Short and Long Term Growth Effects of Financial Crises in Developing Countries

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Abstract

Growth theory predicts that poor countries will grow faster than rich countries. Yet, growth in developing countries has been consistently lower than growth in developed countries. The poor economic performance of developing countries coincides with both long-lasting and short-lived financial crises. In this paper, we analyze to what extent financial crises can explain low growth rates in developing countries. We distinguish between inflation, currency, banking, debt, and stock-market crises and separate the short- and long-run effects of them. Our results show that financial crises have reduced growth and that the policy decisions have caused them to be worsened and/or extended.

1. INTRODUCTION

From 1973 to 2007, the labor productivity growth of developed countries averaged 2% per year. Over the same period, the average labor productivity growth in Africa and Latin America averaged 0.5% and 0.8% per year, respectively. Only developing countries in Asia were able to match (and exceed) growth in the developed world (3.2% per year).[1] During this period, Africa and Latin America, in particular, faced several financial crises (Wilson, Saunders & Gerard, 2000; Reinhart and Rogoff, 2010). For example, Latin America suffered economically due to persistent financial crises throughout most of the 1970s and the 1980s (De Gregorior and Guidotti, 1995), while large parts of Africa faced "near-permanent banking-stress" for 20 years (Kane and Rice, 2001).

In this paper, we analyze to what extent the poor economic performance of developing countries since the 1970s can be explained by the occurrence of both short-lived and persistent financial crises. We also study how these crises affect the potential for developing countries to catch up with the developed world. Namely, we estimate the impact of financial crises on total factor productivity and capital accumulation. In the neoclassical growth model, income convergence between countries is conditioned on the assumption that all countries have the same productivity level (Solow, 1956, 1957). Therefore, a financial crisis that slows down productivity growth has more negative long-term growth effects compared to a financial crisis that slows down real capital accumulation (Gourinchas and Jeanne, 2006; Bonfiglioli, 2008; Baekert, Campbell & Lundblad, 2010).

The recurrence of financial crises among developing countries can be explained by the quality of their political institutions and increased financial openness (this is particularly true since the 1990s, when capital markets were liberalized in many countries). There is ample evidence that financial development and openness can promote long-run economic growth by lowering the cost of capital and improving the allocation of capital (King and Levine, 1993;

Beakert, Campbell & Lundblad, 2010; Quinn and Toyoda, 2008; Levine, Loyaza and Beck, 2000; Bonfiglioli, 2008). However, there is also growing literature recognizing that increased financial integration and liberalization increase the probability of financial crises (see e.g., Kaminzky and Reinhart, 1999; Rancieré Tornell & Westermann, 2008).

The relationship between (i) financial openness and growth and (ii) financial openness and financial crises is dependent on the quality of political institutions. Weak political institutions are often an underlying factor in generating financial crises but can also prolong the duration of the crises through erroneous and late policy responses (Kane and Rice, 2001; Acemoglu, Johnson & Robinson, 2003; Tommasi, 2004). In contrast, strong and often democratic institutions (Cavallo and Cavallo, 2010) are better equipped to prevent and solve crises once they occur (Rodrik, 2000).

Empirical evidence of the short term effects of financial crises show that financial crises reduce economic growth through increased uncertainty and volatility in the economy, which reduces investments and consumption (Norman and Romain, 2006; Ramey and Ramey, 1995; Hausman and Gavien, 1996; Easterly, Islam & Stiglitz, 2001)

However, empirical evidence of the long-term effects of financial crises is inconclusive. Several studies show that inflation crises (Englebrecht and Langley, 2001; Rousseau and Wachtel, 2002; Boyd, Levine & Smith, 2001), currency crises (Gupta et al., 2007), banking crises (Demirgüc-Kunt, Detragiache and Gupta, 2001; Breuer, 2004), and debt crises (Bordo, Meissner, and Stuckler, 2010; Eichengreen and Hausmann, 1999) have a negative impact on economic growth. Yet, Bruno and Easterly (1998) show that the economic growth after an inflation crisis is higher than before the crisis. Furthermore, Rancière, Tornell, and Westerman (2008) argue that systematic risks in the financial system that cause financial crises can (for developing countries) also compensate for an underdeveloped financial system and improve long term growth prospects. Gupta, Mishra, and Sahay (2007) show that

currency crises negatively affected growth 6 times out of 10, while the remaining 4 cases had a positive impact on growth. It has also been argued that financial crises induce economic and institutional reforms that can promote growth (Cavallo and Cavallo, 2010).

In this paper, we employ the dataset of financial crises from Reinhart and Rogoff (2010) and analyzed how five different types of financial crises (inflation, currency, banking, debt, and stock market crashes) have affected total factor productivity and capital accumulation in the short and long run. Our dataset includes 21 developed and 30 developing countries for the period of 1973-2007.

Our analysis gives fruitful insight into the following: (i) the degree to which the poor economic performance of developing countries can be explained by financial crises; (ii) which of the two growth channels (total factor productivity and capital accumulation) are most affected by financial crises and thereby how these crises affect the ability of developing countries to catch up with developed countries; (iii) which types of financial crises have the most severe growth effects; and (iv) whether the long-run growth effects of financial crises are the same as the short-run growth effects.

Our results show that financial crises have both short- and long-term negative impacts on growth. These effects mainly occur through the total factor productivity channel, although there is an effect on capital accumulation as well. These results also show that policy responses to the crises in Africa and Latin America have reinforced these negative growth effects. Without financial crises, growth in Latin America would have kept pace with the growth in developed countries while Africa would still have lagged behind.

The remainder of the paper is organized as follows: Section 2 presents the model, Section 3 contains the empirical results, and Section 4 concludes the paper.

2. LABOR PRODUCTIVITY GROWTH AND FINANCIAL CRISES

The literature on financial crises commonly distinguishes between five different types of financial crises: inflation, currency, banking, debt, and stock market crises. Sometimes a financial crisis occupies only one of these five categories, but often times it can occupy more than one. Sovereign debt crises, for example, are often preceded by a banking crisis, forcing the national government to take over debts in the banking sector (Velasco, 1987; Reinhart and Rogoff, 2010). In turn, debt crises often spill over into currency crises (Kaminsky and Reinhart, 1999; Eichengreen and Bordo, 2002) and countries facing insolvency sometimes inflate the economy to reduce the debt burden (Labán and Sturzenegger, 1994). This action may, in turn, cause an inflation crisis as well.

