Exports and Exchange Rate Movements: The Role of Credit Market Imperfections

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Abstract

Focusing on a threshold regression analysis, the result provides new evidence that the negative effect of exchange rate depreciation on exports takes place as certain threshold level of credit market imperfection has been attained.

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***Keywords*:** Exchange rate, Exports, Credit market imperfection, Threshold effects

1. Introduction.

The fluctuation character on the reaction of exports in response to exchange rate depreciation is puzzled (Duttaguta and Spilimbergo, 2004). A possible explanation that has received considerable attention in recent years is the failure to date for contingent effect in the affiliation of exchange rate depreciation and the level of exports. Many analysts of international economics concur that the impact of exchange rate depreciation on exports may be contingent on several intervening factors. By-and-large, there is growing view that recognized the role of financial markets in international trade and stressed that exports are explicitly vulnerable to credit imperfections[1]. Forbes (2002), for example, exhibits 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 firms reliant on foreign-currency borrowing to finance working capital through which the balance-sheet effect of currency mismatch phenomena resulted in a raise in the outstanding of foreign-currency debt. In an environment, leads the value of collateral to decrease, contracting the borrowing capacity for a higher credit constraint among exporting countries in which impedes the net worth of exports sectors to an acute collapse of exports productivity and thereby offset the competitiveness effect of exchange rate depreciation[2].

Despite its importance, however, empirical evidence regarding this issue remains relatively thin. The work by Berman and Berthou (2009), for instance, find that the credit market imperfections play important role as pre-condition for a negative impact of exchange rate depreciation on exports[3]. That is, a marginal decrease in the development of financial market leads to worse off the reaction of countries to depreciation on exports through a higher level of credit constraints. A recent paper by Tang *et al.,* (2013) confirmed this finding. According to these authors, an increase in the exchange rate depreciation through a higher credit rationing leads to lower exports in less financially developed economies as to developed countries one. However, a limitation with this type of modeling strategy is that the use of a linear interaction model (constructed through the exchange rate and credit market imperfections), where enforces a priori restriction that the effect of exchange rate depreciation on exports volume tends to monotonically decreasing (or increasing) with credit imperfections. This attests that certain level of credit market imperfections is required for exchange rate depreciation to take place in influencing 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.

[1] Tornell and Westermann (2003) demonstrate the prevalent role played by the credit market imperfections in the boom-bust cycles and other macroeconomic pattern across the middle income countries via three channels, the foreign currency borrowing associated with the currency mismatch, credit constraints, and systemic bailout guarantees.

[2] Minetti and Zhu (2011) using micro-level data from Italian manufacturing firms, highlight that credit frictions appear to depress the exports capacity, especially for firms with high financial dependence or have few colletralizable assets.

[3] 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 the apprehension, this 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 act as switching trigger. A systematic cross-country observations analysis is conducted, using a data set for 88 countries over the years 1980–2009. The empirical result exerts strong evidence on the presence of 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 certain level of threshold effect.

2. Model specification

The benchmark specification used is broadly follows Berman and Berthou (2009), which accommodate the relevance of credit market imperfections to the effects of exchange rate depreciation on exports via the following linear cross-country exports equation:

$$EXPORTS_i = \theta + \gamma_1 ER_i + \gamma_2 X_i + \mu_i \quad (1)$$

where *EXPORTS* is the exports volume, *ER* is the real effective exchange rate, *X* is a vector of conditional variables (domestic income, competitors-domestic price ratio and foreign demand) and μ_i is an error term[4]. Arguably, equation (1) is well captured the contingency effects, and to modeling 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:

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

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

The estimate value of τ is computed with all possible value 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 of τ is the minimizer of the sum of squared errors calculated for each possible value of τ, which trivially followed with the estimates of slope parameters as $\beta(\tau)$. Next, a model based bootstrap developed by Hensen (1996) is employed to test the significance of threshold parameter τ as under the null hypothesis the value of τ is not identified. A least square (LS) technique is used in performing the estimation of (1), given that τ is linear in its parameter.

