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GROWTH AND ADJUSTMENT IN EAST ASIA AND LATIN AMERICA

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Resumen

En este artículo se comparan las experiencias del Este Asiático y América Latina en cuanto a crecimiento y ajuste macroeconómico entre los años 1970 y 2000. Los resultados indican que la diferencia entre ambas regiones se puede atribuir a que difieren en factores fundamentales de crecimiento tales como su tasa de inversión, recursos humanos, fertilidad, calidad de sus instituciones, estabilidad macroeconómica y grado de apertura comercial. También se examina el rol que cumplen las diferencias de calidad en la educación y la desigualdad entre ambas regiones. También han contribuido a diferenciar el comportamiento del crecimiento los shocks de balanza de pagos. El análisis revela que las tasas de crecimiento tienden a caer solo temporalmente luego de una crisis de balanza de pagos para luego volver a los niveles previos a la crisis, lo que produce la típica forma de “v” en las funciones de producto tanto en el Este Asiático como en América Latina. Sin embargo, a menudo se asocia una crisis de balanza de pagos con una caída sustancial de las tasas de crecimiento, la que termina en una nueva crisis en el futuro. Tras analizar qué determina el costo de las crisis en términos de producto, se puede concluir que la liquidez internacional, la solvencia financiera, la depreciación del tipo de cambio real y la política monetaria juegan roles esenciales en cuanto a reducir las pérdidas de producto.

Abstract

This paper compares the experience of growth performance and macroeconomic adjustment between East Asia and Latin America from 1970 to 2000. We find that the difference in growth performance between two regions can largely be attributed to the differences in fundamental growth factors such as investment rate, human resources, fertility, institutional quality, macroeconomic stability and the degree of trade openness. We also discuss the role of quality of education and differences in inequality between the two regions. Balance-of-payments crisis shocks have also contributed significantly to differences in growth performance. Analysis reveals that growth rates tend to fall only temporarily following a balance-of-payments crisis and then rebound to the pre-crisis levels, producing the typical v-type pattern for output in both East Asia and Latin America. However, a balance-of-payments crisis is often associated with a large decline of growth rates and develops into another crisis in the future. Analyzing what determines the output cost of crises we find that international liquidity, financial soundness, real exchange rate depreciation and monetary policy play a critical role in reducing output losses.

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1. Introduction

What determines economic growth, the policies that affect it and how to spur it are all tremendously important issues. The well being of the population and prospects for poverty reduction are intimately related to economic growth. Even the issue of potential growth is at the heart of recent discussions on stabilization policy. Whether a central bank should attempt to cool down the economy or not, or what is the actual fiscal impulse, will depend crucially on what is the view of the rate of growth that can be sustained without facing inflationary pressures.

During the past four decades growth rates in the world have varied greatly. The four East Asian tigers -Hong Kong SAR, South Korea (Korea henceforth), Singapore, and Taiwan-grew extremely rapidly at an average of over 6.0 percent a year in per capita terms between 1960 and 2000. On the other hand, many countries in Latin America recorded less than 1.0 percent growth during the same period. The high growth of East Asian countries, compared to the poor performance of Latin American economies leads directly to the question of what are the fundamental factors that explain such differences, and what should be done to spur growth.

In this paper we assess the evolution of growth in those two regions and attempt to explain the poor performance of Latin America relative to East Asia.

Using cross-country growth regressions, we find that the traditionally important growth factors such as investment, population growth, and the quality of human resources explain almost a half of the difference in per capita GDP growth between East Asia and Latin America. In addition, economic policy and institutional factors, such as rule of law, government consumption, macroeconomic stability and the degree of openness explain the other half of the growth differences between East Asia and Latin America. The occurrence of balance-of-payments crises also contributed to lower growth in Latin America relative to East Asia.

We extend the discussion on growth determinants to the role of income distribution and the quality of education. Although those variables do not enter satisfactorily into growth regressions, due to collinearity or lack of available data, we provide evidence suggesting that they may help to explain why the regions have different institutions and policies.

Comparing the experience of adjusting from currency crises in East Asia and Latin America, we find that the adjustment process is in general consistent with the stylized v-pattern observed in all crisis episodes. The mean growth rates hit the bottom at the time of the crisis or one year after, and then tend to return to the pre-crisis trend rate during the two or three years following the crisis.

However, output losses have been very severe in some recent crises such as the East Asian crisis of 1997. Therefore, it is important for an economy to reduce its vulnerability to crises, and avoid the severe output losses once it is hit by a crisis.

By examining the patterns of adjustment from previous crisis episodes, we identify the factors that help countries avoid a large decline in growth during the crisis and recover to the pre-crisis potential growth path. It appears that adequate international liquidity, real exchange rate depreciation and sound banking system play a critical role in avoiding severe shocks from a crisis. A good external environment also speeds up recovery, limiting the cost of crisis. We have also found that expansionary monetary policy may be relevant in dampening the crisis cost, but no significant effects for fiscal policy.

The paper follows in five sections. In section 2 we present an overview of East Asian and Latin American growth over the past forty years. In section 3 using cross-country regressions, we explain what have been the critical factors behind Latin America's low growth performance relative to East Asia, and also discuss prospects for the future. In section 4, we analyze the patterns of adjustment from previous crisis episodes, and compare the experience of East Asian and Latin American crisis episodes. In section 5 we investigate the factors that help countries avoid severe output losses following crisis and return more quickly to the pre-crisis potential growth path. Finally, section 6 concludes.

2. Overview

Compared to East Asia, Latin America's growth performance was disappointing. Table 1 presents the details of growth in a sample of 21 Latin American countries and 9 East Asian economies we analyze in this paper.¹ All averages are constructed unweighted by size, thus giving the same weight to all countries.²

Clearly, average growth rates in Latin America have been below the East Asian averages over the past four decades. For Latin America as a whole, average per capita GDP growth was 1.3% from 1960 to 2000, compared to 4.6 % in East Asia over the same period. Those differences are astonishing. While per capita income in East Asia increased sevenfold, in Latin America it did not even double.

Latin America's bad performance in these 40 years is not entirely a consequence of the debt crisis and the so-called "lost decade" of the eighties. Its performance has been consistently poor, with average growth rates well below those of East Asia. However, the 1980s were the years with the biggest difference in growth rates: 4.5% in East Asia, -0.8% in Latin America. In some sense, therefore, one may support the view that growth performance was particularly poor during the debt crisis.

It is interesting to note that average GDP per capita in Latin America was more than twice the average in Asian countries in 1960, but low growth over the next 40 years reverted this situation bringing the Asian average per capita GDP to twice that of Latin

¹ The East Asian nine economies are: China, Hong Kong SAR, Korea, Singapore, Taiwan, Thailand, Malaysia, Indonesia, and the Philippines. The 21 Latin American countries are listed in table 1.

² We use GDP data from Penn-World Tables version 6.1, as described in Summers and Heston (1991) and Heston, Summers, and Aten (2002). The selection of countries was made on the basis of data availability for regressions in Section 3.

America. This is a crude proof of the income differences that can accumulate from having low growth vis-à-vis high growth during a period of forty years.

Note that over the period the growth performance of the East Asian region as a whole has been declining. The average per capita GDP growth rates were 5.4% in the 1970s dropping to 4.5% in the 1980s and 4.0% in the 1990s. Growth rates plunged most sharply in the five countries that were most affected by crises: Thailand, Indonesia, the Philippines, Malaysia, and Korea.

The 90s is also a period in which growth recovered in Latin America, but it was still lower than during the 60s and 70s. However, growth experiences were much more diverse. The standard deviation of growth was almost twice that of the 60s. The top four countries in terms of growth during the nineties, Haiti, Dominican Republic, Chile and Argentina, grew faster than the top four during the 60s, Panama, Brazil, Trinidad and Tobago and Peru. But, during the 90s, six countries experienced negative growth, whereas none did during the 60s.

It is also important to note that the good performance of Latin America in the 60s and 70s was in the context of strong growth of the world economy. Indeed, as table 1 shows, during the 60s Latin America grew below the world economy, and in the 79s grew 0.2 percentage points than the world economy, but in the 90s the growth of Latin America was 0.30 percentage points above the world economy.

There are many factors that could explain low growth performance of Latin America, and we will revisit some of them in a later section of this paper. There are some previous studies that discuss empirical evidence concerning Latin American growth. De Gregorio (1992), using a five-year panel data for 12 Latin American countries between 1950 and 1985, finds that the two most important factors inhibiting growth in Latin American countries are low investment and high inflation.

Regarding inflation, Latin America has been by far the region with the highest inflation rate in the past 30 to 40 years, and this has hindered growth. Inflation affects growth through many channels.³ As argued by Fischer (1993), the high rate of inflation is also a summary statistic for macroeconomic mismanagement and for the inability of governments to put in place sound economic policy. In a panel-data framework similar to that of De Gregorio (1992), Corbo and Rojas (1993) find that inflation and black market premium are both significant determinant of growth when entered separately in the regressions. But, when jointly included, the two variables are not significant. More recent evidence, however, has shown that in a large sample of countries inflation and black market premium are both negatively correlated with GDP growth.

Thus, the evidence highlights the importance of macroeconomic stability to spur growth. In addition to inflation and black market premium, there is also evidence that shows the

³ See De Gregorio (1996) for further discussion on channels through which inflation affects growth, and how they are consistent with existing evidence.

importance of having low budget deficits, but also some structural measures such as trade openness and depth of the financial sector.

During the 90s, Latin American countries made important progress in terms of reforms. There were important improvements in macroeconomic stability as well as structural reforms. In a recent and comprehensive review of reforms and growth performance, Lora and Panizza (2002) show that countries that had the best growth performance were also at the forefront of reforms. Contrary to previous estimates, they show that reforms increase growth temporarily. In fact, during the early 90s reforms explain an increase in growth of 1.3%, but it declined to 0.6%, when no reforms were implemented. This is consistent with the neoclassical growth model, in which reforms increase long-term income, increasing transitional growth. As time goes on, the effect of reforms on growth diminishes, although the income gains remain.

The recent experience of Argentina is a dramatic reminder that structural reforms are not enough. Macroeconomic stability as well as institution building are essential to avoid large declines in income, that may neutralize all the gains achieved by reforms.

3. Determinants of Economic Growth: A Cross-country Analysis

In this section, we explore the main factors that influenced growth of per capita income over the past three decades. The analysis is based on a general framework of cross-country regressions, which puts the experience of an individual country in a global context. This approach allows us to understand the specific factors associated with economic growth across countries and the key differences between fast and slow growing economies. Based on this framework, we explore the factors that explain why Latin American countries grew much slower than the best performing economies in East Asia. This exercise will provide a basis for understanding future growth prospects of the East Asian and Latin American countries.

3.1 The Basic Empirical Framework

The basic empirical framework is based on an extended version of the neoclassical growth model, as described by Barro (1991), Mankiw, Romer, and Weil (1992), Barro and Lee (1994), Barro and Sala-i-Martin (2004). This model predicts “conditional convergence” of income, implying that a country with a lower initial income relative to its own long-run (or steady-state) potential level of income grows faster than a higher-income country over time. The basic idea is that the farther an economy locates away from its steady-state level, the greater is the gap of reproducible (physical and human) capital stock per worker and technical efficiency from their long-run potential levels. The gap of existing capital and technology from their steady-state levels provides the low-income economy with the chance to catch up rapidly with the high-income country, through high rates of capital accumulation as well as diffusion of technology from the more technically advanced economies. In the cross-country context, convergence implies that poorer countries would grow faster than richer countries, when controlling for the

variables influencing the steady-state level of per capita income. As a reduced form the model can be represented by

$$(1) \quad g_{yiT} = \log(y_{iT} / y_{0i}) / T = \mathbf{b}_0 + \mathbf{b}_2 \log(y_{0i}) + \mathbf{b}_3 Z_i + \mathbf{e}$$

where the dependent variable is the growth rate of per capita income for the period T for country i , $\log(y_{0i})$ is a log value of the initial level of per capita income for country i , and Z_i denotes an array of the variables that influence the country i 's steady-state level of per capita income. The conditional convergence implies a negative coefficient on the initial income. Note that the variables included in Z could affect either the rate of productivity growth or the rate of capital accumulation.

A wide variety of external environment and policy variables will affect growth rates by influencing the long-run potential income and the rate of productivity growth. The extended Solow-type neoclassical growth model emphasizes investment rate, population growth, and human capital as important factors that determine the steady-state level of income (see, for example, Mankiw, Romer, and Weil (1992)). Previous empirical research also considers institutions and policy factors as the important determinants of long-run per capita income (Mauro, 1995; Knack and Keefer, 1996; and Barro, 1997). They include government consumption, rule of law, inflation, democracy, and trade openness.

The external environment and policy variables that we consider are as follows⁴:

Investment: In the neoclassical growth models, a higher value of saving rate, domestic and foreign, raises the steady-state level of output per capita (equation (1)) and thereby increases the growth rate for a given starting value of GDP.

Fertility: The fertility rate is an important influence on population growth, which has a negative effect on the steady-state ratio of capital to worker in the neoclassical growth model. Hence, the model predicts a negative effect of fertility on economic growth. Higher fertility also reflects greater resources devoted to child-rearing, and for this reason it is better to use fertility rates than population growth.

Human Resources: The various models of new growth theories emphasize human capital as a key factor to drive the long-term growth of income. In the framework of extended neoclassical growth model, for given values of the other explanatory variables, a higher human capital stock leads to a higher steady-state per capita income. In the endogenous growth model, human capital generates perpetual growth by either preventing returns to a broad capital from falling or by increasing capabilities for the innovation and adaptation of new technologies. The human resource variables include a measure of human capital stock. We use the average years of secondary and higher schooling for males aged 25 and over, available from Barro and Lee (2001). The greater initial educational stock

⁴ Our empirical framework includes a representative set of the explanatory variables that have been widely used in previous work. See Barro and Sala-i-Martin (2004, Ch. 12) for details.

indicates that more skilled workforce can produce more output from given natural and physical resources. Hence, the country with a greater education stock is in a more favorable condition for future growth. In addition, life expectancy at birth, as a log value at the initial year of the period, is used to measure health attainment, which is considered as another important component of human capital stock. A higher life expectancy would tend to indicate a healthier, more productive worker.

Institutions and Policy Variables: We consider five institutions and policy variables. The first variable we consider is *government consumption* (defined as the average ratio of government consumption in final goods to GDP). The measure of government consumption used here excludes public expenditure on education and defense because these two categories of government expenditure can be regarded as primarily investment (Barro, 1991 and Barro and Lee, 1994). Higher government consumption leads to lower growth because it shifts resources from productive activities and distorts private decisions.

The second institution and policy variable is a measure of *overall maintenance of the rule of law* in the economy. An environment that secures property rights and provides a strong legal system is central for investment and other aspects of economic activities. The best available indicators to measure quality of institutions come from international consulting firms that give advice to international investors based on information collected by local experts. Knack and Keefer (1996) introduce measures of institutional quality initially devised by Political Risk Services. The measures consist of five indicators including (a) quality of bureaucracy, (b) corruption in government, (c) rule of law, (d) expropriation risk, and (e) risk of repudiation of contracts by government. Among the various indicators, the measure of the rule of law is considered to have the most explanatory power for economic growth (Barro, 1997). We use this measure of law enforcement, which was rescaled to zero-to-one scale, with one being the most effective.

The third policy measure is *inflation rate*. De Gregorio (1992, 1996), Fischer (1993), and Barro (1997) find that inflation has a significant negative effect on growth. Hence, the worsening price stability, caused by macroeconomic mismanagement, seems to lead to lower steady-state level of per capita output for given values of other explanatory variables.

We also include a measure of "*democracy*" as another institution variable. This measure is constructed by Barro (1997) based on the measure originally constructed by Gastil. It measures the strength of electoral rights and civil liberties, scaled from zero to one, where one corresponds to the highest level of democracy. The relationship between democracy and economic growth is not clear. For example, a more democratic political regime can entail redistribution of income from rich to poor. This redistribution may reduce the incentives of people to work and invest, and thus go against economic growth. But, reducing income inequality and having an open political system can reduce the tendency for social unrest and thus contribute positively to overall economic activity.