Arguably, some types of financial crises can have more severe effects than others. A crisis that directly affects capital accumulation (i.e. a banking crisis) will probably have more severe effects than a crisis only have indirect effects on investments (i.e. inflation crisis). For example, the negative effect of high and volatile inflation on investments can be reduced by price indexing contracts (McNelis, 1988), but it is more difficult for an agent in the economy to protect themselves against the negative effects of a banking crisis.

In addition, stock markets crashes can affect investments (Tobin, 1969; Furstenberg, 1977) and/or private consumption through a wealth effect (Friedman, 1957; Paiella, 2009). However, in stock markets in developing countries, only a limited number of people own shares (Enisan and Olufisayo, 2009). This causes wealth effects to be small at the aggregate level. A currency crisis, however, is likely to have more severe effects on the economy than the stock market crash, especially for a developing country that is dependent on foreign investment capital and technology. Moreover, a stock market crash is more likely to follow as a result of a currency market crisis rather than precede it. For example, the stock market indices fell sharply in several Southeast Asian countries between 1996 and 1997, which was

due to a dramatic outflow of capital as foreign investors lost confidence in the region (Pilbeam, 2006).

The impact of financial crises on labor productivity is modeled using a Cobb-Douglas production function with Harrod neutral technology and constant returns to scale,

$$Y_{it} = (A_{it}L_{it})^{\alpha}K_{it}^{1-\alpha} \tag{1}$$

where Y is the real GDP, K is real capital, A is technology, L is employment, α is the labor output elasticity, i denotes country, and t time. Dividing by L, taking the log and first difference, we obtain the following expression of the (log-) labor productivity growth rate,

$$\Delta y_{it} = \alpha\Delta a_{it} + (1 - \alpha)\Delta k_{it}, \tag{2}$$

where y is the log of labor productivity and k is the log of capital-per-employee. In (2), we observe the two growth channels: total factor productivity (Δa_{it}) and capital-per-employee accumulation (Δk_{it}).

Kose, Prasad, and Terrones (2009) show that financial integration promotes productivity improvements. Similarly, Bekaert, Campbell & Lundblad (2010) find that financial integration has a more positive effect on productivity than capital accumulation. These results indicate that a financial crisis has stronger effects on productivity growth than on capital growth. Because economic convergence between countries depends on equal productivity levels, financial crises will have more severe long term effects if they affect total factor productivity than if they only affect capital accumulation (Gourinchas and Jeanne, 2006; Bonfiglioli, 2008). This possibly explains why developing countries have lagged behind the developed world in the last decades.

To explore the effects of financial crises on growth and the two growth channels, we estimate three models. The first model estimates the direct impact of financial crises on labor productivity growth,

$$\Delta y_{it} = \beta_{y1} + \beta_{y2}\Delta k_{it} + \gamma_y F_{it-1} + \theta_y C_{it} + \varepsilon_{it}, \tag{3}$$

where F_{it-1} is a vector with dummy variables indicating different financial crises and C_{it} is a vector with common control variables (*i.e.,* education, political institutions, and globalization). An econometric concern in this model is reversed causality between the financial crises and economic growth. Financial crises may reduce growth, but a financial crisis may also be outcome of a period of low growth rates. Following Beck (2008), we address this and employ internal instruments to correct for this possible error[2].

The second model analyzes the effect of financial crises on capital accumulation,

$$\Delta k_{it} = \beta_{k1} + \gamma_k F_{it-1} + \theta_k C_{it} + \eta_{it}. \tag{4}$$

The third model analyzes the effect of financial crises on total factor productivity,

$$\Delta \hat{a} = \beta_{a1} + \gamma_a F_{it-1} + \theta_a C_{it} + \omega_{it}, \tag{5}$$

where the estimate of total factor productivity is obtained from first running the regression

$$\Delta y_{it} = \beta_{y1} + \beta_{y2} \Delta k_{it} + \varepsilon_{it} \tag{6}$$

and then defining total factor productivity as

$$\Delta \hat{a}_{it} = \Delta y_{it} - \hat{\beta}_{y2} \Delta k_{it}. \tag{7}$$

(a) Time Horizons

Some financial crises are persistent and last for several years, while others vanish quickly. Based on the (New-) neo-classical synthesis, which combines neo-classical models for the long run and Keynesian models for the short run (see e.g., Woodford, 2003), it is likely that the effects of a financial crisis depend on the analyzed time horizon. Over the long term, when prices are fully flexible, aggregate demand adjusts to aggregate supply. The effects of financial crises mainly operate through the supply side of the economy by affecting the two growth channels (capital accumulation and productivity). The short run, in contrast, is characterized by sticky prices. Therefore, a financial crisis can affect both aggregate supply and aggregate demand, generating different effects of the financial crisis compared to the effects in the long run. To test the difference between the effects of a short- and long-run

crisis, we decompose all variables into a short-run and a long-run component to estimate both short-run and long-run versions of the models (3)-(5).

To decompose the data into time horizons, we employ a Maximal Overlap Discrete Wavelet Transform (MODWT). Simply speaking, the MODWT is a band-pass filter that decomposes time series into a trend component and several long and short cycles. As an illustration, consider the decomposition of the labor productivity growth rates,

$$\Delta y_{it} = D_{1it} + D_{2it} + D_{3it} + S_{3it}, \tag{8}$$

where D_{1it}, is a 1-2-year-long cycle, D_{2it} is a 2-4-year-long cycle, D_{3it} is a 4-8-year-long cycle, and S_{3it} is the trend component (8 years and beyond)[3]. We define the short run as the length of the average business cycle (approximately 8 years), and the long run as 8 years and beyond. The short-run variables are

$$\Delta y_{it}^{SR} = D_{1it} + D_{2it} + D_{3it}, \tag{9}$$

and long-run growth is

$$\Delta y_{it}^{LR} = S_{3it}. \tag{10}$$

The short run growth component captures cycles in growth up to 8 years long, and the trend growth rate captures more persistent growth variations (exceeding 8 years). [4]

Compared to other methods[5], such as 5-year averages, there are several advantages in using the MOWDT to distinguish between the short-run and the long-run effects. First, the MODWT is designed to decompose time series that that contain structural breaks, outliers and other non-recurring events without having to pre-whiten the data (Percival and Walden, 2006). Second, using simple averages may induce cycles and artifacts in the analysis of random variables (Slutsky, 1938; Percival and Walden, 2006). By using the MODWT, such problems are avoided. For more information about the MODWT, see e.g., Ramsey and Lampart (1998), Percival and Walden (2006), Crowley (2007), and Andersson (2008).

