

Growth dynamics, financial crises and exchange-rate regimes^{1*}

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October 2014

Abstract

We empirically investigate the impact of financial crises and nominal exchange-rate regime changes on growth dynamics. To that end, we estimate autoregressive models using panel data for 163 countries classified into four income groups during the period 1970-2011. Results suggest that financial crises significantly reduce short-run and long-run growth for high-income and lower-middle income countries. In the case of the upper-middle income countries, financial crises inflict a negative and statistically significant impact on short-run growth but only a marginally significant effect on long-run growth, while for lower income countries they only have a short-run influence. As for the exchange-rate regimes, we find that they only positively affect the short-run growth rate for lower-middle income and low income countries, not showing any significant impact on long-run growth rates.

Keywords: Growth dynamics, financial crises, nominal exchange rate regime changes.

JEL: O40, F42, N10 F31

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I. Introduction

The 2007-2009 global financial crisis led to the sharpest drop in world output since the Great Depression of the 1930s. This severe impact on the real economy has stimulated an extensive research on the impact of financial crises on long-term growth.

Cerra and Saxena (2008) showed how banking crises have uniformly been associated with large and prolonged falls in output for all the country groups and geographical areas they consider. Reinhart and Rogoff (2009) have documented systematic, large and persistent falls in real per capita Gross Domestic Product (GDP) in the immediate aftermath of severe banking crises. Cecchetti *et al.* (2009) also concluded that there is a tendency for systemic banking crises to have lasting negative output effects.

On the other hand, since financial crises historically are associated with stresses on, and changes in, monetary regimes, a strand of the literature has explored the role of nominal exchange-rate regimes in the real effects of financial crises. Furceri and Zdzienicka (2012) find that flexible exchange rates attenuate the effect of the crises. Tsangarides (2012) obtain an asymmetric effect of the regime during and recovering from the crisis. Rose (2013) argues that hard fixers have had macroeconomic experiences similar to those of inflation targeters with flexible exchange rates during and after the global financial crisis. Gagnon (2013) contents that inflation targeting countries with flexible exchange rates performed better during the global financial crisis and its aftermath than countries that had a fixed exchange rate.

This paper systematically investigates the impact of financial crises and nominal exchange rate regime changes on growth dynamics over the long term for a large set of 163 countries, exploring if such impact differs across countries. Our work contributes to previous literature in several ways. First, we use a much more study period (1970-2011) and a more comprehensive country sample (163 countries classified into four income groups) to scrutinize real GDP growth. Second, our methodology enable us to captures the dynamic nature of growth using panel data models and to examine the role played by exchange-rate regimes and financial crises on short-run and long-run growth rates.

In Section II we present the data and estimation methodology, while in Section III we report our main empirical results.

II. Data and Methodology

II.1. Data

In our empirical analysis, we use annual data of real GDP growth for 163 countries, covering developed, emerging, developing and transition countries².

To assess real economic growth, we use the annual percentage change rate of the GDP at market prices expressed in constant 2000 US dollars, taking from the World Bank's Development Indicators database.

Due to data availability, our sample period ranges from 1970 to 2011. Nevertheless, our sample covers a relevant time period characterized by relatively open and integrated markets over the post-Bretton Woods period.

We divide economies under study in four income groups using the World Bank's classification: low income, lower middle income, upper middle income and high income countries. Given that income classifications are set each year based on their per capita income data, we recursively formed groups of countries based on the income classifications, tracking their growth performance³.

II.2. Methodology

Following Cerra and Saxena (2008), we analyze the impact of financial crises and nominal exchange rate regime changes through the estimation of the following univariate autoregressive AR(p) model in growth rates, which accounts for the nonstationarity of output and for serial correlation in growth rates:

² In order to save space, we do not report the list of countries under study. However, they are available from the authors upon request.