The last policy variable is a measure of *openness*. Open economies have greater access to cheap imported intermediate goods, larger markets, and advanced technologies. Lee (1993) and Frankel and Romer (1999) find evidence that more open economies tend to grow faster. We measure the extent of each economy's openness by the ratio of exports plus imports to GDP. Openness is well-known to vary by country size--larger countries tend to be less open because a larger internal market can help reduce reliance on international trade. The openness measure used in this analysis filters out the normal relationship (estimated in another regression system) of international openness to the logs of population and area. This filtered variable thus reflects the influences of government policies, such as tariffs and trade restrictions, on international trade (see Barro and Sala-i-Martin, 2004, Ch. 12).

Terms of Trade Shock: The terms of trade shock is considered as an exogenous factor that affects the growth rate of an individual economy. Improvement in the terms of trade, measured as the ratio of export to import prices, can make a country produce more and expand its export sector.

Balance-of-Payments Crisis: External imbalances normally affect mostly cyclical fluctuations rather than long-run growth. However, when a significant balance-of-payment difficulty causes a crisis, it can disrupt the whole economy because the uncertainty it generates discourages investment and other productive activities, while increasing speculative activities. Financial distress may lead to bankruptcies of profitable firms that would otherwise have been viable. Barro (2001) shows that currency crises have a negative influence on economic growth.

We define a balance-of-payments crisis dummy variable for each country during any five-year period to equal one if a crisis occurred during the period and otherwise to take on the value zero. The definition of balance-of-payments crisis is discussed in section 4.1.

Table 2 provides statistics of the basic data for all 85 countries in the sample, for the beginning and latest sub-periods, 1970-75 and 1995-2000. The table also compares the statistics between Latin America and East Asia. It confirms that over the past three decades, the group of nine East Asian economies was better placed for rapid growth than the Latin American group in terms of most structure and policy environments. A notable exception is that in 1995-2000 a larger fraction of the East Asian region was subject to balance-of-payments crises than the Latin American region. And, the faster increase in income due to the higher growth performance in the East Asian economies led them to face a less favorable convergence effect in the 1995-2000 period than not just in their earlier period but also with respect to the Latin American countries as a whole.

Our regression of specification (1) applies to a panel set of cross-country data over six five-year periods from 1970 to 2000, corresponding to the periods 1970-75, 1975-80, 1980-85, 1985-90, 1990-95, and 1995-2000.⁵ The dependent variables are the annual growth rates of real GDP per capita over the six five-year periods: 1970-75, 1975-80,

⁵ We do not include the 1960s period in the regression because the currency-crisis variable is only available from 1970.

1980-85, 1985-90, 1990-95, and 1995-2000. Some previous studies used cross-section data in which each country has only one observation. The approach based on the panel data set seems to consider more information that is available from time series variations within each country.

One concern in the empirical specification is that any effect from contemporaneous explanatory variables may reflect reverse causation from GDP growth to the explanatory variables. For example, the relationship between contemporaneous investment and growth may reflect high growth causing high saving. This problem, however, can be solved by adopting the instrumental-variables estimation technique. We estimate this system of the six equations by three-stage least squares.⁶ The instrumental-variable technique controls for the possible simultaneity problem when Z_i --the control variables--are endogenously determined. Instruments are mostly lagged values of the independent variables (see the notes to Table 3). We use prior colonial status (Spanish or Portuguese colonies and other colonies) as instruments for inflation rate in the instrumental-variable technique as in Barro (1997). In order to control for the possible reverse causation from lower growth to higher frequencies of balance-of-payments crisis, we use the ratio of international reserve to monthly imports at the beginning of each five-year period as an instrument for balance-of-payments crisis.

3.2 *Regression Results*

Table 3 presents the regression results using the basic framework of equation (1) and the explanatory variables just described. The three-stage least squares technique applies to a data set for 85 countries.

Column 1 of table 3 shows the result of the basic regression without including balance-of-payments crisis dummy variable. Column 2 includes as an independent variable the balance-of-payments crisis dummy. Although columns 1 and 2 show a similar pattern of results, substantial differences arise for inflation and schooling variables. The estimated effect of inflation on growth becomes much smaller when we include the balance-of-payments crisis variable. This may reflect the strong positive correlation between inflation and balance-of-payments crisis. On the contrary, the schooling variable becomes more significant in column 2 where the balance-of-payments crisis variable is added. Since the balance-of-payments crisis variable itself enters very significantly, we focus on the result of column 2.

The result shows strong evidence for conditional convergence: the coefficient on the log value of initial GDP in column 2 is highly significant, and the estimated coefficient is -0.025 (standard error = 0.004). Thus, a poor country with a lower initial income level

⁶ The estimation weights countries equally but allows for different error variances in each period and for correlation of these errors over time. Some studies suggest estimating panel growth regressions by the fixed-effects estimation technique, considering for an unobservable country fixed effect. However, the fixed-effects technique eliminates information from cross-section variations (see Barro, 1997, pp.36-39). Temple (1999) discusses other statistical problems concerning the estimation and interpretation of cross-country growth regressions.

grows faster, controlling for the variables that influence the steady-state level of income. Specifically, the coefficient implies that a country with half the income level of another country grows by 1.73 percentage points ($=2.5\% \cdot \ln(2)$) faster than the richer country.

The investment rate and fertility variables come to have strong effects on growth rate. The estimated coefficient on investment rate is positive and statistically significant at the 5% level. The coefficient 0.056 (s.e. = 0.027) implies that a one standard deviation increase, equivalent to 8.3 percentage point in the ratio of investment to GDP in the 1995-99 period, is associated with an increase in the growth rate of about 0.5 percentage points per year. The estimated coefficient on the logarithm of fertility rate is strong negative, -0.015 (s.e. = 0.006), implying that an increase of 0.51 (the variable's standard deviation) in fertility rate in 1995 is estimated to lower the growth rate by about 0.8 percentage points per year.

The result of column 2 shows that human resource variables have a significantly positive effect on economic growth. The educational attainment variable, which is measured by an average year of secondary and tertiary schooling of male adult population, has a positive effect on the growth rate: the estimated coefficient, 0.0029 (s.e. = 0.0017), is statistically significant at the 10% critical level. The mean and standard deviation of the schooling variable were 2.4 and 1.5 per year respectively in 1995. Therefore, the coefficient indicates that one standard-deviation increase in the secondary and higher schooling raises the growth rate of per capita income by about 0.4 percentage points per year. The logarithm of life expectancy at age 1— a measure of health attainment— is highly significant in the regression: the estimated coefficient 0.065 (s.e. = 0.021) implies that increase in life expectancy by 0.13 (the standard deviation of the log of life expectancy) in 1990 is estimated to raise the growth rate by about 0.9 percent per year.

We find clear evidence that the institution and policy variables play a significant role in determining economic growth. The government consumption variable has a significantly negative impact on growth: an increase in government consumption ratio by one percentage point reduces growth by 0.07 percentage points a year. In the sample, a one standard deviation of 5.5 percentage points over the 1995-99 period decreases the growth rate of per capita income by about 0.4 percentage points per year.

The rule of law index has a strong positive effect on growth, indicating that countries with more effective law enforcement for the protection of property and contractual rights tend to have higher growth rates. The estimated coefficient, 0.018 (s.e. = 0.008) implies that a one standard deviation increase of 0.22 in this index (on a scale of 1.0) in the 1995-99 period is associated with an increase in the growth rate of about 0.4 percentage points.

The openness variable appears to be positively associated with growth rate. The estimated coefficient 0.0086 (s.e. = 0.0046) is significant at the 10% level. An increase of an economy's openness by 0.4 (its standard deviation) over the 1995-99 period is estimated to raise the growth rate of about 0.4 percentage points per year.

The regression result confirms the non-linear relationship between democracy and growth, as found by Barro (1997). The coefficients on the indicator of democracy and its square terms are positive and negative respectively and both of them are statistically significant. The pattern of coefficient values indicates that growth increases with political freedom in low level of democracy but decreases with it once the society has attained a certain level of political freedom. The estimated coefficients in column 2 imply that the switch occurs at a level of democracy of 0.635. Both Latin America and East Asian regions on average were below this critical value in the 1970s. However, in the 1995-99 period, Latin America's average level of democracy, 0.732, slightly exceeded this critical level.

Column 2 shows that the effect of inflation on economic growth is negative but statistically insignificant. The estimated coefficient, -0.013 (s.e. = 0.009), implies that an increase in the average rate of inflation by one standard deviation of 9.7 percent over the 1995-99 period would lower the growth rate by 0.1 % per year. Note that the coefficient is less than half the value of column 1, where inflation has a greater impact on growth. As we saw earlier, the problem is the correlation between balance-of-payment crises and inflation.

The regression result shows a less significant effect of the terms of trade change on per capita GDP growth. The estimated coefficient on the growth rate of the terms of trade is 0.035 (s.e.= 0.023), indicating that countries with favorable terms of trade shock by one standard deviation of 0.039 in the 1995-99 period grew by about 0.1 percentage points per year more than other countries.

The balance-of-payments crisis turns out to have a strong, negative effect on economic growth. The estimated coefficient on the balance-of-payments crisis variable is -0.017 (s.e.= 0.005), indicating that a balance-of-payments crisis shock lowers the growth rate by 1.7 percentage points per year.

Column 3 of table 3 adds a lagged effect of a balance-of-payments crisis. The result confirms that of Barro (2001). The retardation of growth by a balance-of-payments crisis does not persist into the next five-year period. In fact, the effect of a balance-of-payments crisis on economic growth in the subsequent five-year period turns out to be positive but statistically insignificant. Therefore, a balance-of-payments crisis reduces income permanently, although it has no permanent effects on growth.

Table 3 also shows the result of regression with the inclusion of regional dummies. Column 4 of table 3 shows that Latin American dummy has a statistically insignificant coefficient while East Asian dummy is marginally significant at the 10 percent level. It is interesting to note that earlier empirical studies found a significant and negative "Latin American dummy" (Barro, 1991), which in the current empirical framework becomes insignificant, and indicates that the explanatory variables included at the right-hand side explain most of the poor performance of Latin American economies. However, the point estimates, although small in magnitude and statistically insignificant, still indicate that besides the variables included, Latin America has lower growth rates than average, and East Asia has higher growth rates than average. Even with the two regional dummies

controlled, the regression shows that most of the explanatory variables are still significant and have the estimated coefficients of the same magnitude, compared to those in column 2 of table 3.

3.3 *Economic Growth of Latin America in Comparative Perspective*

The cross-country regression results allow us to analyze growth performance of the Latin American countries relative to performance in other regions. We compare the growth performance of Latin America to the best performance of East Asia. Average per capita growth rates for the nine economies in the East Asia region were 5.6%, 5.1% and 4.3% over each decade of the 1970-2000 period, while those for the 21 Latin American countries were 2.1%, -0.8% and 1.6% respectively.

We use the point estimates of the parameters in the regression (2) of table 3 for a simple "accounting" that breaks down the fitted values of growth rates for each country into the contributions from each of the explanatory variables. Although the residual errors in individual country growth rates are substantial, it is worthwhile to examine the differences in the explanatory variables that generate the differences in the fitted growth rates. We then explore the sources of the differences in the fitted growth rates between East Asia and Latin America.

Table 4 presents the results. The basic regression can account for a substantial part of the growth differences between two regions. For the 21 Latin American countries, the predicted growth rate is 3.1 percentage points lower on average than that of East Asia over the whole period from 1970 to 2000, while the actual difference was 3.6 percentage points, and therefore we can explain the bulk of the differences. It is interesting to note, however, that the larger difference occurs during the "lost decade" of the eighties. This predicted difference can be broken down separately into the contributions from the 12 explanatory variables.

The relatively higher income level of Latin America compared to that of Asia in 1970, led to lower growth in this region in the 1970-90 period because of the convergence effect. However, this convergence effect became rather favorable to Latin America since 1980 when the income of East Asia exceeded that of Latin America. Hence, the net convergence effect becomes negligible over the three decades from 1970 to 2000.

In 1970 Latin America had a slightly higher life expectancy and thus a better condition for growth than East Asia. But, in general Latin America had relatively poorer human resources--in terms of lower educational attainment and lower life expectancy--than East Asia. The regional differences have widened over time. The net effect of human resources contributed to slower growth in Latin America by about 0.3 percentage point relative to Asia over the whole period.

Investment rate and fertility had strong effects on Latin America's performance relative to Asia by lowering the per capita growth rate by about 0.6 and 0.5 percentage points per year respectively over the past three decades. Without this difference, Latin America

would have had a level of per-capita income 25% higher after the thirty years ending in 2000.

The institution and policy variables turned out to have a significant effect on differences in growth rates. The differences in growth may be due to low (human and physical) capital accumulation, or low productivity growth. The growth effects of institutions and policies that we discuss now can occur by reducing productivity and the speed of catch-up to the technological frontier, and changing the incentives for (physical and human) capital accumulation.

The combined effect of the differences in the five policy variables--government consumption, rule of law, inflation, democracy, and trade openness--accounted for 1.6 percentage points slower growth of Latin America relative to Asia over the period from 1970 to 2000. The institution and policy variables contributed most to the difference in growth rates by 2.0 percentage points in the 1980-90 period. That is, during the debt crisis, policies and institutions deteriorated significantly in Latin America. As we emphasize below again, although external conditions could have deteriorated internal policies and institutions, the bad growth performance, even in a period with negative external environment such as the eighties, can be traced to bad policies and institutions.

Among the institution and policy variables, trade openness was the most important variable. Latin America's relatively inward-oriented trade strategy accounted for slower growth of about 0.6 percentage points per year in Latin America. Latin America does not only have lower trade share (exports plus imports share on GDP), but most of the countries are smaller in size and population than Asian countries, which further reduces its effective trade openness.

The higher inflation in Latin America also reduced growth by 0.3 percentage points relative to Asia over the whole period from 1970 to 2000. The negative effect of high inflation was more significant in the 1980s, lowering growth by 0.7 percentage points in Latin America relative to Asia. During the 80s the average inflation rate in Latin America was 48.5%, while during the same period, for our sample of 9 East Asian countries it was 2.6%. As discussed above, this effect does not include the likely detrimental effects of inflation on investment; however the evidence shows that the effects of inflation on investment are much smaller than the effects of inflation on productivity growth (De Gregorio, 1996).

Government consumption and rule of law also contributed to the lower growth rate of Latin America by 0.3 and 0.4 percentage points per year respectively over the three decades. By contrast, democracy turned out to play an insignificant role on growth difference between the two regions. On average East Asia's low political freedom, which is far lower than the "critical turning point", has been relatively unfavorable to economic growth. Because democracy has a nonlinear effect on per capita growth, its very low or high values would be more detrimental to growth. In this respect, the democracy level for China, Indonesia and Haiti were very low, while Costa Rica, and Trinidad and Tobago

were on the high side of the distribution. But, for most East Asian and Latin American countries, the democracy level has not made a significant difference to their growth rates.

Table 4 shows that the effect of the relatively unfavorable terms-of-trade shock was also small in Latin America. This result questions the view that the problem of Latin America was due to its patterns of specialization that faced a particularly unfavorable external scenario. According to the advocates for the import substitution strategy of Latin America in the sixties, countries should pursue internal industrialization since the products they exported had declining terms of trade. But, the evidence from our regression shows that the latter argument is wrong and that it is precisely openness, as part of good policies and institutions that boosts fast and lasting growth.

In addition, the external environment could explain part of the poor performance during the debt-crisis. As we see, the largest difference between predicted and actual growth occurs in the 80s. This difference of 1.4 percentage points, even after we control for policies, institutions, terms of trade and balance of payments crisis, is not explained by the growth regressions. Of course, as we discuss in the next section, the output losses from currency crisis do not only depend on external factors, but also on some internal factors such as initial conditions and policy responses.

On the other hand, the balance-of-payments crisis contributed to growth in Latin America being about 0.2 percentage points less than in East Asia over the whole period. It had the biggest effect in the 1980-90 period, explaining the growth differential of 0.5 percentage points. But, in the 1990s, when East Asian economies also suffered from balance-of-payments crises, its contribution to the growth differential became negligible.

Thus, while initial income and external conditions explain only moderate differences in growth rates, the major differences are produced by investment, human resources and the institution and policy variables. The traditionally important growth factors such as investment, fertility, and the quality of human resources contributed significantly to the difference in per capita GDP growth between East Asia and Latin America. Moreover, relatively poor economic policies, such as trade protection, high inflation, high government consumption, and lack of good institutions have been very important factors contributing to the relatively slow growth of Latin American countries during the past three decades.