3. EMPIRICAL ANALYSIS

(a) Data

Our data set contains 51 countries (see Table A.1.) covering the period of 1973-2007. The final year is dictated by availability of real investment data (Penn World Table 6.3) that is needed to generate national capital stock estimates. Of the 51 countries, the World Bank classifies 21 as developed countries, and 30 countries are classified as developing countries.[6] We rely on external data sources for labor productivity, financial crises, institutions, education, and globalization. A detailed description of the data and the data sources are available in Table A.2.

Our indicators of financial crises are collected from Reinhart and Rogoff's (2010) database.[7] This database distinguishes between five different types of crises that are indicated with dummy variables: inflation, currency, banking, debt, and stock market crises. A detailed definition of these financial crises is available in Reinhardt and Rogoff (2010) and in Appendix (Table A.2). An inflation crisis occurs when the annual rate of inflation exceeds 20% per year, whereas a currency crisis occurs when the national currency loses 15% or more of its value against the USD or some other relevant currency. Additionally, a banking crisis is defined as a bank run that leads to a government takeover of a bank. Lastly, a debt crisis is defined as a country defaulting on its external debt.

Capital stock is estimated using the perpetual inventory method assuming a fixed 5% depreciation rate.[8] Larsson *et al.* (2000) have estimated capital stock data for the period of 1967-1997, and we use their estimates for 1967 as our initial capital stock estimate. Total factor productivity is estimated using (7).

For education, we use the total years of schooling among the labor force[9]. Education data are only available at a five-year interval, and without higher frequency data, we cannot include the variable in the short-run models. Therefore, education is only included in the long-run models. To capture the effect of globalization on the financial system and the overall economy, we use the KOF index, which is a combined measure of economic, social

and political globalization (Dreher, 2006). Recently, the KOF index has been used in empirical research to capture the macroeconomic effects of the current globalization process (see e.g., Bergh and Nilsson, 2010).

Based on Cavallo and Cavallo's (2010) discussion of the link between democratic institutions and financial crises, we use the Freedom House political rights index to control for institutional quality. Each country is scored by Freedom House between 1 and 7, where countries with a score between 1 and 2.5 are defined as free. Countries with a score between 3.0 and 5.0 are partly free, and countries with a score between 5.5 and 7 are not free.

Because we are modeling growth rates, we use the percentage change in education, political rights and the KOF index in the regression models.

Figure 1 shows the labor productivity growth rates: growth is, on average, the highest among developing Asian countries with an average yearly growth rate of 3.19%, while it is the lowest among African countries, at 0.51% per year. Among Latin American countries, average labor productivity growth is 0.78% per year and among developed countries 2.00%. As can be seen in the Figure below, labor productivity growth is more volatile among developing countries than among developed countries. While growth remains within a span of -2% to 5% per year among developed countries, among African countries yearly growth fluctuations of +/- 15 percentage points are common.

[FIGURE 1]

As can be seen in Table 1, developed countries have experienced fewer financial crises than developing countries (0.54 per year). A stock market crisis is the most common (0.27 per year), and a debt crisis is the least common (0 per year). Among African countries, the average is 1.21 per year, and a stock market crash (0.34 per year) is the most common followed by debt (0.28 per year), currency (0.23 per year) and inflation crises (0.20 per year). Developing Asian countries experience 0.84 crises per year of which a stock market crash

(0.27 per year) and bank crisis (0.23 per year) are the two most common types. Latin America has the highest frequency of financial crises (1.73 per year). In Latin America, inflation crises are the most common (0.45 per year), followed by debt (0.43 per year), and currency crises (0.42 per year).

[TABLE 1]

As can be seen in Table 2, currency and debt crises often coincide in the long term; the correlation between inflation and currency crises is 0.77, and the correlation between inflation and debt crises is 0.43. There is, however, no significant correlation between any of the other financial crises. Over the short term (Table 3), the highest correlation is between inflation and currency crises, at 0.14, but this is not significantly different from zero. Although financial crises occur simultaneously over the long term, they are independent over the short term.

The high long-term correlation between inflation and currency crises implies that we can interpret these two crises as a joint monetary crisis instead of two separate crises (over the long term). The significant and positive correlation with the Freedom House political rights index suggests that policy decisions are at least in part responsible for causing the monetary crises.

[TABLE 2]

[TABLE 3]

(b) Regression Results

For each regression model, we present two regression results: the results from a complete model that includes all variables and the results from a reduced model where the insignificant variables have been removed. The error term in the model is specified as a two-way error component model that includes fixed effects for both cross-sectional and time effects. We use

robust standard errors to account for heteroskedasticity (see e.g., Arrelano, 1987; Baltagi, 2008). The regression results are available in Table 4 (long run) and Table 5 (short run).

Labor productivity growth responds negatively to a financial crisis both over the long term and the short term. However, the impacts of the different types of crises are not the same in the short and the long run. Inflation, currency, and banking crises affect growth in the short run, but in the long run, only currency and debt crises have significant effects. Stock market crashes have no growth effect at all, irrespective of the time horizon. Banking crises have the largest short-term effect on growth, -1.33 percentage points per year, and currency crises have the largest long-term effect, -1.27%.

[TABLE 4]

[TABLE 5]

Overall, short-run growth models explain little of the variation in the data (R^2 is 0.11). Short-term crises have no long-run effect, and their most negative effect comes from increasing volatility in the economy. But, even if financial crises do cause higher short- term volatility, as in indicated by the low R^2-values, most of the short-term volatility in the data are due to other factors. Because of this, the impact of financial crises over the short term is limited. Over the long term, the explanatory power of the models is higher: R^2 is between 0.36 and 0.39.