³ Income classifications are set each year on July 1. These official analytical classifications are fixed during the World Bank's fiscal year (ending on June 30), thus countries remain in the categories in which they are classified irrespective of any revisions to their per capita income data.

$$y_{it} = \alpha_i + \sum_{s=1}^p \beta_s y_{i,t-s} + \sum_{s=0}^p \delta_s D_{i,t-s}^{fc} + \sum_{s=0}^p \delta_s D_{i,t-s}^r + \varepsilon_{i,t}$$

$$y_{it} = \alpha_i + \sum_{s=1}^p \beta_s y_{i,t-s} + \sum_{s=0}^p \delta_s D_{i,t-s}^{fc} + \sum_{s=0}^p \delta_s D_{i,t-s}^r + \varepsilon_{i,t} \quad (1)$$

where y is the percentage change in real GDP of country i in year t , D^{fc} is a dummy variable capturing financial crises (banking crises, currency crises and debt crises), D^r is a dummy variable indicating changes in the nominal exchange rate regime, ε_i is a random error term and the number of lags p is determined using the Akaike, Hanna-Quinn and Schwarz Information Criteria.

We construct dummy variables capturing financial crises from the information provided by Laeven and Valencia (2008, 2013) and Reinhart (2010). The former covers all systemically important banking, currency and debt crises for the period 1970 to 2007 for 261 countries, while the later offers the individual timeline of public and private debts, banking, sovereign domestic and external debt crises, and hyperinflation, for 70 countries, from their independence to 2010. Additionally, dummy variables capturing changes in the nominal exchange rate regimes are constructed using the International Monetary Fund (IMF) coarse classification provided by Ilzetzki, Reinhart and Rogoff (2008).

We estimate equation (1) using (unbalanced) panel data analysis, partitioning the country samples to examine any differential impact on countries according to their income level. To estimate the panels, we consider three basic panel regression methods: fixed-effects method, the random effects method and pooled-OLS method.

III. Empirical Results

In Table 1 we report the results obtained using the fixed effects model since it is the relevant one in all cases⁴. Table 2 reports the static long-run solution obtained from these dynamic results.

⁴ The Hausman test rejects the RE model in favour of the FE estimation. The joint significance of the fixed error component model is strongly confirmed, suggesting that FE is needed. Breusch and Pagan's Lagrange multiplier test fails to reject the null that variances across entities are zero, concluding that RE is not appropriate.

III.1. High income results

As can be seen in Table 1, the past growth rate impacts significantly on current growth, mostly the first lag. Moreover, the current coefficient of the dummy capturing current financial crises is significant and negative, indicating a reducing effect of financial crises on current growth. Finally, results suggest that nominal exchange rate regime changes do not significantly impact on current growth, being in line with Sosvilla-Rivero and Ramos-Herrera (2014) who contend that, for high-income countries, there are not significant differences in economic growth between exchange-rate regimes.

As for the long-run static solution (Table 2), while $D^{fc} D^{fc}$ is highly significant, D^r is not significant at the usual levels. Evaluated at the mean values of the dummy variables, this long-run solution suggests that, for this group of countries, the financial crises diminished the average growth rate by 0.07041 percentage points during the 1970-2011 period, while the exchange rate regime contributed to increased it by 0.0639 percentage points.

III.2. Upper-middle income results

In Table 1 we observe that there is higher degree of growth persistence in this group of countries, since the first lag of the growth rate is positive and statistically significance with an associated coefficient of 0.4126. As for the impact of the financial crises and exchange-rate regimes, the coefficients associated with the current values of both dummy variables are found to be negative and statistically significant.

Regarding the solved long-run model, results in Table 2 suggest that while financial crises have a marginal negative effect on long-run growth (it is only significant at the 10% level), exchange-rate regimes positively affect long-run growth, although D^r is not statistically significantly at the usual levels. Using mean values of the dummy variables, the estimated long-run model indicates that, for this group of countries, the financial crises reduced the average growth rate by 0.1839 percentage points during the

period under study and the exchange rate regime augmented it by 0.2389 percentage points.