Table 4 focuses on the relatively poor performance of Latin American countries compared to East Asia. But, there were also tremendous variations in growth performance among Latin American countries. While the best performing, Dominican Republic and Chile, grew by 3.2 and 2.4 percent per year during the period 1970 to 2000, the worst performers, Nicaragua and Venezuela, registered negative growth rates of -2.7 and -1.7 percent. In addition, growth rates fluctuated a lot within each country. For instance, average per capita growth for Chile was only around 1.2 percent over the period 1970-90 but increased dramatically to 4.8 percent over the period 1990-2000. On the contrary, with the exception of Philippines, the 9 Asian countries all had strong growth throughout most of those three decades without significant variations.

For this reason we investigate to what extent variations in growth performance of individual Latin American countries can be attributed to the factors that explain the international growth variations, in particular, to what extent the variations are due to differences in domestic institutions and policies. We therefore extend table 2 of the entire period by breaking down Latin America into 21 individual countries.

Based on the regression result of column 2 of table 3, we can assess how much of the variations in growth performance of individual Latin American countries relative to the performance in East Asia can be attributed to each explanatory variable. Table 5 shows the effect of various factors on the difference between predicted and actual growth to 10 selected Latin American economies over the whole period from 1970 to 2000. For instance, the predicted growth rate for Chile is 2.6 percentage points lower on average than the East Asian region, while the actual difference was 2.1. The relatively higher income level of Chile compared to East Asia led to a drop of 0.5 percentage points in Chile's growth because of the convergence effect. Investment represented a 0.5 percentage points growth while fertility and human resources made no significant contribution to the growth differential. Chile's sound rule of law accounts for the 0.2 percentage point edge over East Asia but other institutions and economic policies were relatively unfavorable to growth in Chile. The combined effect of the differences in the other four policy and institutional variables --high government consumption, high inflation, low levels of democracy, and low trade openness-- accounted for 1.5 percentage points slower growth of Chile relative to the group of nine East Asian countries from 1970 to 2000. Most of these indicators improved during the nineties, which contributed to growth above the East Asian average, only surpassed by China and Taiwan in the whole decade.

The negative effect of poor institutions and policies on growth is evident in all Latin American countries. In some countries such as Bolivia, Haiti, and Nicaragua, poor institutions and economic policies completely outweigh the favorable factor of lower initial income, leading to a far slower average per capita growth compared to the East Asia region. For example, Haiti would have grown by 3.7 percentage points more than East Asia thanks to its relatively lower initial income level. But, it turned out that Haiti's average growth rate over three decades was about 2.8 percentage points lower than the East Asian average because of poor human resources and economic institutions.

Some Latin American countries more prone to crisis over the past three decades (Argentina, Brazil, Ecuador and Mexico) show significantly lower growth rates, about 0.7 to 0.9 percentage points down on East Asia.

3.4 *Growth Prospects for East Asia and Latin America.*

The results from cross-country regressions can be used to construct forecasts of economic growth for individual countries. The projected growth rates for 2001-2010 are obtained by multiplying 2000 values (or the 1995-99 period average) of explanatory variables by the estimated coefficients in the panel regression of column (2) in table 3. Terms-of-trade shocks are assumed to be equal to those in the 1990s. We assume no balance-of-payments crisis.

The results of growth projection for East Asia and Latin America are presented in table 6. We only provide the regional averages.

For the 21 Latin American countries, the predicted growth rate is estimated to be 2.3 percent over the 2001-2010 period, increasing from the average of 1.6 percent during the nineties. On the contrary, the average growth rate for the East Asian region is predicted to be 3.8 percent that is very close to the average of 4.0 percent in the last decade. Hence, the growth differential between two regions will shrink substantially to 1.4 percentage points, compared to 3.1 percentage points over the whole period from 1970 to 2000 and 1.9 percentage points over the 1990-2000 period. This is explained basically by convergence, since the high initial income in East Asia slows down growth vis-à-vis Latin America.

Overall, growth in Latin America is predicted to be higher than in any single decade of the previous 40 years, with the exception of the sixties when it was equal. Although modest when compared to East Asian performance, this rate of per-capita income growth is almost twice that of 1960-2000. Improved institutions and policies help to explain why Latin America could do better.

The predicted difference of average growth rates over the period of 2001-2010 can be broken down separately into the contributions from the 12 explanatory variables. The result of table 6 shows that the convergence effect becomes quite unfavorable to East Asia due to its higher income relative to that of Latin America in 2000. The net convergence effect during the 2001-2010 period is predicted to make the average growth rate of the East Asian region 1.7 percentage points per year lower than that of the Latin American region. Therefore, considering the effect that convergence has in reducing the differences across regions, the rest of the factors influencing growth still explain a large difference of about 3 percentage points.

The increasing gap between Latin America and East Asia in terms of human resources is likely to contribute to the slower growth of Latin America with a net effect of some 0.6 percentage points over the 2001-2010 period. Although both regions have experienced improvements in human resources (see table 2), the differences have widened and the human resources variables explain a larger difference than in the past. The difference in investment still explains about 0.7 percentage points in growth differentials.

The institution and policy variables are expected to maintain strong effects on differences in growth rates. The combined effect of the differences in the five policy variables --government consumption, rule of law, inflation, democracy, and trade openness-- is expected to account for 1.3 percentage points slower growth of Latin America relative to East Asia over the period from 2001 to 2010.

Note that we assume no crisis will occur to any region. But, crises often recur. The crisis could make big differences to our predictions. The estimation shows that the occurrence of a balance-of-payments crisis would lower the growth rate by 1.7 percentage points per year. This is equivalent to the predicted differential of growth rates between the two regions over the 1990-2000 period.

3.5 *Extensions: Quality of Education and Income Distribution*

Empirical studies of the determinants of economic growth suggest numerous additional explanatory variables. Our framework captures most important growth determinants, but some missing variables could also have a bearing on performance, particularly in Latin America and East Asia. These variables could be relevant growth determinants although the regressions may not capture them well because lack of data or collinearity problems with the other independent variables that may hamper the possibility to find sensible estimates.

One important additional variable is the quality of schooling.⁷ The schooling variable considered in basic regressions refers to the quantity of education, as measured by years of schooling, rather than the quality. An alternative measure of educational stock, which is considered to reflect variations of educational quality between countries, are the scores achieved in internationally comparable tests in the subjects of science and mathematics. Conceptually, the quality of education is reflected in the performance of students and graduates. One shortcoming of these data, however, is that the observations apply to different years and are most abundant for the 1990s. Based on the limited sample, Barro (1999) and Hanushek and Kimko (2000) find that test scores are positively related to growth rates of real per capita GDP in cross-country regressions.

Table 7 shows the average test scores on mathematics and science for seventh grade students in the countries that participated in the cross-national achievement tests. In 1991 the international Assessment of Educational Progress (IAEP) conducted tests of mathematics and science achievements of 13-years-old students. The International Association for the Evaluation of Educational Achievement (IEA) also carried out the Third International Mathematics and Science Study (TIMSS) in 1994 and 1995.

Among the 44 participating countries that participated in the IAEP and/or TIMSS projects, students in the East Asian economies- China, Hong Kong, Japan, Korea, Singapore and Taiwan - showed the highest achievements in mathematics. For example,

⁷ Barro and Sala-i-Martin (2004) show that some additional regressors are statistically significant when they are added one at a time to the regression, similar to our framework shown in table 3. Notably, schooling quality and geography variables are found to enter significantly.

in the IAEP mathematics test, China ranked first with the students' average score of 80.2, followed by Korea and Singapore. In contrast, Brazil, which is the only participating Latin American country, came last, with the average score of 34.7, after Mozambique. Among the 39 countries that participated in the TIMSS, Singapore, Korea, Japan, and Hong Kong ranked top four in mathematics with the average scores ranging from 56.4 for Hong Kong to 60.1 for Singapore. In contrast, Colombia, which is the only participating Latin American country, performed significantly less with the mean of 36.9, placing it second to the last after South Africa.

The results are also favorable for Asia in science tests, for which Asian students performed much better than those of Latin America. Although evidence on the quality of schooling is still scarce, there is a very clear gap between Latin America and Asia, which adds to the deficiencies in the quality of human resources we already discussed in the previous sections.

Other area where the differences between Latin America and Asia are evident, although not included in the independent variables in our regressions, is income distribution. Figure 1 shows Gini coefficients for Latin American and Asian countries, with Japan and the US for comparison. Data are taken from the *World Development Report* of the World Bank, for the closest year, which in most cases is between 1996 and 1998. There are several problems that make it difficult to compare across countries. For example, differences depend on whether the unit of analysis is household or individual, whether income is measured before or after tax, or whether the surveys refer to income or expenditure. However, despite all of those caveats, the conclusion is undisputable: inequality in Latin America is much greater than in Asia, and as we argue below it could explain differences in human resources, policies and institutions between the two regions.

The relationship between income distribution and growth has recently been a hot topic. Theoretical discussion often predicts negative effects of inequality on growth (Alesina and Rodrik 1994, and Persson and Tabellini 1994). Most cross-country empirical studies also find support for a negative relationship between income inequality and growth (Alesina and Rodrik 1994, and Perroti 1996). However, some recent studies based on the panel-data estimation find a positive relationship (Li and Zou 1998, and Forbes 2000). The main problem affecting cross-country empirical investigation is the quality and comparability of the data measured with small differences often resulting in large differences in the estimated relationship between inequality and growth.

We have investigated the effects of inequality on growth in our panel framework. Our measure of income inequality is Gini index. The data come from the UNU/WIDER – UNDP World Income Inequality Database (WIID), which extends Deininger and Squire (1996) data set.

The first row of table 8 reports the estimated coefficient on Gini index when it is added to the systems in row 2 of table 3. The overall sample size for the panel regressions decreases from 464 to 277, because many fewer observations of Gini coefficients are available than for the full sample considered in table 3. In the system, the Gini value

around 1970 appears in the equation for growth from 1970 to 1975, and so on. The five-year lagged values of the Gini coefficients are added to the list of instruments.

The estimation result shows that there is no significant impact of Gini coefficients on economic growth. The estimated coefficient, -0.001 (s.e.= 0.018) is essentially zero. Thus, with the other explanatory variables considered in growth regressions held constant, differences in income distribution have no significant relation in subsequent economic growth.

Although income inequality has no direct impact on growth, additional effects can arise from the influence of inequality on the explanatory variables. One of these effects suggested by previous studies involves the impact of income distribution on fertility. Row 2 of table 8 shows the estimation result for a panel system in which the log of the fertility rate is the dependent variable. In this system, the explanatory variables include the log of per capita GDP and Gini index. The lagged values of the log of per capita GDP and Gini index are used as instruments. The result confirms a strong positive impact of inequality on fertility.

In the theories based on political economy arguments, inequality affects government expenditure and thereby affects growth. In unequal societies, there are more incentives for redistributive politics (Meltzer and Richard, 1981). Row 3 of table 8 shows direct consideration of a panel system in which government consumption ratio is the dependent variable. We find a significant influence from the Gini index.

Another channel by which income inequality influences growth is educational attainment. Poor families that are faced with borrowing constraints are not able to invest in their children even when the returns on education are very high. Poor families have problems to send their children to school even under free schooling, since they often need income from their children's employment. This occurred relatively less in more equal societies, for the same level of income, where the parents are able to pay the costs of education. More equal distribution enables more households to send their children to school. Row (4) of table 8 confirms that there is a strong negative impact of income inequality on secondary school enrollment. Lower secondary school enrollment will lead to smaller secondary educational stock in time, and consequently have an adverse impact on economic growth. Thus, income distribution affects growth through the human capital channel.

We also find a strong negative impact of income inequality on institutional quality. Row (5) of table 8 shows the estimation result for a panel system in which the log of the rule-of-law index is the dependent variable. We find a significantly negative impact of the Gini index on the rule of law. Political economy considerations can also help to explain why corruption, rule of law, and institutional quality in general is weaker in more unequal societies.

Overall, we find substantial evidence that inequality affects growth indirectly by influencing fertility, government consumption, education and rule-of-law. Consider as an

example the estimated coefficient of 0.143 on the Gini coefficient in row 3 of table 8. This point estimate implies that an increase in the Gini coefficient by 0.1 (its standard deviation), that is 10 percentage points, raises the government-consumption ratio by 1.4 percentage points of GDP. If we multiply this value by the estimated coefficient on the government-consumption ratio in the growth regression (-0.07 in column 2 of table 3), we get -0.001. Thus, this indirect channel lowers economic growth by about 0.1 percentage point. Similarly, the point estimate of -0.87 on the Gini coefficient in the regressions for rule of law (row 5 of table 8) and the estimated coefficient on the rule-of-law index in the growth regression (0.018 in column 2 of table 3) imply that an increase in the Gini coefficient by 0.1 leads to a decrease in growth rate by about 0.16 percentage point indirectly through deteriorating institutional quality.

This evidence suggests that although there is not a significant direct effect of income distribution on economic growth in our regressions (row 1 in table 8), inequality may be detrimental to economic growth by increasing distortions, weakening institutions and reducing the quality of human resources. More research needs to be done to establish the definite connections, since up to this point we have seen some very suggestive correlations.

In addition, the accounting exercises overall show that although the gap in growth rate between Latin America and East Asia will narrow in the next decade, it will still remain substantial due to the differences in investment, fertility, schooling, and some policy variables such as government consumption, rule of law, and inflation.

Therefore, Latin America must work further to improve the investment rate, fertility, schooling, and institutions. Two important policies to achieve this objective involve increasing public saving and expanding educational enrollments. Increase in public saving will contribute to increase investment rate, contain pressures on government consumption, tax distortions, and high inflation rates. Increase in educational enrollments, particularly at secondary level, will help to lower fertility and increase educational attainments.

But, improvement in public finance and education investment is not easy. As we just analyzed in Section 3.2, high government expenditure and lower educational enrollments are to a certain extent an outcome of unequal income distribution. Latin American countries have more unequal income distribution than East Asian countries, and the evidence on the determinants of income distribution show that this gap cannot be closed in a short period of time. For example, improvements in education take time to pass through to a large share of the labor force (see, e.g., De Gregorio and Lee, 2002).

4. Crisis, Adjustment and Sustained Growth

In the previous section, we find that a balance-of-payments crisis reduces growth rates in the years close to the crisis. Such crises have contributed to the differences in growth performance between East Asia and Latin America of 0.25 percentage points per year

over the 1970-2000 period. This is not minor, since it is about 40% of the difference explained by investment rates, or almost the same as the difference explained by human resources. Moreover, if East Asia could have avoided the severity of the 1997 crisis, a much larger part of regional growth differences would have been attributed to a balance-of-payments crisis. Hence, it is important for an economy to reduce its vulnerability to a crisis and thereby avoid the deleterious effect of financial turmoil on economic growth. Once an economy is hit by a crisis, the necessary adjustments must be made quickly so that it can return to sustained growth.

There has been considerable literature, starting with Frankel and Rose (1996), about identifying the determinants of currency crises, or at least searching for good indicators that can help to predict the occurrence of crisis. Our purpose is different and we take a different route since we are interested in determining the output costs after a balance-of-payments crisis has occurred and which factors could help to alleviate these costs.

In this section, we analyze the patterns of adjustment we observe in previous crisis episodes, and compare the experience of adjusting from currency crises in East Asia and Latin America. We investigate the factors that help countries avoid the severe output losses following the crises and return more quickly to the pre-crisis potential growth path.

4.1. Defining Balance-of-Payment Crisis

To examine the nature of adjustments from a crisis, we first need to define what a crisis actually is. A balance-of-payments crisis is typically defined as an event when an index of exchange market pressure exceeds a certain threshold. Several alternative indicators and methods have been used in the literature to identify the dates of currency crises. Frankel and Rose (1996), Milesi-Ferreti and Razin (1998), Barro (2001) and Park and Lee (2002) use the nominal depreciation rate as the index and date each crisis when the index increased sharply over an exogenous threshold rate of depreciation common to all countries.