The high long-term correlation between inflation and currency crises creates a multicolinearity problem in the model, and it is only possible to include one of the two at a time. However, because of the high correlation between the two, we interpret them as representing a monetary crisis. The effect of a long-run monetary (currency) crisis reduces growth by 1.09 percentage points per year. When occurring jointly with a debt crisis (which is often the case), growth is reduced by another 1.27 percentage point. Combined, the two crises thus reduce growth by 2.34 percentage points per year.

Turning to the growth channels, we find a stronger effect of financial crises on total factor productivity than on capital accumulation. This result is in accordance with Bonfigioli (2010), who found that financial development has a stronger effect on productivity than on capital accumulation. In the short run, financial crises have a negative impact on total factor productivity, but no effect on the capital accumulation. Because these negative effects on productivity capture both demand and productivity effects over the short term and capital accumulation is unaffected by financial crises, these results indicate that aggregate demand is more important than the aggregate supply side in the response to financial crises in the short-run.

In the long run, financial crises (i.e., a debt crisis) have a negative impact on both capital accumulation and total factor productivity. Debt crises reduce capital accumulation growth by -2.14 percentage points and total factor productivity by -0.98 percentage points. Total factor productivity is also negatively affected by monetary crises (currency crisis), at -1.18 percentage points. Considering that these crises often coincide, the combined effect on total factor productivity is -2.08 percentage points each year the crisis lasts.

All countries have experienced short-run financial crises, but only Africa and Latin America have experienced persistent long-run financial crises. To test if the crises effects are the same for both continents, we estimate two sub-panels using long-run data: one for African countries and one for Latin American countries. These long-run estimation results are presented in Table 6.

[TABLE 6]

For Africa as well as Latin America, a debt crisis has a significant and negative impact on capital accumulation. However, a debt crisis affects total factor productivity in Africa but not in Latin America. Instead, total factor productivity in Latin America is affected

negatively by inflation crises. Further, capital accumulation in Latin America is negatively affected by banking crises, which is not the case for Africa.

A positive and significant correlation between monetary crises and the Freedom House index suggests that monetary crises are partially caused by monetary policy decisions over the long term. For example, debt crises during the early 1980s created a need for many developing countries to become less dependent on foreign sources of capital and adjust their economies. Latin American economies postponed this process by inflating their currency (Labán and Sturzenegger, 1994). Not all developing countries have followed this same path (Dijkstra, 1997). Consequently, they have not suffered as much from the inflation and currency crises that resulted from the policy response. For example, during the Southeast Asian crises in 1996-1997, policy makers responded quickly and inflation never rose to the same levels as in Latin America. As a result, Southeast Asia recovered quickly from the crisis (Pilbeam, 2006).

(c) Potential Labor Productivity Growth

To illustrate how much long-run financial crises have reduced growth in developing countries, we decompose labor productivity growth into capital growth and total factor productivity[10] for an "average" developed, "average" African, "average" Asian, and "average" Latin American country. Moreover, for African countries and Latin American countries, we calculate the potential long-run growth rates, defined as the growth rates that would have been achieved in the absence of long and persistent financial crises. The results for the average African and Latin American country are presented in Table 7 (these results are based on the parameters from Table 5). The results for developed countries and developing Asian countries are available in Table 8 (these results are based on the results from Table 3). The results are summarized decade-by-decade.

[TABLE 7]

13

[TABLE 8]

Financial crises are estimated to have reduced average growth in Latin America by 1.25 percentage points per year and African countries by 0.68 percentage points per year. The average potential growth for the entire period of 1973-2007 in Latin America is equal to the observed growth for the developed countries: 2.03% compared to 2.00%, respectively. Average potential African growth is lower, at 1.19%. From 2000 to 2007, however, potential African growth exceeded observed growth among developed countries (2.00% compared to 1.51%).

On average, growth is the highest in Asia. Table 8 shows that the high Asian growth rates of 50% can be explained by capital accumulation. Latin American growth is lagging behind observed Asian growth due to lower capital accumulation rates. Additionally, Africa is trailing Asia because of lower potential capital accumulation rates and lower potential total factor productivity growth.

In relation to developed countries, these results show that Latin America would have been falling behind during the 1970s and 1980s had there been no financial crises. They also show that they would have been catching up from the 1990s and onward. Similarly, Africa would have been falling behind from the 1970s and throughout the 1990s but catching up thereafter. Without the financial crises, growth would have been higher, but limited investments (due to other factors than financial crises) would still prevent African and Latin American countries from catching up to developed countries and developing Asian countries.

In Figure 2, potential African and Latin American labor productivity level is plotted together with the observed long run labor productivity level for Asia and the other developed countries. Because our data set begins in 1973, we set the productivity level to 1 in 1972. As can be seen in Figure 2, developing Asian countries outpace all other countries. Latin American countries catch up with developed countries in the late 1980s, and both set of

countries double their productivity level between 1972 and 2007. African countries, however, still lag behind.

[FIGURE 2]

[FIGURE 3]

The difference between the estimated long-run productivity level and the estimated long-run potential labor productivity level are shown in Figure 3: Africa is in Panel A, and Latin America is in Panel B. As can be seen in the Figure, this difference grows persistently over time. In 2007, the actual productivity level was 36.2% below the potential in Latin America and 22.2% in Africa. Considering that productivity has been below the potential level since the 1970s, we define, similar to Boyd, Kwak & Smith (2002), the cost of financial crises as the cumulative difference between potential and the actual productivity level,

$$\sum_{i=1973}^{2007} ln(potential\ productivity\ level_i) - ln(long\ run\ productivity\ level_i). \qquad (11)$$

For African countries, the cumulative cost of financial crises equals 3.92 years of production per employee between 1973 and 2007 and 9.14 years of production per employee for Latin American countries. Despite the fact that financial crises cannot fully explain why Latin American and African countries are lagging behind productivity in developed countries and developing Asian countries, the cost of long term financial crises are substantial over time.

