	ISL	Low	Turkey	TUR	High
India	IND	High	United Kingdom	GBR	Low
Indonesia	IDN	High	United States	USA	Low
Iran	IRN	Low	Uruguay	URY	Low
Ireland	IRL	Low	Venezuela	VEN	High
Israel	ISR	Low	Vietnam	VNM	High
Italy	ITA	Low	Zambia	ZMA	High

Notes: Countries that are in Low and High CC-regimes reflect the above and below of CC index 0.301, respectively.

Appendix IV Threshold estimate (1990 – 2009)

	Linear model	Threshold model			
		Panel A: CMI=FCB		**Panel B:** CMI=CC	
	OLS without threshold	Low-regime FCB≤ 0.186	High-regime FCB> 0.186	Low-regime CC≤ 0.325	High-regime CC> 0.325
Constant	-0.255	-0.502	-0.369	-0.185	-0.208
	(0.103)	(0.143)	(0.116)	(0.060)	(0.056)
	[-2.487]	[-3.510]	[-3.181]	[-3.084]	[-3.733]
Domestic Income	0.060	0.091	0.077	0.057	0.059
	(0.024)	(0.021)	(0.035)	(0.015)	(0.012)
	[2.553]	[4.333]	[2.200]	[3.800]	[4.917]
Competitors/domestic price	0.011	0.003	0.017	0.006	0.013
	(0.004)	(0.005)	(0.004)	(0.007)	(0.002)
	[2.750]	[0.600]	[4.250]	[0.857]	[5.384]
Foreign Demand	0.249	0.384	0.261	0.180	0.145
	(0.081)	(0.112)	(0.078)	(0.041)	(0.045)
	[3.072]	[3.429]	[3.346]	[4.405]	[3.241]
ER	-0.018	-0.046	-0.057	-0.021	-0.034
	(0.043)	(0.033)	(0.023)	(0.040)	(0.013)
	[-0.419]	[-1.394]	[-2.478]	[-0.531]	[-2.710]
	0.060	0.091	0.077		
R-*sq*	0.471				
Heteroscedasticity test (*p*-value)	0.232				
LM test for no threshold		44.191		29.587	
Bootstrap *p*-value		0.045		0.033	
Threshold Estimate:		0.186		0.325	
Number of Countries		20	35	41	47

Note: H_0: No threshold effect. The bootstrap *p*-value is calculated with 1000 replication and 10% trimming percentage. FCB is foreign liability and CC is credit constraint. Figure in ( ) are standard error (White corrected for heteroscedasticity. Figure in [ ] are *t*-statistics.

Appendix V Threshold effect for further split

	Second Sample Split	
	Foreign currency borrowing = FCB	Credit constraints = CC
LM test for no threshold	19.823	11.536
Bootstrap *p*-value	(0.137)	(0.247)

Note: H_0: No threshold effect. The bootstrap *p*-value is calculated with 1000 replication and 10% trimming percentage.

Appendix VI Bootstrapped *p*-values

	Bootstrap Replications		
	10000	5000	1000
Trimming Percentage			
Foreign currency borrowing = FCB			
20	0.027	0.029	0.031
15	0.028	0.030	0.033
10	0.030	0.032	0.035
Credit constraints = CC			
20	0.018	0.019	0.021
15	0.020	0.021	0.024
10	0.022	0.024	0.026

Notes: The threshold estimate of FCB is 0.177 and the LM-test for no threshold is 30.826. Meanwhile, the threshold estimate for CC is 0.301 with the LM-test for no threshold is 24.890.