Severe speculative pressure does not always lead to large depreciations when the authorities successfully defend the currency by intervening in the foreign exchange market. Hence, Eichengreen, Rose and Wyplosz (1995), Kaminsky and Reinhart (1999), and Glick and Hutchison (2001) use an alternative indicator of currency pressure by combining depreciation rates with additional variables such as foreign reserve losses and domestic interest rate. Then, a balance-of-payments crisis is considered to have occurred if the composite indicator increased above a threshold level in terms of the country-specific moments. For example, Kaminsky and Reinhart (1999) have constructed the indicator of currency pressure by a weighted average of monthly nominal depreciation rate and monthly percentage change of foreign reserve, with weights such that the two components of the indicator have an equal size in terms of sample volatilities. A balance-of-payments crisis is then identified to have occurred in the specific year when the change in the indicator of currency pressure for any month of that year exceeded three standard deviations above the mean of the indicator over the sample period for each

country.⁸ This procedure is also subject to a potential problem because it implies that, if the form of the distribution were equally normal but the mean and standard deviations varied across countries, then the expected number of crises would be the same for all countries.

Our indicator of currency crises combines two approaches. We define a balance-of-payments crisis as an episode identified either by the former or the latter approach. For the former approach, we judge a country to have a balance-of-payments crisis if it experienced a nominal currency depreciation of at least 25 percent in any quarter of a specific year and the depreciation rate exceeded that in the previous quarter by a margin of at least 10 percent. In applying the criterion in the latter approach, we count those episodes in which the indicator of currency pressure for any month of that year exceeded three standard deviations above the mean of the indicator, provided that either the monthly nominal depreciation rate or percentage change of reserve loss exceeds 10 percent.

We apply the window of three years to isolate independent crises. That is, a balance-of-payments crisis occurring in that year or three years following the initial crisis is counted as a continuation of the same crisis rather than a new episode of crisis. Applying this procedure we identify 260 independent currency crises for 130 countries over the period from 1970 to 1999. Out of them, 221 currency crises occurred in developing countries. Latin American countries have suffered more balance-of-payments crises than East Asia; 55 compared to 14, in the 1970-1999 period. Table 9 shows a summary for the patterns over time and across regions of our definition of balance of payment crises.

4.2. Overview and the Stylized Patterns of GDP Adjustment during Crisis

Figure 2 shows the movements of real GDP growth rates before and after the currency crises during the 1970 to 1999 period. We show the movements of the sample mean of the GDP growth rate at the onset of the balance-of-payments crisis; in each of the preceding six years; and in each of the following eight years. For comparison, we include a straight line in the figure, which indicates the average GDP growth rate during the ‘non-crisis’ period that was not subject to a crisis in that specific year. We use the sample of developing countries.

We can clearly see that the growth rates show a v-type pattern during the period bordering the occurrence of a crisis. The growth rates over the six to two preceding years are comparable to those of non-crisis periods, which is about 3.9 percent in the sample of developing countries.⁹ But thereafter the growth rate starts to decline sharply and reaches the trough at the crisis year. This v pattern of real GDP adjustment over the period before and

⁸ Kaminsky and Reinhart (1999) tried to exclude the orderly large-scale nominal depreciation in hyperinflation countries by separating the sample observations in which inflation in the previous six months was higher than 150 percent.

⁹ In order to have updated data up to 2002 (and forecasts for 2003), we use GDP growth rates from IMF, World Economic Outlook database as of April 2002, rather than per capita GDP from Summers-Heston. The non-crisis average of per capita GDP growth rates is 2.1% over the sample period.

following the crisis is broadly consistent with the findings in Gupta et al. (2002), and Park and Lee (2002). At the trough, the growth rate of all crisis-hit developing countries is about 1.1 percent. But the GDP growth rate recovers its pre-crisis trend level in two or three years after the outbreak of crisis.

The quick recovery of GDP growth rates to their trend level in the crisis-hit countries is consistent with the fact that balance-of-payments crises slow down growth rates only temporarily as we found in the previous section. Thus, when an economy is hit by a crisis, it tends to recover the potential trend growth rate quickly. Therefore, the level of the trend growth rates seems to play a critical role for the adjustment pattern. However, the recessions caused by balance-of-payments crises must incur *permanent output loss* because the post-crisis *growth* rates do not exceed the pre-crisis period averages, and for this reason we cannot think of them as output movements around a long-term trend, but as periods with permanent costs in terms of output and welfare.

Figure 2 shows that the adjustment process in both East Asia and Latin America that can be inferred from the movements of the growth rates is broadly consistent with the stylized v-pattern we observe from the all crisis episodes. The mean growth rates hit the bottom at the time of the crisis or one year after the crisis, and then show the quick recovery over the following two years. A similar v-type pattern of adjustment in both East Asia and Latin American crisis episodes suggest that despite the conventional sense of structural differences between East Asia and Latin America, *the pattern of adjustment from crisis is similar everywhere.*

Although the v-shape pattern is similar, the adjustment is much sharper in East Asian crises than in Latin American crises. The deeper initial contraction following a crisis in the East Asian countries must be attributed to the severity of the 1997 East Asian crisis. Figure 3 exhibits the adjustment patterns from crises in East Asian economies. It confirms that the contraction of real income in the East Asian countries that suffered the crisis in the 1990s was a lot larger than it was in the previous decades. The five countries that were most affected by crisis, such as Thailand, Indonesia, the Philippines, Malaysia, and Korea, suffered a sharp decline of real income. In 1998, GDP growth rates of the five crisis-hit Asian countries plunged sharply from the pre-crisis average of 7.0% to the negative numbers ranging from -13.1% in Indonesia to -0.8% in the Philippines (see figure 4).

It is interesting to note the similarities across Asian countries during the crisis. As figure 4 shows, all of them followed qualitatively the same pattern, and even the figures are broadly alike. This indicates that this was a regional phenomenon. Although it is out of the scope of this paper to measure fundamental vs. self-fulfilling crisis, as well as the impact of contagion, the similarity suggests that despite having similar fundamental domestic problems, as discussed below, there were common external shocks, such as deterioration of business confidence or frantic behavior of financial markets, that explain the high correlation in the evolution of GDP.

There are several factors that contributed to the deeper contraction in the 1997 East Asian crisis. One important factor is that the 1997 East Asian crisis has an aspect of a severe liquidity crisis caused by investors' panic (see Radelet, Sachs and Lee 2001). After Thailand fell victim to a currency crisis in July 1997, there was rampant speculation that other East Asian countries might not be able to avoid currency devaluation and debt default. When foreign investors panicked, capital flows quickly reversed. Over the pre-crisis period from 1993 to 1996 the five countries had a capital-account surplus of about 7% of GDP on average. This surplus reversed to 0 in 1997 and to a deficit of 4.8 percent of GDP over the following 4 years (see Table 10). Thailand experienced a sudden reversal of about 19 percent of GDP between 1996 and 1997. This reversal was even more pronounced in terms of private capital inflows, reaching an adjustment that amounted to about 23 percent of GDP (from a net inflow of 11 percent in 1996 to a net outflow of 12 percent in 1997). Official creditors offset only in a small fraction the reversal of private capital. In Korea the capital account went from a surplus of 4.6 percent of GDP to a deficit of 1.9 percent. Net bank lending outflows amounted to 8.3 percent of GDP.

The abrupt reversal of foreign lending led the economies to a sharp liquidity crisis. The East Asian economies except Malaysia had short-term foreign liabilities larger than foreign reserves (see table 10). The balance sheets of financial institutions suffered from currency mismatch. By mid-June of 1997, the foreign liabilities of the banking sector exceeded its foreign assets, ranging from 1.3 in Korea to 6.8 in Thailand. Maturity mismatches also created another vulnerability. Korean data shows that short-term foreign liabilities of the banking sector were more than twice as large as short-term foreign assets (Park and Lee 2002). It is no wonder that the large unexpected currency depreciation and financial distress provoked deep contractions. In East Asia, the adverse impact was amplified because most firms were highly leveraged. The firms that were highly leveraged with large amounts of short-term liabilities faced more difficulties in financing and were unable to service their debts. Bankruptcies soared, and investment collapsed. In Korea investment rate dropped from 33.4 percent in 1997 to 22.0 percent in 1998.

Following the deeper initial contraction, however, the East Asian economies returned quickly to the pre-crisis trend growth in just two years. The speedy recovery confirms the typical v-type adjustment pattern. The strong recovery of the East Asian economies is also attributed to some additional factors including their export-oriented structure and swift adjustment of macroeconomic policies.¹⁰ It is one of the stylized facts from previous crisis episodes that the external sector has led the recovery and contributed to the sharp turnaround in GDP growth. A large real exchange rate depreciation following a currency crisis has a strong impact on post-crisis export growth. As the East Asian economies are more export oriented, they benefited more from their increasing export competitiveness following the substantial real exchange rate depreciation after the crisis. The level of openness in terms of the share of exports and imports in GDP ranges from 200 percent in Malaysia to 60 percent in Indonesia.

¹⁰ Park and Lee (2002) provide detailed analysis of the adjustment and recovery from 1997 East Asian crisis.

The sharp depreciation that these economies faced led to a moderate increase in inflation in 1998 and large gains in competitiveness. Thereafter, inflation subdued to pre-crisis, and even lower, levels. The only exception was Indonesia where inflation went up to 58 percent in 1998, and still 20 percent in 1999. In this high inflation environment, Indonesia was also the economy with the lowest rate of growth in the two years following the crisis (table 10).

Another special feature of the East Asia crisis is that compared to the cross-country evidence, the impact of depreciation on real output showed up as early as one year after the crisis. The large real exchange depreciation therefore restored external balance without much delay in East Asia. The flexibility in the labor market may have helped to facilitate this swift adjustment. The shift of labor resources from the non-tradables to the tradables sector was relatively easier with the flexible factor markets. The adjustment of the private sector under the changed macroeconomic circumstances tends to be much quicker. In Korea, for example, the growth rate of the nominal wage, which used to be about 10% per year, dropped sharply after the crisis. In 1998, the nominal and the real wage rate decreased by 2.5 and 10 percent, respectively. The freeze in nominal wages in Korea in 1998 was not due solely to the decline in labor demand after the crisis. It was also due to a temporary negotiation in the Tripartite Committee, which consists of representatives from the government, labor unions and employers' organizations (Lee and Rhee, 2001).

The quick improvement in East Asian exports was supported by swift adjustment of macroeconomic policies. After the onset of the crisis, implementation of tight stabilization policies as well as financial restructuring supported by the IMF reinforced the contractionary effects of the crisis.¹¹ Although tight macroeconomic policy might be unavoidable in order to stem capital outflows and to prevent depreciation-inflation spirals, their contractionary impacts were much larger than had been expected by anyone, including the IMF. Starting in the middle of 1998, the East Asian countries began to change their monetary and fiscal policy stance toward expansion. Evidence shows that easing of monetary and fiscal policy quickened the pace of recovery in the East Asian countries, particularly in Korea, Malaysia and Thailand (see Park and Lee, 2002).

The Latin American experience has been very different to that of Asia. In the last 25 years, Latin America has suffered two crisis periods. The first one was the debt crisis in the early eighties that hit most of the region about the same time and then a sequence of crises during the nineties that started with Mexico in 1994 and the aftershocks to the whole region, especially Argentina, which was able to keep convertibility but faced a financial crisis. Later on, with the Asian and subsequent Russian crisis, Brazil had a currency crisis at the end of 1999, growth in the whole region declined and finally came the crisis in Argentina. The Brazilian depreciation was one of the main, or perhaps the final, ingredients for the collapse of Argentina's convertibility in 2001.

¹¹ See World Bank (2000), Borensztein and Lee (2002), Park (2001), and Park and Lee (2002) for the detailed discussion of the process of macroeconomic adjustment and financial restructuring policies in the 1997 East Asian crisis.

The debt crisis in Latin America is the most similar to the Asian crisis in terms of its timing. Although the initial shock in each case was not the same, the causes, consequences and outcome show some similarities. In the case of Asia, the crisis started with Thailand's currency crisis. In Latin America, the beginning of the crisis is traced to August 1982, when Mexico announced that it could not meet its foreign obligations, after the sharp increase in world interest rates caused by the tightening of monetary policy by the Fed under the chairmanship of Paul Volcker.¹² It is possible to find many similarities between both crises, especially since they were both regional crises. However, what is striking when comparing figures 4 and 5, is that the evolution of the economies were very different. The extent of the collapse, the previous evolution of output, and the post-crisis recovery are quite heterogeneous in Latin America, as summarized with the four largest countries.

One important difference between the Asian crisis and the debt crisis is that in the former a large fiscal imbalance in most of the countries was the cause of the large foreign indebtedness and the further collapse. What has been highlighted in the Asian crisis, as well as the Chilean crisis of 1982 and Mexican crisis in 1994, was that its origin was not a fiscal imbalance. Indeed, of all the experiences of Table 10, only Chile (1982) and Mexico (1994) had a fiscal surplus the year before the crisis. The expanding current account deficit and the resulting increase in net foreign liabilities was mainly due to the decisions of the private sector which, faced with a liquidity squeeze, was unable to pay foreign creditors. However, as Burnside, Eichenbaum and Rebelo (2001) argue, the implicit bailout to failing banks, which actually took place, should also be considered a fiscal imbalance. This fiscal imbalance was not in the official accounts, but in the form of a contingent liability.

Chile is perhaps the closest predecessor to the crisis of the 90s. It is also interesting to note that the GDP adjustment in the 1980s in Chile has a very similar pattern to that of the Asian crisis. The causes were similar. A strong fiscal position, running a budget surplus of 2.4% of GDP in 1981, which later deteriorated significantly as a result of the bailout of banks and declining revenues stemming from recession. The current account deficit in 1981 rose to an unprecedented level of 15% of GDP. This deficit, rather than financing investment, financed basically an increase in consumption, with a sharp reduction of national savings. On the other hand, the increase in investment was mainly in non-tradables, mostly construction. This was the consequence of financial liberalization and the fixing of the exchange rate from June 1979 until June 1982. The real exchange rate appreciated and it was clearly misaligned by 1981. Starting at a value of 100 in 1978, the real exchange rate index declined (appreciated) by 36 percent until 1981, and then recovered as a result of a sharp depreciation. Since, the authorities had stated for a long time that the exchange rate was irrevocably fixed, the banking system was mismatched in terms of currencies and maturity. There was no good supervision and

¹² This is clearly a major shock, but countries like Chile, for example, were suffering an Asian-type currency crisis, which started in June 1982. For more details on the debt crisis see Edwards (1995), ch. 2.

there were clear signals that banks in trouble would be bailed out. In addition, the links between the banking system and the corporate sector increased financial fragility.¹³

The main difference between Chile and East Asia was the evolution of inflation which was at an annual 20% or more, except in the year of recession when it was 13 percent, illustrating that the decline in the rate of inflation in the year of the crisis was more linked to the fixed exchange rate and the decline in output rather than to a reduction in long-term inflation.

It is interesting to note that Chile in the 1982 crisis and Mexico in the 1994 crisis, are the two Latin American countries with a v-shape pattern of adjustment most similar to those of Asia, and similar to those of the broad evolution of GDP shown in Figure 1. One could argue that the private origin of the massive crisis with a strong initial fiscal position may allow for an orderly, although costly, resolution of the financial crisis.

Except in the case of Colombia, short-term debt was usually a problem in Latin America, where short-term liabilities were from 2 to 6 times larger than reserves, and hence faced serious liquidity problems.

In addition, the sharp depreciation that these countries experienced after the crisis may have helped them to recover more quickly, as also happened in Asia. Indeed, comparing the debt crisis in Latin America, Edwards (1995) shows that between 1982 and 1987 Chile's depreciation was about 90%, while in Argentina, Brazil and Mexico it was in the order of 20-30%. In addition, in the late 1980s the inflationary problems of Argentina and Brazil led them to adopt heterodox disinflation policies, which boiled down to price controls without fiscal adjustment, and as expected, they were a complete failure, a final touch to the lost decade.

Latin America during the nineties has suffered from currency crises, but their timing is not the same, the characteristics are not the same, neither are their causes. Therefore, when examining the growth experience, it is difficult to attribute them to a common cause, such as the implementation of reforms, as those who argue against reform would support, or to a bad external environment.