4. CONCLUSIONS

Our results show that long-run financial crises can in part explain the poor economic performance of African and Latin American developing countries since the 1970s. Without financial crises over the entire period of 1972-2007, Latin American growth would have equaled that of developed countries. However, Africa would have still lagged behind. Our research suggests that the most influential of all crises are debt crises, which have affected both African and Latin American countries over the long term. Debt crises are also significantly correlated with inflation and currency crises. Moreover, inflation and currency

15

crises are correlated with Freedom House's political rights index, which suggest that the policy response to the debt crises of the early 1980s made the economic growth consequences of the debt crises worse.

These results also show that even without financial crises, African and Latin American capital accumulation rates would have been lagging behind the rates of developed countries and, in particular, the capital accumulation rates of developing Asian countries. Over the considered period, Asian countries have grown the fastest. Additionally, more than 50% of their growth is explained by capital growth. Even if financial crises can explain part of the African and Latin American countries poor economic performance, other factors affecting capital growth have contributed significantly.

Bonfiglioli (2008) and Gourinchas and Jeanne (2006) have argued that low productivity growth is worse for a developing country than low capital accumulation rates, as the potential to catch up with rich countries is conditioned on the same level of productivity. Our results show that financial crises, over the long term, affect both capital accumulation and total factor productivity. Our results thus indicate that the crises and their subsequent policy responses have had a severe negative impact on the ability of developing countries to catch up with developed countries.

Financial crises have both short- and long-term economic effects. However, financial crises explain little of the short-term variation in the data. Although financial crises have a negative impact on all countries (not just developing countries), compared to the "normal" short term volatility in the data (caused by non-crises factors), financial crises generate little volatility. The short-term consequences are consequently small compared to the long-term consequences.

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Table 1. *Descriptive Statistics: Average values*

	Developed Countries	African Countries	Asian Developing Countries	Latin American Countries
Labor Productivity Growth	2.00	0.51	3.19	0.78
Capital Growth	2.67	1.36	3.92	1.56
Financial Crisis	0.54	1.21	0.84	1.73
Inflation Crisis	0.06	0.20	0.06	0.45
Currency Crisis	0.09	0.23	0.17	0.42
Banking Crisis	0.12	0.16	0.23	0.19
Debt Crisis	0.00	0.28	0.12	0.43
Stock Market Crisis	0.27	0.34	0.27	0.24
Political Rights	1.20	5.03	3.56	2.79
Education	1.23	3.93	2.30	2.06
Globalization	1.17	1.75	2.02	1.46

Table 2. *Explanatory Variables Long-Run Correlation Matrix*

	Inflation crisis	Currency crisis	Banking crisis	Debt crisis	Stock market crash	Political rights	Education	Globalization (KOF)
Inflation crisis	1.00							
Currency crisis	0.77***	1.00						
Banking crisis	0.14	0.21**	1.00					
Debt crisis	0.43***	0.45***	0.20**	1.00				
Stock market crash	-0.07	0.07	-0.12	-0.03	1.00			
Political rights	0.24**	0.23**	-0.02	-0.04	0.02	1.00		
Education	0.04	0.10	-0.08	0.05	0.02	0.06	1.00	
Globalization (KOF)	0.00	0.06	0.16*	-0.05	0.05	-0.16*	-0.14	1.00

Table 3. *Explanatory Variables Short-Run Correlation Matrix*

	Inflation crisis	Currency crisis	Banking crisis	Debt crisis	Stock market crash	Political rights	Education	Globalization (KOF)
Inflation crisis	1.00							
Currency crisis	0.14	1.00						
Banking crisis	-0.01	0.06	1.00					
Debt crisis	0.03	0.09	0.05	1.00				
Stock market crash	0.01	0.00	0.02	0.01	1.00			
Political rights	0.01	-0.04	0.02	-0.08	-0.05	1.00		
Education	0.01	-0.06	0.01	-0.05	-0.04	0.04	1.00	
Globalization (KOF)	-0.00	0.02	-0.00	-0.05	0.03	0.01	0.00	1.00

Table 4. *Long-Run Growth Models*

	Growth		Capital Growth		Total Factor Productivity	
capital	0.27***	0.27***	---	---	---	---
	(0.05)	(0.06)				
inflation	-0.08	---	0.38	---	-0.10	---
	(0.92)		(1.28)		(0.73)	
currency	-1.39*	-1.27**	-1.80	---	-1.28	-1.18**
	(0.81)	(0.58)	(1.42)		(0.81)	(0.58)
banking	-0.81	---	-0.10	---	-0.80	---
	(0.51)		(0.90)		(0.51)	
debt	-0.95**	-1.09**	-1.79**	-2.14***	-0.84*	-0.98**
	(0.47)	(0.48)	(0.81)	(0.73)	(0.46)	(0.47)
stock market	0.96	---	1.02	---	0.89	---
	(0.83)		(1.46)		(0.84)	
political rights	0.15	---	-0.01	---	0.15	---
	(0.12)		(0.21)		(0.12)	
education	-0.12	---	0.12	---	-0.13*	---
	(0.08)		(0.14)		(0.07)	
globalization (KOF)	0.25**	0.23**	-0.05	---	0.25**	0.24
	(0.12)	(0.12)	(0.21)		(0.12)	(0.12)
adjusted R^2	0.39	0.36	0.10	0.07	0.22	0.38
BIC	-0.44	-0.38	0.68	0.68	-0.43	-0.38

Table 5. *Short-Run Growth Models*

	Growth		Capital Growth		Total Factor Productivity	
capital	0.35***	0.35***	---	---	---	---
	(0.03)	(0.03)				
inflation	-0.92***	-0.92***	0.39	---	-0.92***	-0.92***
	(0.32)	(0.31)	(0.27)		(0.31)	(0.31)
currency	-0.69***	-0.69***	0.01	---	-0.69***	-0.68***
	(0.24)	(0.24)	(0.20)		(0.24)	(0.24)
banking	-1.33***	-1.33***	-0.25	---	-1.33***	-1.33***
	(0.26)	(0.26)	(0.22)		(0.26)	(0.26)
debt	0.01	---	-0.46	---	0.00	---
	(0.29)		(0.25)		(0.29)	
stock market	0.25	---	0.03	---	0.25	---
	(0.18)		(0.15)		(0.18)	
political rights	-0.09	---	-0.09	---	-0.10	---
	(0.13)		(0.11)		(0.13)	
education	0.21***	0.20***	0.01	---	0.21***	0.20***
	(0.06)	(0.06)	(0.05)		(0.06)	(0.06)
globalization (KOF)	-0.01	---	0.03	---	-0.01	---
	(0.03)		(0.02)		(0.03)	
adjusted R^2	0.11	0.11	0.00	---	0.03	0.04
BIC	2.16	2.14	1.86	---	2.24	2.22