III.3. Lower-middle income

As shown in Table 1, for this group of countries the first and second lags of the growth rate are positive and statistically significance, the current and first lag of D^{fc} are found to be negative and statistically significant, and the second lag of D^r is found to be positive and statistically significant.

The long-run solution suggests once more that financial crises inflict a significant negative impact on long-run growth, while exchange-rate regimes impose a positive (but not significant) influence on long-run growth (Table 2). Using mean values of the dummy variables, the estimated long-run model indicates that, in the case of lower-middle income countries, the financial crises weakened the average growth rate by 0.1992 percentage points during the years 1970-2011 and the exchange rate regime incremented it by 0.9485 percentage points.

III.4. Low income

In Table 1 we observe that the first and third lags of the growth rate are positive and statistically significance, while the current lags of the dummy variables are found to be negative and statistically significant.

The long-run solution indicates that, for lower income countries, neither financial crises nor exchange-rate regimes play a significant role on long-run growth (Table 2). Nevertheless, using mean values of the dummy variables, we obtain that financial crises reduced the average growth rate by 0.1599 percentage points during the years 1970-2011 and the exchange rate regime raised it by 1.2060 percentage points.

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Table 1. Growth dynamics

Model: $y_{it} = \alpha_i + \sum_{s=1}^p \beta_s y_{i,t-s} + \sum_{s=0}^p \delta_s D_{i,t-s}^{fc} + \sum_{s=0}^p \delta_s D_{i,t-s}^r + \varepsilon_{i,t}$				
	High Income Countries	Upper-Middle Income Countries	Lower-Middle Income Countries	Low Income Countries
c	2.3684* (0.2492)	2.6300* (0.5895)	2.3515* (0.4543)	1.7012* (0.5299)
β_1	0.2567* (0.0326)	0.4126* (0.0397)	0.1833* (0.0252)	0.2597* (0.0280)
β_2	-0.0193 (0.0295)	-0.0326 (0.0380)	0.1249* (0.0233)	0.0300 (0.0287)
β_3	-			0.0741* (0.0274)
δ_0	-0.7913* (0.2833)	-1.8229* (0.3449)	-1.0306* (0.2382)	-0.7183** (0.3609)
δ_1	-0.4834 (0.2861)	-0.2749 (0.3534)	-0.4405** (0.2348)	0.2214 (0.3559)
δ_2	-0.2786 (0.2848)	1.0190* (0.3513)	0.1215 (0.2333)	-0.1813 (0.3538)
δ_3	-			-0.1948 (0.3535)
γ_0	0.0363 (0.1346)	-0.8345** (0.3647)	-0.2354 (0.2348)	1.2993* (0.3717)
γ_1	0.0717 (0.1672)	0.6064 (0.4375)	-0.3204 (0.2895)	-1.0877* (0.4522)
γ_2	-0.0869 (0.1312)	0.2998 (0.3477)	0.8475* (0.2263)	0.2366 (0.4358)
γ_3	-	-		-0.0217 (0.3469)
R ²	0.53	0.45	0.33	0.23

Note. Standard errors in brackets. * indicates significance levels at the 1%; ** indicates significance levels at the 5%.

Table 2. Solved long-run model

High Income Countries	$y = 3.1057* - 2.0368** D^{fc} + 0.0277 D^r$ (0.2657) (0.9108) (0.4617)
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Upper-Middle Income Countries	$y = 4.2919^* - 1.7400 D^{fc} + 0.1156 D^r$ (0.6392) (1.1303) (1.1570)
Lower-Middle Income Countries	$y = 3.3991^* - 1.9509^* D^{fc} + 0.4217 D^r$ (0.4775) (0.7423) (0.7889)
Low Income Countries	$y = 2.6740^* - 1.3722 D^{fc} + 0.6704 D^r$ (0.5786) (1.5549) (1.7541)

Note. Standard errors in brackets. * indicates significance levels at the 1%; ** indicates significance levels at the 5%.