The first crisis of the 90s started with Mexico's tequila crisis, which then dragged Argentina into a financial crisis. Argentina was able to keep convertibility, at a severe cost in terms of output. Both countries followed a v-shape adjustment. However, Argentina recovered until 1998, but concurrently with the Asian crisis started the deterioration of economic conditions again, which led to the collapse of convertibility in 2001. Brazil and Chile were also hit hard by external conditions. Brazil, after struggling to avoid a currency crisis, had one after the Russian crisis--which is singled out as the most proximate cause of Brazil's crisis--at the end of 1999. If we consider currency depreciation and loss of reserves, Chile did not have a currency crisis in the late 90s. But, the interest rate defense to strong currency pressures in 1998 would, in a broader

¹³ It is also interesting to note, as emphasized by Edwards (1999), Chile had capital controls in 1982, more stringent than the famous controls of the nineties, but this did not avoid the currency crisis.

definition, makes that episode close to a currency crisis. In Argentina, as a result of the appreciation of the dollar in international markets, its dollar-pegged currency and the depreciation of Brazil's real there was growing pressure on Argentina's peso, which finally collapsed in December 2001. Since the late 90s all Latin American countries have been struggling to return to higher growth, but as shown in the previous section, their growth prospects are definitely lower than Asia's.

By contrast, the quick turnaround of the East Asian economy from the 1997 crisis has brightened the region's economic prospects. As the recovery continues in East Asia, these economies seem to return to sustained growth. Despite the impressive record of the recovery, however, not everyone is confident about East Asia's future prospects. The long-term sustained growth in East Asia is no guarantee that the countries will not be susceptible to a severe crisis again. Asian countries still face challenges to increase resilience to crisis, especially in the financial sector.

5. Determinants of Output Cost of Crisis

In this subsection, we formally investigate the factors that determine the magnitude of output losses accompanying a crisis. We examine which kind of initial conditions, policy reactions and external conditions help to reduce the cost of crisis.

We measure the output cost of a crisis by the cumulative loss in output growth during the period from the year when the crisis began until the time when output growth returned to its trend.¹⁴ As a first step, we define the period of crisis as three years—the crisis year and the following two years. Therefore, the output cost of each crisis episode is calculated as follows:

$$\text{output cost} = \sum_{i=0}^2 (\text{trend} - \text{GDP growth}_{t+i}),$$

where t indicates the year in which a crisis occurred. The variable *trend* represents the trend GDP growth rate. This trend is calculated using the average GDP growth rate

¹⁴ This measure must be viewed as an indicator of output losses associated with a crisis, but not necessarily caused by the crisis. Lower output growth during recession may trigger a balance-of-payments crisis, which in turn aggravate the recession. IMF (1998) and Eichengreen and Bordo (2001) have used the same output cost to measure the cost of crises. In the latter case, the output loss is measured until output returns to trend, whereas we fix a 3-year period. The figures, however, yield similar results for the output cost of a crisis, since the recovery time is about 2 to 4 years. Alternatively, the output cost of a crisis can be measured by the cumulative loss in output during the crisis years. In order to construct this, we need to have the measure of potential output. If we assume that the potential output of each country increases from the pre-crisis equilibrium by the rate of the non-crisis trend growth, we have constructed the potential output over the 3 years following a crisis and measured the output cost of a crisis by the sum of log differences between the potential output and potential output over the three years. The estimation results based on this cost measure, which can be provided upon request to the authors, are very similar to those reported in this section.

during the “non-crisis” period that is, a year in which the country was not subject to a crisis and the preceding two years. So for each country this is the average rate of growth during the non-crisis year, where crisis consists of a 3-year period.¹⁵

According to this definition, the average output cost per crisis from 1970 to 1999 was about 5.8 percentage points for an average developing country. Note that this figure is consistent with our estimations of section 3, where we found that a crisis reduces growth by 1.7% per annum during a five-year period. Since we identify the crisis for three years this is about 5% less output. However, the standard deviation of the output cost of crisis is considerably large: 11 percentage points. This implies that each crisis episode had different characteristics in terms of its origin, evolution, and policy responses. In fact, not every crisis episode was associated with output loss: it turned out that output was expansionary in about 30 percent of all crisis episodes. A well-known case is the crisis of the European Monetary System in 1992, where most countries hit by the crisis grew strongly afterwards. During the same period from 1970 to 1999, the average output cost was about 8.9 percentage points on average for Latin American crises and about 10.4 percentage points for an average East Asian crisis for Latin American countries an average developing country

We believe there are a large number of factors that brought about the differences in output cost in the crisis-hit countries. Nature of the shock, initial conditions, external environments, and policy responses must influence the behavior of output following a crisis. For the purpose of our empirical investigation we classify those factors into two broad categories— pre-crisis and post-crisis factors.

Regarding the pre-crisis factors we include (i) pre-crisis GDP growth rate, (ii) international liquidity, measured by an indicator of reserve adequacy, and (iii) banking sector soundness. Real GDP growth rate prior to the crisis can provide information about the degree of imbalances in an economy; in particular we focus our attention on GDP growth compared to its trend rate of growth. If an economy has high GDP growth rate with respect to trend prior to a crisis it is likely to be in an over-expansion, and therefore the crisis will not only have traditional disruptive effects on economic activities, but will also help to bring output closer to its normal levels. For example, previous studies have shown that lending booms and excessive credit expansion during the pre-crisis periods tended to deepen the post-crisis recession and reduce growth (De Gregorio and Guidotti, 1995, and Sachs, Tornell, and Velasco, 1996). In addition, high-growth countries may be more vulnerable to a severe shock, thereby having a larger output loss following a crisis.

Adequate international liquidity of an economy is also important to dampen the shock of a currency crisis. Lack of foreign reserves has often resulted in a sharp liquidity crisis and a deep contraction of real output. As a measure of international liquidity, we use the size of foreign reserves relative to broad money supply (M2). We also consider the ratio of

¹⁵ For an alternative measure of the trend growth rate, we have considered the predicted growth rate coming from the specification 1 of table 3 in section 3. The estimation results based on this measure are broadly similar to those reported in this section. But, the sample size becomes much smaller.

foreign reserves to short-term foreign debt as an alternative measure.

A sound banking sector is also important to prevent illiquidity. The vulnerability of the banking sector often magnifies a shock. In particular, when a currency crisis is associated with a systematic banking crisis, it becomes more costly. These are the “twin crises” that exacerbate the costs of currency crises. Indeed, one mechanism through which currency crisis harms the economy is the balance sheet effects on the corporate and the banking sectors due to maturity and currency mismatches, very common in the East Asian crisis of 1997 and in many of the Latin American experiences. Hence, we include a banking crisis variable as an important factor that affects the severity of the balance-of-payments crisis. The data on banking crises are compiled from Caprio and Klingebiel (1996), Demirguc and Detragiache (1998), and Glick and Hutchison (2001), who documented the episodes of bank insolvencies based on both quantitative and qualitative criteria. The dummy for banking crises is an episode that a currency crisis in a specific year was preceded by a banking crisis during the previous two years or followed by a banking crisis in the next two years.

Regarding post-crisis factors, there are a number of characteristics that can affect the costs of a crisis. Following the discussion of the East Asian and Latin American experiences in the previous section, we consider that the important post-crisis factors include (i) world GDP growth, (ii) real exchange rate depreciation, and (iii) macroeconomic policies.

A global economic environment is important to the post-crisis adjustment of crisis-hit countries. Strong world growth has a positive effect on export growth and helps the crisis-hit countries to recover quickly, by improvements in terms of trade and increasing market access for their exports. The size of initial real exchange depreciation following a crisis can also influence export and output growth in the post-crisis period. It is important to distinguish a nominal from a real depreciation, and indeed, it must not be automatically assumed that letting the currency weaken will necessarily result in a real depreciation. However, evidence suggests that after a currency crisis occurs, the pass-through from exchange rate to inflation is relatively small, but some suitable domestic conditions are needed.¹⁶

Macroeconomic adjustment policies implemented by the government for crisis management are also an important factor for the post-crisis recovery of real output. Fiscal and monetary policies can play a critical role in fostering the recovery, and of course, they have been at the center of many policy discussions on the appropriate mix to adjust efficiently to currency crisis. For example, during the Asian crisis a major issue of discussion was the role of expansionary fiscal policy and the need to tighten monetary policy at the beginning of the crisis in order to establish credibility and avoid excessive currency depreciation.¹⁷ It is out of the scope of this paper to analyze the very short-term

¹⁶ Borenzstein and De Gregorio (1999) for example show that the pass-through is smaller in countries that had low inflation previous to the currency crisis.

¹⁷ See Fischer (1998) and Stiglitz (2002) for contrasting views.

policy reaction to a crisis, since this framework allows us to shed light on the overall policy stance during the period and its impact on recovery.

To the extent that the relevant data are available, we carry out an empirical assessment of the factors determining the output cost of balance-of-payments crises. Using the complete data from 1975 to 1998, we set up a basic equation as follows (a subscript s~v, means average for the period from s to v):

$$(2) \quad \text{output cost}_{t \sim t+2} = \mathbf{b}_0 + \mathbf{b}_1 \cdot \text{pre-crisis growth}_{t-2 \sim t-4} + \mathbf{b}_2 \cdot [\text{foreign reserve}/M2]_{t-1} \\ + \mathbf{b}_3 \cdot \text{banking crisis}_{t-2 \sim t+2} + \mathbf{b}_4 \cdot \text{trade partners' growth}_{t \sim t+2} + \mathbf{b}_5 \cdot \text{real depreciation}_t \\ + \mathbf{b}_6 \cdot \text{money growth}_{t \sim t+2} + \mathbf{b}_7 \cdot \text{budget balance}_{t \sim t+2} + e_t$$

where e is the random disturbance term.

Table 11 provides the estimation results. We have also included dummies for the decades of 1980s and 1990s in order to control unobserved period-specific shocks.

Column 1 shows that all explanatory variables enter with expected signs. We find a strong and statistically significant positive relation between the pre-crisis GDP growth and the output cost of a crisis. This can imply that a country with high growth relative to its trend, that is an economy that is overheating, prior to a crisis tends to have larger decline in GDP growth over the three years following the crisis. The estimated coefficient (0.660, s.e.=0.253) implies that one-percentage-point higher growth rate in the pre-crisis period tends to increase the accumulated output cost by about 0.7 percentage points in the crisis-hit economy. As expected, the crisis tends to eliminate, although not completely, this “excess growth.”

Adequate international liquidity, which is measured as a ratio of foreign reserve to money supply, prior to a crisis is estimated to decrease the output cost of the crisis. The estimated coefficient is negative and statistically significant at the 5 percent level. The estimated coefficient (-0.146, s.e.=0.042) implies that a 25 percentage point increase (standard-deviation) in the foreign reserve-to-M2 ratio lowers the output cost by about 3.6 percentage points.

A dummy variable for the occurrence of banking crises is positive and statistically significant. The estimated coefficient (0.076, s.e. = 0.020) implies that when a balance-of-payments crisis is accompanied by a banking crisis, the output loss increases substantially by 7.6 percentage point. Roughly, we could say that on average a twin crisis is almost like two currency crises in terms of output costs.

The results also show that several factors in the post-crisis period have strong effects on output cost. The world growth variable, which is an average of GDP growth rates of a crisis-hit country’s trading partners weighted by its trade share, turns out to have a

significant effect on crisis cost. The estimated coefficient (-2.74, s.e.=0.96) implies that a one percentage point increase in world GDP growth rate per year is associated with about 2.7 percentage points decline in output cost of the crisis over the three years following the crisis. Note that the size of the coefficient in terms of annual growth rate is closer to one, since a one percentage point rise in world growth reduces the costs in terms of output by 2.7 percentage points over three years.

The results also confirm that real exchange depreciation helps to reduce the output cost.¹⁸ The estimated coefficient on real exchange depreciation variable is negative and statistically significant at the 5 percent level. The estimated coefficient (-0.035, s.e.=0.016) shows that a real exchange depreciation of 70 percentage points (its standard deviation) lessens the decline of GDP growth rate by about 2.4 percentage points over the three years after the crisis.

Column 1 includes average growth rates of real money supply as the macroeconomic policy variable. The monetary policy variable turns out to have significant effects on the output cost of crisis. The estimated coefficient (-0.129, s.e.=0.066) implies that a 10 percentage point increase in real money supply over the post-crisis period leads to a 1.3 percentage point drop in the output cost. Hence, post-crisis expansionary monetary policy helps to alleviate the output cost of a crisis.

In contrast to the positive and significant contribution of monetary policy, fiscal policy turns out to have a negligible effect on the cost of currency crisis. In column 1, we add the budget balance variable as a measure of fiscal policy stance. The estimated coefficient for budget balance variable is positive, suggesting that fiscal deficit tends to lower the output cost, but it is statistically insignificant.

The dummy variables, although significant, conform the presumption that the crises of the 1980s were more costly. By comparing the parameter estimates, the higher cost of a crisis in the 1980s is about half percent of GDP.

Column 2 uses the ratio of foreign reserves to short-term debt as an alternative measure of international liquidity. This measure also has a negative relationship to the output cost of the crisis, and the estimated coefficient is marginally statistically significant at the 10% level.

Column 3 concerns the possible endogeneity problem of monetary growth. The negative correlation between real money supply growth and output cost may come from the positive effect of output growth on money demand, and an accommodation from the supply-side, rather than the reverse. In order to avoid this problem, we use the growth of the real money-to-GDP ratio (M/PY), the inverse of velocity, as a measure of expansionary monetary policy. We still find that expansionary monetary policy tends to

¹⁸ Note that the variable is the rate of real depreciation in the first year of the crisis, which can be less subject to the problem of reverse causality.

lower the output cost of crisis. However, the estimated coefficient (-0.046, s.e.=0.071) is not statistically significant.¹⁹

In sum, the results suggest that adequate international liquidity, real exchange rate depreciation and sound banking system play a critical role in avoiding severe shocks from a crisis. A good external environment also speeds up recovery, limiting the cost of crisis. We have also found some relevant effects of expansionary monetary policy in dampening the crisis cost, but no significant effect of fiscal policy.

However, this does not have a straightforward implication for macroeconomic policies. In many cases, countries attempting to conduct expansionary macroeconomic policies may not be able to. For example, the procyclicality of fiscal policy in Latin America occurs due to the inability of government to borrow during bad times (Perotti and Gavin, 1997). Along the same lines, a central bank that lacks credibility may end up being unable to conduct an expansionary, non-inflationary monetary policy. Therefore, the result could also be due to the institutional capability of countries to implement countercyclical macroeconomic policies. What our results show is that in past experiences of currency crisis, monetary policy has been more effective in alleviating their output costs.

6. Conclusions

We have compared the experience of growth performance and macroeconomic adjustment between East Asia and Latin America. We have focused the analysis on 9 East Asian economies and 21 in Latin America. The cross-country regression highlights the role of investment, human resources, fertility, and institutional and policy factors that have made the potential growth rate of East Asia higher than that of Latin America over the 1970-2000 period.

We find that convergence effects due to the difference in initial income or external shock to terms of trade did not play a quantitatively important role in explaining lower growth in the Latin American region. This finding is important since the rationale for the inward looking trade strategy followed in Latin America since the 60s was based on the belief that Latin America would suffer from deteriorating terms of trade, which ex-post proved to be wrong. In this respect, among policy and institutional factors the most important difference between Latin America and East Asia has been the larger degree of openness of the latter. Balance-of-payments crisis shocks have contributed to the differences of growth performance across regions, although this difference shrank during the 90s as a result of the Asian crisis of 1997.

¹⁹ Fiscal balance can be also procyclical and thereby subject to the possible endogeneity problem. But, the positive estimated coefficient on fiscal balance implies that this endogeneity problem is of little concern. We also used the ratio of real government consumption to GDP as a measure of fiscal policy stance. Since government expenditure is considered to be less elastic to the cycle than revenues, the potential endogeneity problem would be smaller. The government consumption variable also turns out to be statistically insignificant.

Low investment rates in Latin America were also important in explaining the differences with East Asia. In addition, high fertility rates, low quality of human resources, mainly in terms of schooling, high government consumption, and low indices for the rule of law, are all factors that have contributed to the low growth in Latin America vis-à-vis East Asia.

The quality of education, measured by results in international test scores, also shows Latin America substantially behind Asia. However, we cannot estimate its quantitative impact due to the lack of long time series, and this is an issue that deserves further examination.

Another important difference across regions is income distribution. We report some preliminary evidence, which suggests that some of the differences of institutions and policies are the results of the differences in income distribution. This is the case of fertility, government consumption, secondary school enrollment and rule of law.