Table 6. *Long-Run Growth Models for Africa and Latin America*

	Growth		Capital Growth		Total Factor Productivity	
	Africa	Latin America	Africa	Latin America	Africa	Latin America
capital	0.12 (0.12)	0.35*** (0.06)	---	---	---	---
inflation	---	---	---	---	---	-2.00*** (0.80)
currency	---	-1.02** (0.48)	---	---	---	---
banking	---	-1.77*** (0.54)	---	-2.59** (1.21)	---	---
debt	-2.15*** (0.73)	---	-2.17*** (0.92)	-1.94** (0.85)	-1.79** (0.72)	---
stock market	---	---	---	---	---	---
political rights	-0.53** (0.25)	0.47*** (0.24)			-0.42* (0.25)	0.43*** (0.18)
education	---	---	---	---	---	0.41** (0.20)
globalization (KOF)	---	---	---	---	---	---
adjusted R^2	0.38	0.89	0.12	0.14	0.20	0.28
BIC	-0.04	-0.32	0.55	0.42	0.06	-0.47

Table 7. *Long-Run Decomposition for Africa and Latin America*

	Growth	*Capital Growth*	*Total Factor Productivity*	*Growth*	*Capital Growth*	*Total Factor Productivity*
Average:		*Latin America*			*Africa*	
1973-1980	0.94%	1.12%	-0.19%	1.32%	1.78%	-0.47%
1981-1990	-0.42%	0.39%	-0.81%	-0.32%	0.24%	-0.56%
1991-2000	1.19%	0.32%	0.86%	-0.18%	-0.34%	0.16%
2001-2007	1.48%	0.13%	1.32%	1.32%	0.23%	1.09%
Average: 1973-2007	0.78%	0.49%	0.28%	0.51%	0.48%	0.03%
Average:		*Latin America Potential Growth*			*Africa Potential Growth*	
1973-1980	2.19%	1.34%	0.85%	1.60%	1.97%	-0.37%
1981-1990	1.49%	1.00%	0.49%	0.56%	0.50%	0.06%
1991-2000	2.45%	0.77%	1.68%	0.60%	-0.14%	0.74%
2001-2007	2.00%	0.33%	1.67%	2.00%	0.44%	1.56%
Average: 1973-2007	2.03%	0.86%	1.17%	1.19%	0.69%	0.50%

Note: Potential growth is defined as the estimated average growth rate had there been no long-run financial crisis.

Table 8. *Long-Run Decomposition for Developed Countries and Asia*

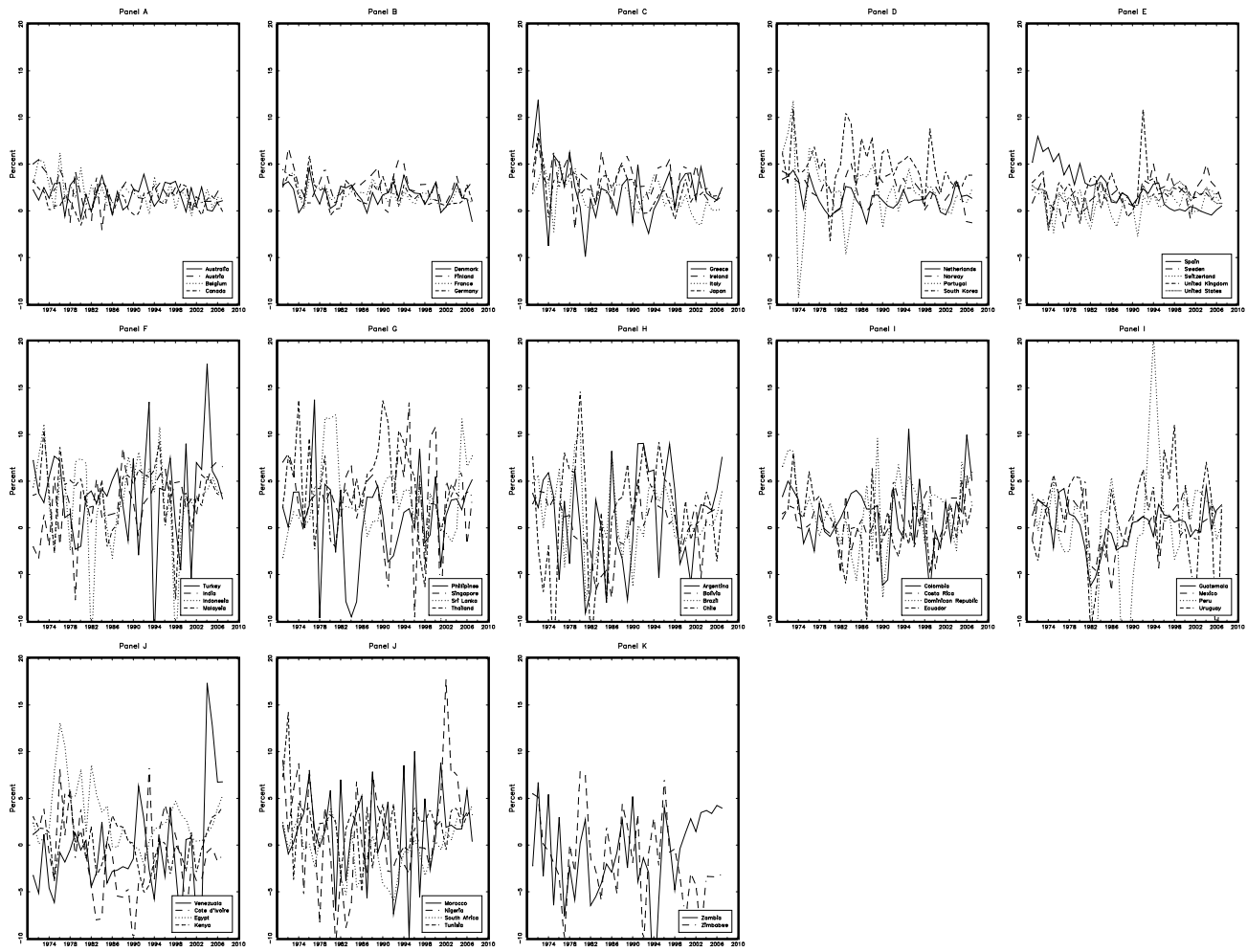|	Growth	Capital Growth	Total Factor Productivity	Growth	Capital Growth	Total Factor Productivity
Average:		Developed Countries			Asia	
1973-1980	2.54%	1.63%	0.91%	3.08%	2.56%	0.53%
1981-1990	1.98%	1.10%	0.88%	2.76%	1.87%	0.89%
1991-2000	1.93%	0.87%	1.06%	3.01%	1.60%	1.41%
2001-2007	1.51%	0.79%	0.72%	3.50%	1.15%	2.35%
Average: 1973-2007	1.99%	1.10%	0.89%	3.19%	1.80%	1.40%