3. Data and Empirical Results

The data set spans over the period 1980–2009 for cross-country observation from 88 countries. 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. The focus on the period 1980-2009 is to capture the importance of liberalizations process as most the countries began to intensified economic reforms program in the 1980s, marched towards actively flexible exchange rate arrangement and to ease restriction on the international capital flows. Based on Berman and Berthou (2009), two types of variable are used to measure the level of credit market imperfections. First, the main measurement of the credit market imperfections employed in this study is the foreign liability of the banking sector that is expressed as a ratio to GDP (henceforth, FL) in order to gauge countries' foreign-currency borrowing, which gathered from IMF, IFS. Second, the credit constraints is measured as in Levine et al. (2000) by the private credit ratio (henceforth, PC), issues by

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

financial institutions as a share of GDP, which are obtained from the Financial Structure Database of the World Bank.

The estimated threshold effect using foreign liability as threshold variable are displayed in Panel A of Table 1. The bootstrap method with 1000 replication and 10% trimming percentage is used to assess the significance of threshold parameter τ. The results indicate that the threshold estimates (FL=-1.773) is significant at 0.035 levels. This suggests that the sample can be split into two regimes. Countries with foreign liability of greater than -1.773 are classified into high-CMI while countries below the value are classified into low-CMI regime. The coefficient on ER is negatively significant in the group of high-CMI but for the low-CMI group it is insignificant. This reflects the existence of nonlinear relationship in the exports effect of exchange rate depreciation and only takes place after the credit market imperfection exceeds certain threshold level. Additionally, the results for models utilizing the private credit ratio as to different channel of credit market imperfections are reported in Panel B of Table 1. The outcome of this analysis signifies that the threshold effect to hold intact.

Table 1: Threshold Estimate

	Panel A: CMI=FL		**Panel B:** CMI=PC	
	Low-regime FL≤ -1.773	High-regime FL> -1.773	Low-regime PC≤ 0.301	High-regime PC> 0.301
Constant	-0.194	-0.202	-0.212	-0.204
	(-2.487)	(-2.767)	(-4.141)	(-3.386)
Domestic Income	0.057	0.062	0.055	0.064
	(3.800)	(3.024)	(3.056)	(3.657)
Competitors/domestic price	0.006	0.011	0.010	0.006
	(0.353)	(3.231)	(3.333)	(0.423)
Foreign Demand	0.141	0.133	0.180	0.171
	(2.636)	(2.447)	(4.405)	(3.442)
Exchange Rate	-0.021	-0.041	-0.032	-0.038
	(-0.531)	(-2.382)	(-2.047)	(0.528)
Threshold Estimate:	-1.773		0.301	
LM test for no threshold	30.826		27.890	
Bootstrap *p*-value	0.035		0.026	
Number of Countries	35	53	50	38

Note: H_0: No threshold effect. The bootstrap *p*-value is calculated with 1000 replication and 10% trimming percentage. FL is foreign liability and PCR is private credit. Figure in parentheses are *t*-statistics.

The robustness of the estimated threshold value is ascertained via a number of sensitivity analyses[5]. First, the high-CMI (FL) regime is tested whether it can be further split into sub-regimes. The split renders insignificant *p*-values of 0.103, signifying the model is satisfactory for two regimes specification. Second, different combination of trimming percentage and the bootstrap replications are used to appraise the *p*-value and find that the threshold effect of ER on exports volume remains valid. Finally, the outliers test on the estimation result is deployed by using the Cook's D statistic advocated by Rousseeuw and Leroy (1987). The test statistic indicates the presence of potential outliers, namely Botswana and Sierra Leone. Appealingly, the exclusion of these countries remains the result unchanged with the null hypothesis of no threshold can be consistently rejected (*p*-value=0.048).

3. Conclusions

The main contribution of the present paper relies on the use of the regression model based on the concept of threshold effect to accommodate rich dynamic for the relationship between exchange rate depreciation, exports and credit market imperfections. Using data from 88 countries over the years 1980–2009, this study constitute new evidence on the importance of credit market imperfections threshold in mediating the negative effect of exchange rate depreciation on exports. It is evident that the exchange rate depreciation tends to hinder exports after credit market imperfections reach certain threshold level. This finding underlies a novel rational interpretation for

[5] The results are available upon request.

"currency-exports dilemma" as acknowledges of credit market imperfections leads to distort the ability of pro-competitive effect of exchange rate depreciation to sustain productive exports efficiently. Hence, polices designed towards stimulating the benefit from traditional competitiveness effect of exchange rate depreciation should integrate with the aims at promoting greater reforms on credit market developments.

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