Using the regression results we estimate growth prospects for both regions and find that the differences should decrease, due to a large extent to an unfavorable convergence effect for Asia, but also due to some progress made in institutions and policies. There still remains a significant gap in terms of investment, fertility, schooling and openness. In any event, Latin America is predicted to grow on a per-capita basis at an average of 2.3% during this decade, while East Asia could grow at 3.8%.

We also analyze the pattern of recession and recovery from balance-of-payment crises and find that the adjustment process in both East Asia and Latin America is broadly consistent with the stylized v-pattern we observe in all crisis episodes around the world. However, one characteristic that differentiates some Latin American countries from Asia, is the addiction of the former to get out of one crisis only to fall into another. This recurrence of balance-of-payment crisis still needs further explanations. One exception has been the Chilean case, which in the 80s suffered a crisis very similar to those of Asian economies in 1997. Although the origins may have been different, the crisis occurred simultaneously with a severe banking crisis. But, they also occurred with sound fiscal policy and the exchange rate declined sharply. In addition, the Chilean economy as well as Asian economies is sufficiently open to recover through export expansion.

We look at a sample of 81 episodes in order to identify factors that could reduce the output cost of crisis. As an external factor we find that a good international environment reduces the costs. At the other extreme we find that sound banking is very important, since the output costs of twin-crisis (balance of payments plus banking) is about twice the cost of balance-of-payment crisis alone. In addition, having international liquidity before the crisis, measured by international reserves as a ratio of M2, reduces the cost of crisis. In terms of policy response, our results indicate that a real exchange rate depreciation and expansionary monetary policy help in the recovery, while fiscal policy has no effects. Further work could try to uncover the conditions that generate effective expansionary

macroeconomic policies to increase resilience to bad external environment and to improve the quality of the adjustment.

For example, in terms of achieving real exchange rate and relative price adjustment, real wages must generally fall. The wage agreements achieved in Korea were important to achieve this goal. Again, we suspect the differences in income inequality across regions may affect the likelihood of reaching such agreements. This could also help to explain the lack of full adjustment in Latin America, which paves the way for the next crisis, or for muddling through.

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Table 1: Economic Growth in East Asia and Latin America

	GDP per capita			Average Annual per capita GDP Growth					
	1960	2000	2000/ 1960	1960- 1970	1970- 1980	1980- 1990	1990- 2000	1960- 2000	1970- 2000
China	682	3747	5.50	1.79	2.72	5.14	7.41	4.26	5.09
Hong Kong	3090	26703	8.64	7.45	6.59	5.04	2.48	5.39	4.70
Indonesia	936	3637	3.89	1.50	5.56	4.08	2.45	3.40	4.03
Korea	1495	15881	10.62	5.97	5.68	7.32	4.67	5.91	5.89
Malaysia	2119	9937	4.69	3.08	5.26	2.92	4.19	3.86	4.12
Philippines	2015	3424	1.70	1.73	3.17	-0.89	1.30	1.33	1.19
Singapore	2161	27186	12.58	8.93	7.76	4.48	4.16	6.33	5.47
Taiwan	1430	18718	13.09	6.68	7.44	6.27	5.36	6.44	6.35
Thailand	1091	6857	6.28	5.13	4.05	5.71	3.50	4.60	4.42
<i>EAST ASIA (9) Av.</i>	<i>1669</i>	<i>12899</i>	<i>7.44</i>	<i>4.69</i>	<i>5.36</i>	<i>4.45</i>	<i>3.95</i>	<i>4.61</i>	<i>4.58</i>
Argentina	7371	10995	1.49	2.29	1.38	-3.87	4.22	1.00	0.57
Bolivia	2354	2722	1.16	0.60	2.01	-2.22	1.08	0.37	0.29
Brazil	2371	7185	3.03	4.23	5.67	-0.26	1.46	2.77	2.29
Chile	3853	9920	2.57	2.19	1.22	1.28	4.79	2.37	2.43
Colombia	2530	5380	2.13	2.23	3.11	1.35	0.87	1.89	1.78
Costa Rica	3476	5863	1.69	1.85	2.59	-0.94	1.75	1.31	1.13
Dominican Republic	1695	5271	3.11	1.75	3.69	0.80	5.12	2.84	3.20
Ecuador	2004	3467	1.73	1.35	6.16	-1.17	-0.85	1.37	1.38
El Salvador	3310	4435	1.34	2.24	0.05	-1.66	2.30	0.73	0.23
Guatemala	2344	3914	1.67	2.44	3.05	-1.21	0.84	1.28	0.90
Haiti	1065	1658	1.56	-1.03	1.78	-2.50	6.51	1.19	1.93
Honduras	1700	2054	1.21	0.91	2.03	-0.25	-0.82	0.47	0.32
Jamaica	2746	3692	1.34	3.43	-1.14	1.72	-1.05	0.74	-0.16
Mexico	3980	8766	2.20	3.28	3.27	-0.43	1.78	1.97	1.54
Nicaragua	2877	1767	0.61	3.25	-2.70	-3.00	-2.42	-1.22	-2.71
Panama	2325	6066	2.61	4.98	3.35	-0.69	1.96	2.40	1.54
Paraguay	2425	4682	1.93	1.70	4.46	1.01	-0.58	1.64	1.63
Peru	3228	4583	1.42	3.73	0.45	-3.13	2.47	0.88	-0.07
Trinidad & Tobago	4370	11148	2.55	4.10	3.77	-0.90	2.43	2.35	1.76
Uruguay	5874	9613	1.64	0.43	2.70	-1.00	2.81	1.23	1.50
Venezuela	7841	6420	0.82	2.95	-2.79	-1.36	-0.80	-0.50	-1.65
<i>Latin America (21) Av.</i>	<i>3321</i>	<i>5695</i>	<i>1.81</i>	<i>2.33</i>	<i>2.10</i>	<i>-0.80</i>	<i>1.61</i>	<i>1.29</i>	<i>0.94</i>
Japan	4545	24672	5.43	9.27	3.09	3.53	1.05	4.23	2.55
USA	12273	33308	2.71	2.87	2.66	2.16	2.30	2.50	2.37
<i>World (85) Average</i>	<i>3823</i>	<i>7503</i>	<i>1.96</i>	<i>2.53</i>	<i>1.99</i>	<i>0.98</i>	<i>1.32</i>	<i>1.70</i>	<i>1.43</i>

Note: Per capita GDP levels and growth rates are based on 1996 international (purchasing power parity adjusted) prices, based on the Penn World Tables 6.1.

Source: Heston, Summers, and Aten (2002).

Table 2. Summary of Key Variables by Region, 1970-75 and 1995-2000 periods (Unweighted average)

	All countries (N=85)	East Asia (N=9)	Latin America (N=21)
		<u>1970-1975 Period</u>	
Per capita GDP growth	0.025	0.048	0.021
Per capita GDP in 1970	5472	2922	4273
Investment/GDP	0.190	0.216	0.145
Fertility rate in 1970	4.9	4.8	5.5
Schooling in 1970	1.21	1.37	0.83
Life expectancy in 1970	64.0	64.8	65.1
Government consumption /GDP	0.094	0.050	0.102
Rule-of-law index	0.560	0.611	0.381
Inflation	0.127	0.105	0.202
Democracy index	0.516	0.346	0.479
Openness	-0.006	0.324	-0.147
Terms of trade	-0.021	0.003	-0.009
Balance-of-payments crisis	0.26	0.22	0.29
		<u>1995-2000 Period</u>	
Per capita GDP growth	0.018	0.025	0.011
Per capita GDP in 1995	9205	11291	5301
Investment/GDP	0.168	0.270	0.150
Fertility rate in 1995	3.2	2.2	3.2
Schooling in 1995	2.43	3.17	1.81
Life expectancy in 1995	68.9	71.8	70.7
Government consumption /GDP	0.077	0.071	0.106
Rule-of-law index	0.707	0.781	0.559
Inflation	0.080	0.044	0.114
Democracy index	0.680	0.500	0.732
Openness	-0.022	0.689	-0.207
Terms of trade	-0.012	0.006	-0.012
Balance-of-payments crisis	0.24	0.56	0.14

Notes: see next page.

Notes to Table 2

The sample consists of the 85 countries that are used in the regressions in table 3. Per capita GDP levels and growth rates are based on 1996 international (purchasing power parity adjusted) prices, based on the World Tables 6.1, as described in Summers and Heston (1991) and Heston, Summers, and Aten (2002).

Schooling data is the average years of male secondary and higher schooling from Barro and Lee (2001). The investment ratio is the ratio of real investment (private plus public) to real GDP, based on the World Tables 6.1, averaged over the period. The government consumption measure is the ratio of real government consumption (exclusive of spending on education and defense) to GDP, based on the World Tables 6.1. The rule-of-law index, expressed on a zero-to-one scale, with one being the most favorable, is based on the *International Country Risk Guide's* maintenance of the rule of law index. The inflation rate is the growth rate over each period of a consumer price index. The democracy index, expressed on a zero-to-one scale, with one being the most favorable, is based on the indicator of political rights compiled by Freedom House. The openness variable is the ratio of exports plus imports to GDP, filtered for the estimated effects on this measure from the logs of population and area. The growth rate of the terms of trade is the change of export over import prices over the period. The balance-of-payments-crisis variable is described in the notes to table 7. The nine East Asian economies are: China, Hong Kong SAR, Korea, Singapore, Taiwan, Thailand, Malaysia, Indonesia, and the Philippines. The 21 Latin American countries are listed in table 1.

Table 3. Cross-Country Panel Regressions for Per Capita GDP Growth Rate

	(1)	(2)	(3)	(4)
Log (per capita GDP)	-0.0236 (0.0036)	-0.0251 (0.0036)	-0.0270 (0.0039)	-0.0224 (0.0036)
Investment/GDP	0.0723 (0.0272)	0.0560 (0.0274)	0.0558 (0.0270)	0.0497 (0.0280)
Log (total fertility rate)	-0.0180 (0.0058)	-0.0151 (0.0060)	-0.0153 (0.0064)	-0.0132 (0.0060)
Male upper-level schooling	0.0021 (0.0017)	0.0029 (0.0017)	0.0031 (0.0018)	0.0019 (0.0017)
Log (life expectancy)	0.0546 (0.0209)	0.0653 (0.0214)	0.0614 (0.0237)	0.0661 (0.0225)
Government consumption/GDP	-0.0723 (0.0272)	-0.0722 (0.0239)	-0.1068 (0.0267)	-0.0646 (0.0238)
Rule-of-law index	0.0178 (0.0074)	0.0179 (0.0075)	0.0184 (0.0084)	0.0161 (0.0075)
Inflation rate	-0.0284 (0.0080)	-0.0129 (0.0090)	-0.0077 (0.0090)	-0.0144 (0.0091)
Democracy index	0.0556 (0.0183)	0.0599 (0.0188)	0.0562 (0.0212)	0.0555 (0.0190)
Democracy index squared	-0.0456 (0.0171)	-0.0472 (0.0175)	-0.0387 (0.0196)	-0.0422 (0.0179)
Openness measure	0.0072 (0.0045)	0.0086 (0.0046)	0.0112 (0.0049)	0.0038 (0.0046)
Growth rate of terms of trade	0.0312 (0.0229)	0.0346 (0.0233)	0.0558 (0.0270)	0.0307 (0.0234)
Balance-of-payments crisis	--	-0.0165 (0.0053)	-0.0168 (0.0058)	-0.0161 (0.0051)
Lagged balance-of-payments crisis	--	--	0.0061 (0.0056)	--
Group of 9 East Asian countries	--	--	--	0.0106 (0.0056)
Group of 21 Latin American countries	--	--	--	-0.0033 (0.0041)
No. of countries	85	85	85	85
No. of observations	464	464	391	464

Notes: see next page.

Notes to Table 3

The system has six equations, corresponding to the periods 1970-75, 1975-80, 1980-85, 1985-90, 1990-95, and 1995-2000. Column 3 omits the 1970-1975 period in order to include the lagged value of the balance-of-payments-crisis variable. The dependent variables are the growth rates of per capita GDP. Data on GDP are from Penn-World Tables version 6.1.

The log of per capita GDP, the average years of male secondary and higher schooling, and the log of life expectancy at age one are measured at the beginning of each period. The ratios of government consumption and investment to GDP, the inflation rate, the total fertility rate, the growth rate of the terms of trade, and the democracy index are period averages. The rule-of-law index is the earliest value available (for 1982 or 1985) in the first three equations and the period average for the other equations. The openness variable is the period average.

Estimation is by three-stage least squares. Instruments are the actual values of the variables for schooling, life expectancy, openness, and the terms of trade; dummy variables for Spanish or Portuguese colonies and other colonies (which have substantial explanatory power for inflation); lagged values of the log of per capita GDP, the government consumption ratio, and the investment ratio; and the initial values for each period of the rule-of-law index and democracy index. In the first two equations, the instrument for the rule-of-law indicator is its values for 1982 or 1985. The initial values of foreign reserve-import ratio are used as an instrument for balance-of-payments crisis. Individual constants (not shown) are included for each period. Standard errors of the coefficient estimates are shown in parentheses.

Table 4. Contributions to Growth Differentials Between East Asia and Latin America, 1970-2000 (percent, annual average)

	Contributions to the difference in per capita GDP growth of East Asia relative to Latin America			
	1970-80	1980-90	1990-2000	1970-2000
<u>Difference in</u>				
<i>Actual Growth</i>	3.26	5.33	2.29	3.62
<i>Predicted Growth</i>	<u>3.40</u>	<u>3.97</u>	<u>1.87</u>	<u>3.08 (100%)</u>
<u>Initial Income</u>	<u>0.91</u>	<u>-0.05</u>	<u>-1.28</u>	<u>-0.14 (-4.5%)</u>
<u>Investment Rate</u>	<u>0.43</u>	<u>0.65</u>	<u>0.73</u>	<u>0.60 (19.6%)</u>
<u>Fertility</u>	<u>0.31</u>	<u>0.56</u>	<u>0.63</u>	<u>0.50 (16.3%)</u>
<u>Human Resources</u>	<u>0.14</u>	<u>0.28</u>	<u>0.45</u>	<u>0.29 (9.4%)</u>
Schooling	0.17	0.20	0.34	0.24
Life Expectancy	-0.03	0.08	0.11	0.05
<u>Institutions and Policy</u>	<u>1.46</u>	<u>1.95</u>	<u>1.29</u>	<u>1.57 (50.8%)</u>
Government Consumption	0.40	0.32	0.22	0.31
Rule of Law	0.41	0.32	0.37	0.37
Inflation Rate	0.16	0.55	0.22	0.31
Democracy	0.04	0.12	-0.27	-0.04
Openness	0.45	0.65	0.75	0.62
<u>Terms of trade</u>	<u>0.01</u>	<u>0.04</u>	<u>0.02</u>	<u>0.02 (0.7%)</u>
<u>Balance-of-payments Crisis</u>	<u>0.14</u>	<u>0.54</u>	<u>0.04</u>	<u>0.24 (7.8%)</u>

Note: Our sample includes the nine East Asian economies and 21 Latin American countries listed in table 1. The predicted per capita growth rate is based on the estimation result of column (2) in table 3.