Figure 1. *Labor Productivity Growth*

Figure 2. *Long-Run Labor Productivity Level*
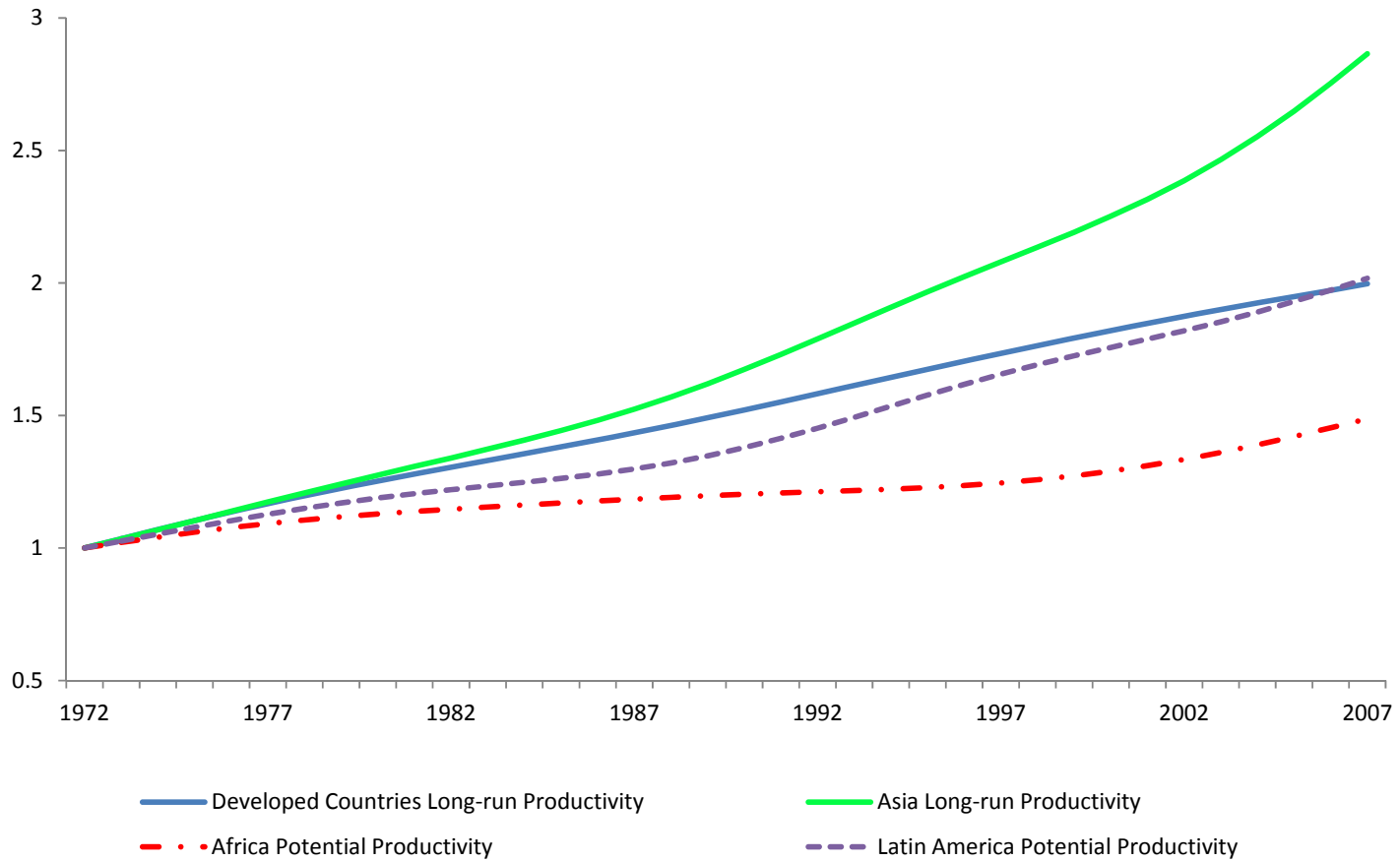
Panel A. *Africa Long-Run Productivity Level*
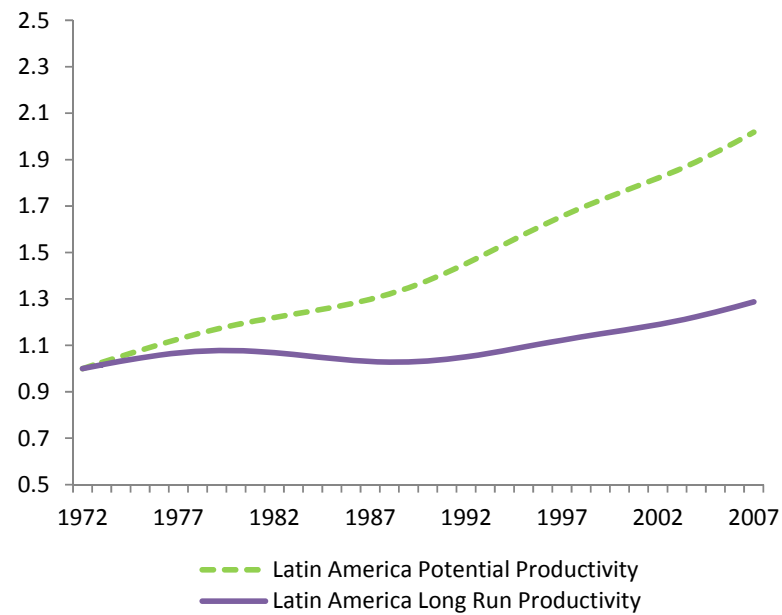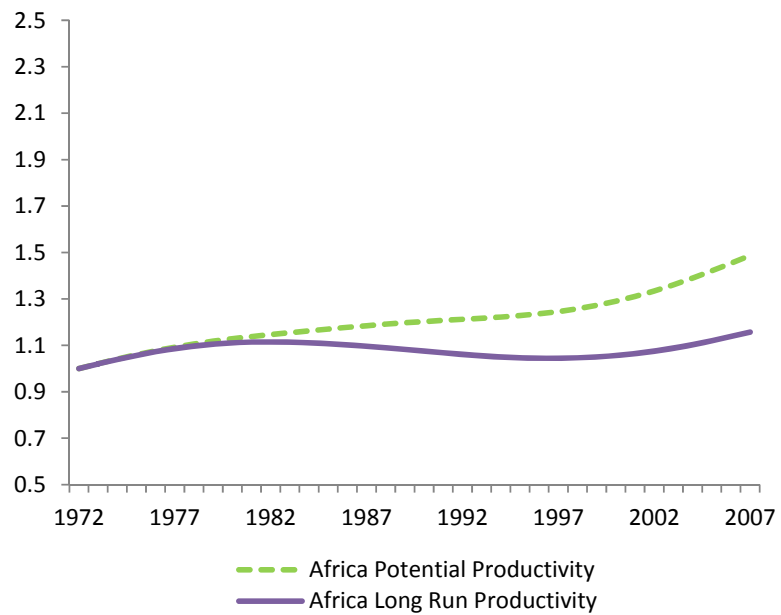
Panel B. *Latin America Long-Run Productivity Level*