**Table 5. Contributions to Growth Differentials of Latin American countries relative to the East Asian Average, 1970-00
(Percent, annual average)**

Country	Difference in ¹		Contributing Factors											
	Actual growth	Predicted Growth	Initial income	Investment	Fertility	Human Resource ²	Institutions and Policy Variables						Terms -of- Trade Shock	Balance -of- Payments Crisis
							Total	Governt. Consump	Rule of Law	Inflation	Democracy	Openness		
Argentina	4.00	4.70	1.8	0.40	0.06	0.18	1.89	0.02	0.24	1.03	-0.14	0.73	0.02	0.7
Brazil	2.28	4.61	0.6	0.21	0.25	0.32	2.12	0.69	0.04	1.15	-0.33	0.57	0.08	0.9
Chile	2.14	2.62	0.5	0.54	-0.01	0.04	1.30	0.36	-0.23	0.39	0.23	0.56	0.12	0.4
Colombia	2.79	2.37	-0.1	0.72	0.30	0.22	1.41	0.24	0.65	0.16	-0.29	0.64	0.02	-0.2
Dominican Republic	1.37	0.84	-1.1	0.61	0.53	0.33	0.70	0.06	0.19	0.09	-0.24	0.59	0.03	-0.2
Haiti	2.64	2.79	-3.7	1.09	0.89	0.46	3.06	0.56	0.87	0.06	0.74	0.83	0.03	-0.2
Mexico	3.03	3.19	1.1	0.37	0.56	0.17	0.46	-0.10	0.12	0.27	-0.37	0.54	0.03	0.7
Panama	3.03	2.16	0.2	0.24	0.32	0.04	1.83	0.47	0.60	-0.05	0.31	0.50	-0.01	-0.2
Peru	4.64	4.14	0.0	0.43	0.59	0.04	2.02	-0.12	0.58	0.79	0.11	0.66	0.07	0.7
Venezuela	6.22	2.81	1.4	0.43	0.47	0.23	0.57	-0.18	0.09	0.19	-0.07	0.55	-0.18	0.1
21 Latin American countries	3.62	3.08	-0.1	0.60	0.50	0.24	1.57	0.31	0.37	0.31	-0.04	0.62	0.02	0.2

Notes: ¹ Difference between each country's (predicted) per capita growth rate and the (predicted) average growth rate of 9 East Asian countries over the 1970-2000 period.

² Human resources include schooling and life expectancy variables.

Table 6. Growth Prospects for East Asia and Latin America, 2001-2010

<u>Predicted per capita GDP growth, 2001-2010</u>	
East Asia	3.78
Latin America	2.34
<i>Difference in predicted growth</i>	<i>1.44</i>
<u>Predicted per capita GDP in 2010</u> <i>(ratio to per capita GDP in 2000)</i>	
East Asia	19092 (1.48)
Latin America	7073 (1.24)
<u>Contributions to the difference in per capita GDP growth of East Asia relative to Latin America</u>	
<u>Initial Income</u>	<u>-1.66</u>
<u>Investment Rate</u>	<u>0.67</u>
<u>Fertility</u>	<u>0.59</u>
<u>Human Resources</u>	<u>0.56</u>
Schooling	0.40
Life Expectancy	0.16
<u>Institutions and Policy</u>	<u>1.26</u>
Government Consumption	0.26
Rule of Law	0.34
Inflation Rate	0.09
Democracy	-0.19
Openness	0.77
<u>Terms of Trade</u>	<u>0.02</u>

Notes: The projection assumes that all countries maintain the policies recorded in 2000. Per capita GDP levels and growth rates are based on 1996 international prices, based on the Penn World Tables v.5.6. The projected growth rates for 2001-2010 are obtained by multiplying 2000 values (or the 1995-99 period average) of explanatory variables by the estimated coefficients in the panel regression of column (2) in table 3. Terms-of-trade shocks are assumed to be equal to those in the 1990s. We have assumed no balance-of-payments crisis.

Table 7. International Tests in Mathematics and Science

Country	Mathematics		Science	
	IAEP, 1991	TIMSS, 1994-95	IAEP, 1991	TIMSS, 1994-95
Australia		49.8		50.4
Austria		50.9		51.9
Belgium		53.3		48.5
Brazil	34.7		49.6	
Bulgaria		51.4		56.5
Canada	62	49.4	68.8	49.9
China	80.2		67.2	
Colombia		36.9		38.7
Cyprus		44.6		42
Czech Republic		52.3		57.4
Denmark		46.5		43.9
France	64.2	49.2	68.6	45.1
Germany		48.4		49.9
Greece		44		44.9
Hong Kong		56.4		49.5
Hungary	68.4	50.2	73.4	51.8
Iceland		45.9		46.2
Iran, I.R. of		40.1		43.6
Ireland	60.5	50	63.3	49.5
Israel	63.1		69.7	
Italy	64		69.9	
Japan		57.1		53.1
Jordan	40.4		56.6	
Korea	73.4	57.7	77.5	53.5
Latvia		46.2		48.5
Lithuania		42.8		47.6
Mozambique	28.3			
Netherlands		51.6		51.7
New Zealand		47.2		48.1
Norway		46.1		48.3
Portugal	48.3	42.3	62.6	42.8
Romania		45.4		48.6
Russian Federation	70.2	50.1	71.3	53.8
Singapore		60.1		54.5
Slovak Republic		50.8		54.4
South Africa		34.8		31.7
Spain	55.4	44.8	67.5	47.7
Sweden		47.7		48.8
Switzerland	70.8	50.6	73.7	48.4
Taiwan	72.7		75.6	
Thailand		49.5		49.3
United Kingdom	60.6	47	68.3	49
United States	55.3	47.6	67	50.8
Yugoslavia	57.1	49.8	70.3	53

Notes: The data are average test scores for the students of age 13 for mathematics and science. The scores that are available in various format, are transformed to the percent-correct form for comparability. The IAEP means the tests of mathematics and science achievements of 13-years-old students conducted by the international Assessment of Educational Progress in 1991. The Third International Mathematics and Science Study (TIMSS) is conducted by the International Association for the Evaluation of Educational Achievement (IEA) in 1994 and 1995. For the TIMSS, Belgium is French-speaking region.

Source: US Department of Education, *Digest of Education Statistics*, 1992; and IEA, *Third International Mathematics and Science Study*, 1994-1995, 2000.

Table 8. Effects of Gini Index on Growth and Other Variables

	Dependent variable	Gini index
(1)	Growth rate regression	-0.001 (0.018)
(2)	Fertility (log)	1.335 (0.146)
(3)	Government consumption/GDP	0.143 (0.036)
(4)	Secondary school enrollment	-0.800 (0.098)
(5)	Rule-of-law index	-0.869 (0.126)

Notes: In the growth rate regression in row (1), Gini index is added to systems in column 2 of table 3. The Gini value around 1970 appears in the equation for growth from 1970 to 1975, and so on. The five-year lagged value is added to the list of instruments. The regressions for the other dependent variables come from systems of the six five-year periods from 1970 to 1999 for each variable. The log of per capita GDP and Gini index are included as independent variables. Estimation is by three-stage least squares. Instruments are the lagged values of the log of per capita GDP and Gini index.

Table 9. Incidence of Balance-of-Payments Crises, Over the 1970-1999 Period

Period	All countries	All developing countries	East Asia 9	Latin America 21
1970-1999	260	221	14	55
1970-75	26	15	2	6
1975-79	29	21	1	7
1980-84	46	39	4	12
1985-89	47	46	1	14
1990-94	72	62	1	13
1995-99	40	38	5	3

Notes: A balance-of-payments crisis is defined by combining two criteria. A balance-of-payments crisis is judged to occur in the year when a country experienced a nominal currency depreciation of at least 25 percent in any quarter of a specific year and the depreciation rate exceeded that in the previous quarter by a margin of at least 10 percent. A crisis is also identified at the month of a year when an indicator of currency pressure, a weighted average of monthly nominal exchange depreciation and monthly foreign reserve loss, exceeds three standard deviations above the mean of the indicator over the sample period for each country, provided that either the monthly nominal depreciation rate or percentage change of reserve loss exceeds 10 percent. A crisis that is not at least 3 years after the latest crisis is counted as a continuation of the initial crisis rather than an independent crisis.

Table 10: Macroeconomic Indicators during Balance-of-payments Crises in East Asia and Latin America

A. East Asia

	<i>av. t-3</i>	<i>t-4</i>	<i>t-2</i>	<i>t-1</i>	<i>t</i>	<i>t+1</i>	<i>t+2</i>	<i>av. t+3</i>	<i>t+4</i>
Indonesia (1997)									
GDP growth (%)	7.4	8.2	8.0	4.5	-13.1	0.8		4.2	
Inflation (%)	9.1	9.4	8.0	6.7	57.6	20.3		8.3	
Budget balance (% GDP)	-0.2	1.0	1.3	-0.9	-2.4	-1.6		-2.6	
Current account (% GDP)	-1.5	-3.2	-3.4	-2.2	4.4	4.1		4.6	
Capital account (% GDP)	2.9	5.1	4.8	-0.3	-10.1	-4.2		-7.2	
Real exchange rate (index)	100.6	102.8	99.5	107.1	212.2	139.1		147.3	
Short-term debt/total debt (%)	59.1	60.1	59.6	66.0	161.9	105.9		93.8	
Short-term debt/reserves (%)	171.9	232.1	234.4	218.1	110.3	67.3		59.2	
External debt/GDP (%)	20.3	26.2	31.4	25.2	16.6	12.0		12.1	
Korea (1997)									
GDP growth (%)	6.9	8.9	6.8	5.0	-6.7	10.9		6.2	
Inflation (%)	5.5	4.4	5.0	4.4	7.5	0.8		3.2	
Budget balance (% GDP)	0.9	-0.8	-1.0	-0.8	-2.7	-2.7		1.3	
Current account (% GDP)	-0.3	-1.7	-4.4	-1.7	12.7	6.0		2.3	
Capital account (% GDP)	1.8	3.5	4.6	-1.9	-2.6	3.1		0.2	
Real exchange rate (index)	97.9	100.5	99.6	107.0	134.0	119.8		116.4	
Short-term debt/total debt (%)	22.0	25.2	31.7	33.7	47.6	32.9		28.1	
Short-term debt/reserves (%)	200.7	229.7	284.3	303.2	71.4	55.5		43.1	
External debt/GDP (%)	55.9	60.8	58.6	38.5	24.6	30.7		34.3	
Malaysia (1997)									
GDP growth (%)	9.6	9.8	10.0	7.3	-7.4	6.1		4.4	
Inflation (%)	3.6	3.5	3.5	2.7	5.3	2.7		1.5	
Budget balance (% GDP)	0.6	0.8	0.7	2.4	-1.8	-3.2		-5.7	
Current account (% GDP)	-6.1	-9.7	-4.8	-5.9	13.2	15.9		8.9	
Capital account (% GDP)	8.9	8.6	9.4	2.2	-3.5	-8.4		-5.9	
Real exchange rate (index)	99.7	96.8	93.4	96.5	117.1	118.2		115.1	
Short-term debt/total debt (%)	43.9	41.5	45.2	49.4	60.1	53.8		49.3	
Short-term debt/reserves (%)	37.0	40.8	54.3	79.1	44.6	28.7		23.9	
External debt/GDP (%)	31.4	26.3	32.2	33.2	26.3	20.6		16.4	
Philippines (1997)									
GDP growth (%)	3.3	4.7	5.8	5.2	-0.6	3.4		3.8	
Inflation (%)	7.6	8.0	9.0	5.9	9.7	6.7		5.2	
Budget balance (% GDP)	-2.3	-1.4	-0.1	-1.5	-3.0	-3.3		-4.4	
Current account (% GDP)	-5.1	-2.7	-4.8	-5.3	2.4	10.0		4.3	
Capital account (% GDP)	7.0	7.2	13.6	7.9	0.7	-1.2		-0.2	
Real exchange rate (index)	96.7	94.8	85.8	91.3	114.8	107.7		107.1	
Short-term debt/total debt (%)	63.1	54.8	54.9	62.1	82.2	76.2		78.5	
Short-term debt/reserves (%)	35.2	80.3	85.0	133.1	95.7	58.0		53.7	
External debt/GDP (%)	14.4	15.1	21.7	22.7	19.1	14.9		14.2	

	<i>av. t-3</i>	<i>t-4</i>	<i>t-2</i>	<i>t-1</i>	<i>t</i>	<i>t+1</i>	<i>t+2</i>	<i>av. t+3 t+4</i>
Thailand (1997)								
GDP growth (%)	8.7	9.2	5.9	-1.4	-10.5	4.4		3.3
Inflation (%)	4.2	5.8	5.8	5.6	8.1	0.3		1.6
Budget balance (% GDP)	2.0	3.0	2.4	-0.9	-2.4	-3.5		-2.9
Current account (% GDP)	-5.3	-8.1	-8.1	-2.0	12.7	10.1		6.5
Capital account (% GDP)	8.4	13.0	10.7	-8.0	-12.6	-9.0		-10.8
Real exchange rate (index)	100.3	103.8	101.6	110.0	121.5	117.0		122.2
Short-term debt/total debt (%)	48.7	59.8	62.0	72.5	93.9	77.7		61.9
Short-term debt/reserves (%)	114.6	147.0	128.3	149.0	100.8	58.0		38.4
External debt/GDP (%)	46.2	51.9	42.3	35.0	27.3	20.6		16.8

B. Latin America

	<i>av. t-3</i>	<i>t-4</i>	<i>t-2</i>	<i>t-1</i>	<i>t</i>	<i>t+1</i>	<i>t+2</i>	<i>av. t+3 t+4</i>
Argentina (1991)								
GDP growth (%)	0.3	-7.0	-1.3	10.5	10.3	6.3		1.5
Inflation (%)	237.2	3079.5	2314.0	171.7	24.9	10.6		3.8
Budget balance (% GDP)	-2.0	-0.7	-0.3	-0.5	0.0	-0.7		-0.6
Current account (% GDP)	-6.4	-7.1	-14.5	-9.5	-5.6	-11.0		-7.6
Capital account (% GDP)	2.4	5.4	2.6	-1.0	-2.6	-3.0		-1.6
Real exchange rate (index)	94.5	105.2	92.2	79.9	81.4	80.2		84.5
Short-term debt/total debt (%)	26.0	28.1	30.8	26.7	19.8	12.6		10.8
Short-term debt/reserves (%)	135.3	99.9	148.8	252.7	169.7	103.4		87.7
External debt/GDP (%)	42.1	40.2	47.6	70.5	88.2	98.2		114.0
Brazil (1999)								
GDP growth (%)	3.5	3.3	0.1	0.8	4.4	1.4		2.2
Inflation (%)	41.0	6.9	3.2	4.9	7.1	6.8		11.2
Budget balance (% GDP)	-6.7	-6.1	-8.0	-10.0	-4.6	-5.3		-10.3
Current account (% GDP)	-2.8	-3.8	-4.2	-4.8	-4.1	-4.6		-1.5
Capital account (% GDP)	4.3	3.1	2.5	1.5	4.9	3.9		--
Real exchange rate (index)	101.4	98.0	98.1	131.0	110.6	122.7		123.0
Short-term debt/total debt (%)	69.6	74.5	85.9	87.9	87.3	86.9		89.0
Short-term debt/reserves (%)	244.8	309.6	490.7	614.0	639.3	554.3		558.1
External debt/GDP (%)	25.6	26.2	30.9	45.8	40.1	45.3		52.3
Chile (1982)								
GDP growth (%)	8.3	7.8	6.7	-13.4	-3.5	6.1		4.6
Inflation (%)	36.8	35.1	19.7	9.9	27.3	19.9		25.1
Budget balance (% GDP)	2.4	5.4	2.6	-1.0	-2.6	-3.0		-1.6
Current account (% GDP)	-6.4	-7.1	-14.5	-9.5	-5.6	-11.0		-7.6
Capital account (% GDP)	11.6	11.8	14.6	3.4	-16.3	-0.4		-10.5
Real exchange rate (index)	94.5	73.3	64.1	71.2	78.2	77.4		94.1
Short-term debt/total debt (%)	26.0	28.1	30.8	26.7	19.8	12.6		10.8
Short-term debt/reserves (%)	135.3	99.9	148.8	252.7	169.7	103.4		87.7
External debt/GDP (%)	42.1	40.2	47.6	70.5	88.2	98.2		114.0

	av. t-3 t-4	t-2	t-1	t	t+1	t+2	av. t+3 t+4
Colombia (1998)							
GDP growth (%)	5.5	2.1	3.4	0.6	-4.2	2.7	1.5
Inflation (%)	21.8	20.8	18.3	18.6	10.2	9.3	7.1
Budget balance (% GDP)	-1.8	-3.7	-2.7	-3.6	-5.5	-3.5	-3.5
Current account (% GDP)	-4.7	-4.8	-5.4	-4.9	0.8	0.8	-1.8
Capital account (% GDP)	4.6	6.9	6.2	3.4	-0.7	-0.1	2.9
Real exchange rate (index)	96.5	90.3	86.5	89.7	92.2	88.1	94.2
Short-term debt/total debt (%)	21.8	18.3	16.4	15.2	11.4	10.3	9.7
Short-term debt/reserves (%)	71.3	60.7	58.4	64.0	52.7	42.2	37.1
External debt/GDP (%)	31.2	33.8	33.1	37.5	43.5	44.1	48.5
Mexico (1994)							
GDP growth (%)	4.7	3.6	2.0	4.4	-6.2	5.2	5.9
Inflation (%)	24.7	15.5	9.8	7.0	35.0	34.4	18.3
Budget balance (% GDP)	0.2	4.5	0.5	0.0	-0.5	-0.2	-1.3
Current account (% GDP)	-4.1	-7.3	-5.8	-7.0	-0.5	-0.8	-2.9
Capital account (% GDP)	6.0	8.1	8.4	3.7	-3.7	1.3	4.7
Real exchange rate (index)	97.0	92.8	85.7	88.6	124.9	110.3	96.8
Short-term debt/total debt (%)	33.6	39.0	39.9	47.5	33.8	20.3	21.5
Short-term debt/reserves (%)	164.1	129.2	128.2	659.3	198.3	170.9	111.9
External debt/GDP (%)	24.1	18.8	20.0	20.7	34.5	49.3	38.3
Argentina (2001)							
GDP growth (%)	6.0	-3.4	-0.8	-4.4	-11.0	3.0	4.5
Inflation (%)	0.7	-1.2	-0.9	-1.1	25.9	22.3	13.0
Budget balance (% GDP)	-1.4	-2.9	-2.4	-3.3	-1.1	--	--
Current account (% GDP)	-4.5	-4.2	-3.1	-1.7	9.5	--	--
Capital account (% GDP)	6.0	5.3	3.1	-5.1	--	--	--
Real exchange rate (index)	98.6	91.9	93.8	89.5	164.5	--	--
Short-term debt/total debt (%)	30.9	29.4	39.9	21.5	14.8	--	--
Short-term debt/reserves (%)	172.2	163.1	236.2	247.7	217.7	--	--
External debt/GDP (%)	44.4	51.4	52.3	62.4	150.8	--	--