Figure 3.*Observed and Potential Long-run Growth – Africa and Latin America*

Table A.1 *Variable Description*

Variable	Description
Labor productivity	Estimates of labor productivity are collected from the Conference Board's total economy database (http://www.conference-board.org/data/economydatabase)
Capital stock	Capital stock data are estimated using the perpetual inventory method. Real capital investment data come from Penn World Tables 6.3 We assume a fixed depreciation rate of 5% but also tested a 3% and a 7% depreciation rate. Changing the depreciation rates has no significant effect on the estimates of the effects of financial crises. We rely on Larsson *et al.* (2000) to obtain an initial capital stock value.
Financial crisis	We rely on Reinhart and Rogoff's (2010) database of financial crises. The database distinguishes between five different crises (inflation, currency, debt, banking and stock market crises). An inflation crisis is defined as annual inflation exceeding 20%. A currency crisis is defined as the domestic currency losing 15% of its value against the USD or another relevant currency. A banking crisis is defined as a bank run leading to a bank closure, merger or takeover by the public sector. A banking crisis is also when a bank needs assistance, which spreads to other banking institutions. A debt crisis is when a country defaults on its external debt.
	This database can be found here: http://terpconnect.umd.edu/~creinhar/Courses-html. The link also contains a detailed description of the data.
Education	The education variable measures the increase in the total number of years of schooling among the labor force. The data are collected from the World Development Indicators (http://data.worldbank.org/indicator).
Political Rights	We use Freedom House's political rights index. The database can be found here: www.freedomhouse.org
Globalization	To measure globalization, we use the KOF index by Dreher (2006), which combines three dimensions of globalization (economic, social, and political). Economic globalization accounts for 36% of the index, social globalization for 38% of the index, and political globalization for 26% of the index. The database is available from: http://globalization.kof.ethz.ch/

Table A.1. *Countries Included in the Analysis*

Developing Countries	*Developed Countries*
Argentina	Australia
Bolivia	Austria
Brazil	Belgium
Chile	Canada
Colombia	Denmark
Costa Rica	Finland
Côte d'Ivoire	France
Dominican Republic	Germany
Ecuador	Greece
Egypt	Ireland
Guatemala	Italy
India	Japan
Indonesia	Netherlands
Kenya	Norway
Malaysia	Portugal
Mexico	South Korea
Morocco	Spain
Nigeria	Sweden
Peru	Switzerland
Philippines	United Kingdom
Singapore	United States
South Africa	
Sri Lanka	
Thailand	
Tunisia	
Turkey	
Uruguay	
Venezuela	
Zambia	
Zimbabwe	

[1] http://www.conference-board.org/

[2] Data availability makes it impossible to find external instruments for each of the five financial crises, and we rely instead on internal instruments.

[3] The decomposition of the variables is made variable-by-variable and country-by-country. Not just the dependent is decomposed, but all variables are decomposed into time horizons.

[4] To employ the maximal overlap discrete wavelet transform one must chose a set of basis functions. We chose to use Haar wavelet basis functions because they minimize the potential effect of boundary coefficients (see Percival and Walden, 2006).

[5] Other examples include a Hodrick-Prescott filter and a Fourier transform.

[6] See http://data.worldbank.org/about/country-classifications

[7] The database can be obtained from Reinhart's webpage: http://terpconnect.umd.edu/~creinhar/Courses.html

[8] We also tested alternative depreciation rates (3% and 7%), but changing the depreciation rate has only a minor effect on estimated capital output elasticity, and no significant effect on the estimates of the effects of financial crises.

[9] Alternative measures, such as secondary schooling, were also considered, but models including total schooling have better statistical properties than models using secondary schooling.

[10] The sum of the capital accumulation effect and total factor productivity equals labor productivity growth.