Notes: The column t ($t+or-j$) corresponds to the year of (the year j before or after) the currency crisis, which is indicated in parenthesis for each country. The first column is the average of the three and four years previous to the crisis. The data on GDP, inflation, budget balance, current account, capital account and reserves come from the IMF, *World Economic Outlook* database, April 2003, and completed with JP Morgan (EMEI). For the fiscal balance, in Latin America, Indonesia and Thailand correspond to the central government, while the others correspond to general government. The real exchange rate corresponds to the JP-Morgan index, transformed to measure the price of foreign goods respect to domestic goods, so an increase is a real depreciation. The index is equal to 100 for $t-4$. Data on debt, and composition, come from BIS, JP Morgan, and Central Bank of Chile.

Table 12. Determinants of Real Output Cost from the Balance-of-Payments Crises

	(1)	(2)	(3)
Pre-crisis GDP growth (average t-2~t-5)	0.660 (0.253)	0.804 (0.259)	0.594 (0.261)
Foreign reserve/M2 (t-1)	-0.146 (0.042)		-0.154 (0.043)
Foreign reserve/short-term debt (t-1)		-0.0025 (0.0014)	
Banking crisis (t-2~t+2)	0.076 (0.020)	0.066 (0.023)	0.081 (0.021)
Trade partners' GDP growth (t~t+2)	-2.735 (0.963)	-2.571 (0.963)	-2.916 (0.991)
Real exchange rate depreciation (t)	-0.035 (0.016)	-0.028 (0.017)	-0.036 (0.016)
Real money supply growth (t~t+2)	-0.129 (0.066)	-0.157 (0.071)	
Growth of real money supply-to-GDP ratio (t~t+2)			-0.046 (0.071)
Budget/GDP (t~t+2)	0.311 (0.297)	0.133 (0.325)	0.214 (0.301)
Dummy for 1980s	0.011 (0.027)	0.017 (0.034)	0.016 (0.027)
Dummy for 1990s	-0.036 (0.031)	-0.041 (0.039)	-0.031 (0.032)
No. of crisis episodes	81	73	81

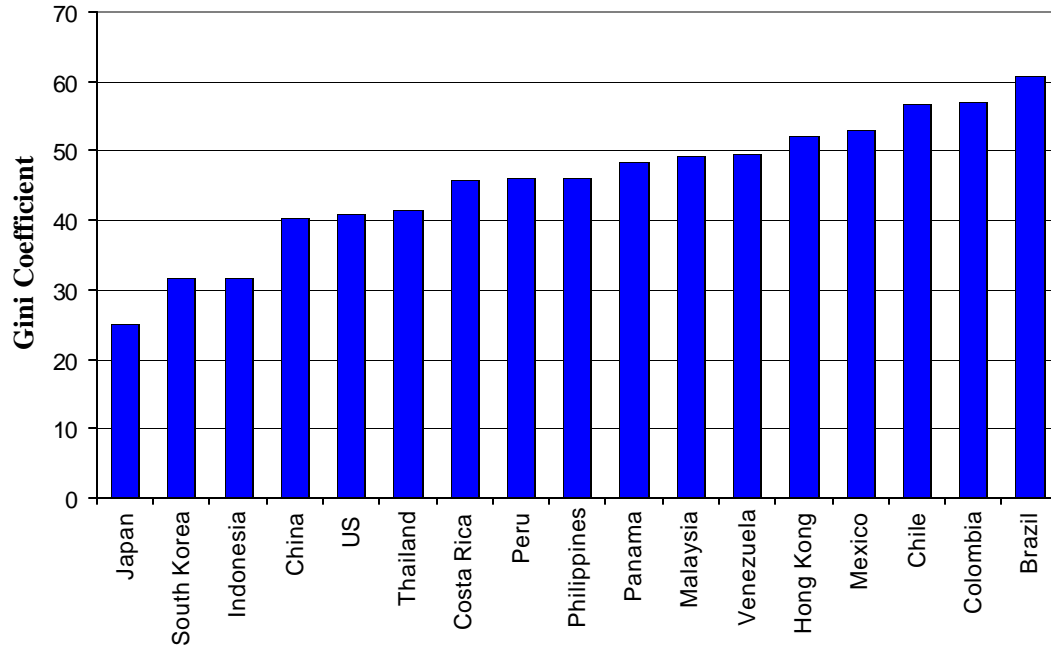
Notes: Robust standard errors are in parentheses. The dependent variable is a measure of output cost from a crisis which is calculated by summing the differences between the trend GDP growth rate and GDP growth rates over the three years including the crisis year and the following two years.

Appendix Table: Balance-of-Payment Crises in Latin America and East Asia, 1970-1999

East Asia					
China	1984M1	1989M12	1994M1		
Indonesia	1978M11	1983M4	1997M9		
Korea	1971M12	1980M1	1997M11		
Malaysia	1997M8				
Philippines	1970M2	1983M10	1997M9		
Thailand	1997M7				
Latin America					
Argentina	1975M3	1981M4	1987M2	1991M1	
Bolivia	1972M10	1980M1	1985M9		
Brazil	1979M12	1983M2	1987M1	1991M1	1999M1
Chile	1971M7	1975M1	1982M8		
Colombia	1998M9				
Costa Rica	1974M4	1981M1			
Dominican Republic	1985M1	1990M8			
Ecuador	1970M8	1982M5	1986M8	1992M9	1998M10
El Salvador	1986M1	1990M5			
Guatemala	1986M6	1990M8			
Haiti	1991M9				
Honduras	1990M4				
Jamaica	1978M5	1983M11	1991M9		
Mexico	1976M9	1982M2	1986M1	1994M12	
Nicaragua	1979M4	1985M2			
Panama	1973M2				
Paraguay	1984M3	1989M3			
Peru	1976M6	1982M12	1987M10	1992M6	
Trinidad and Tobago	1985M12	1993M4			
Uruguay	1972M3	1982M11	1987M12		
Venezuela	1984M2	1989M3	1994M5		

Figure 1

Income Distribution, in the 1990s



Source: World Bank, *World Development Report*.

Figure 2

GDP Growth Rates During Currency Crises

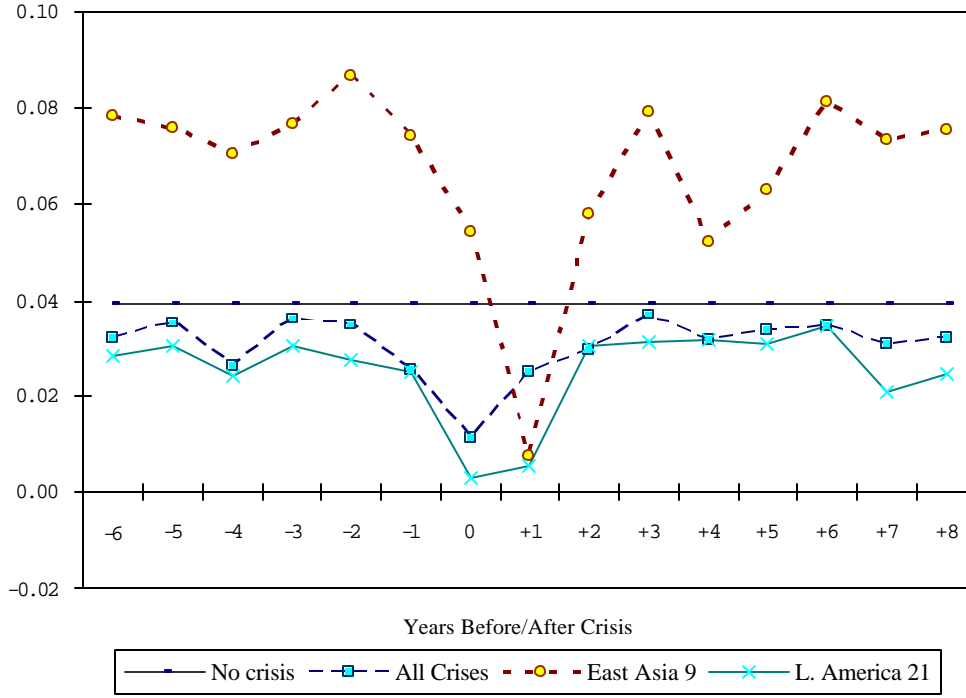


Figure 3

Adjustments of GDP Growth Rates in East Asian Crises

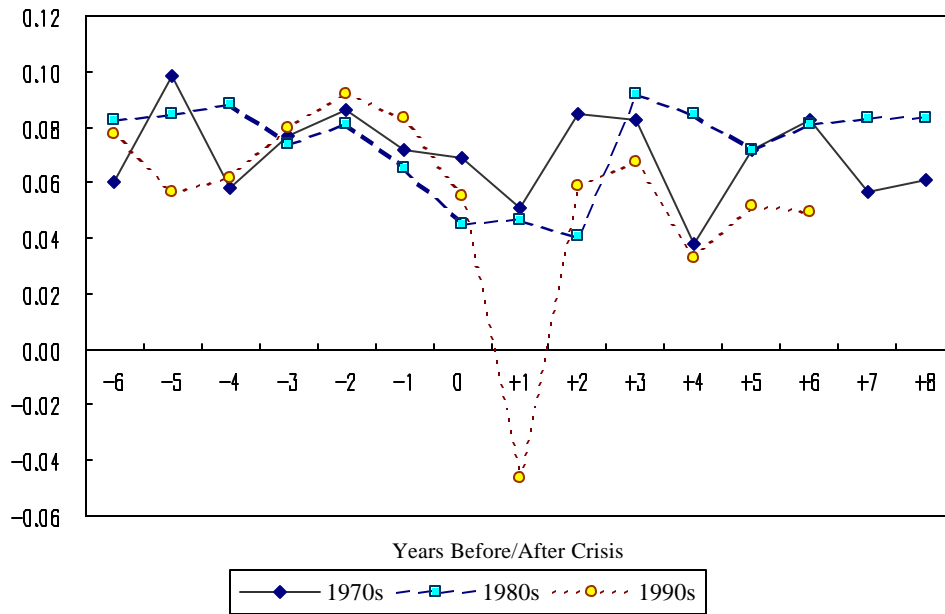


Figure 4

Adjustments of GDP Growth rates during the 1997 East Asian Crisis

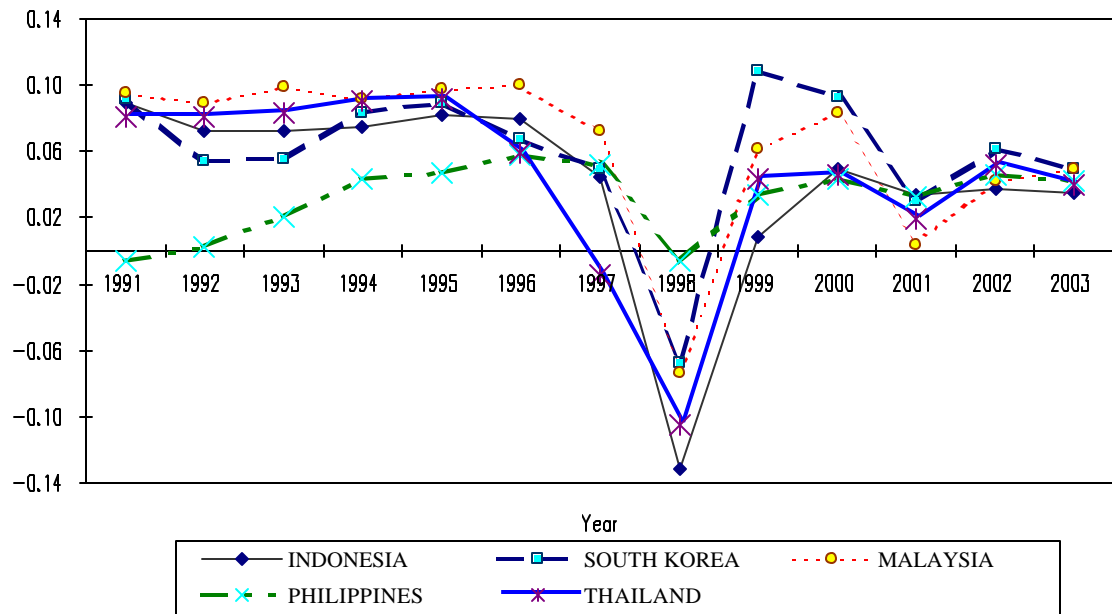


Figure 5

Adjustment of GDP Growth Rates during Latin American Crises in the 1980s

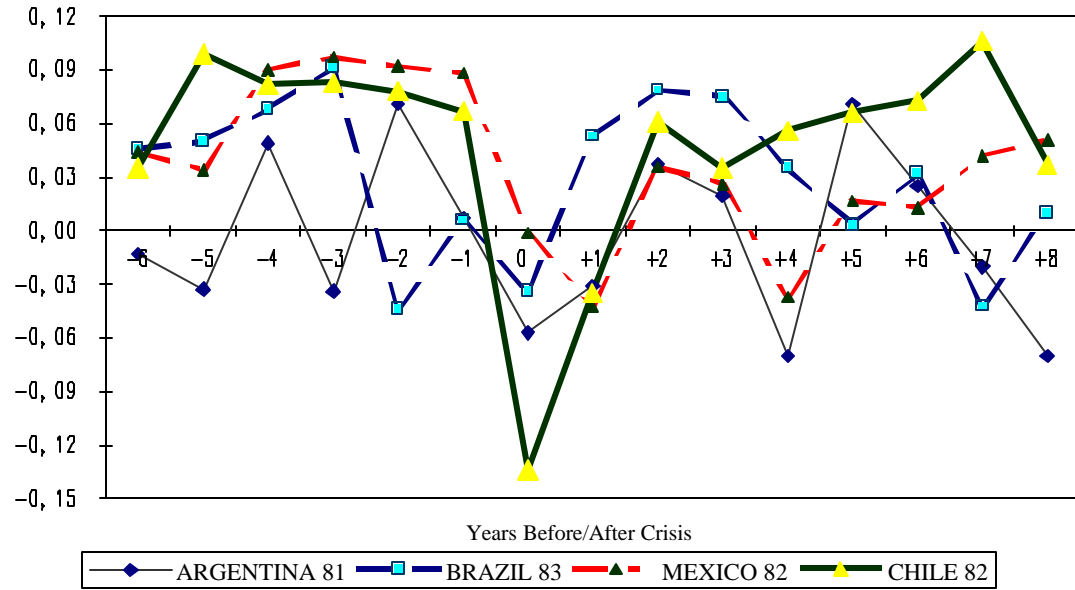
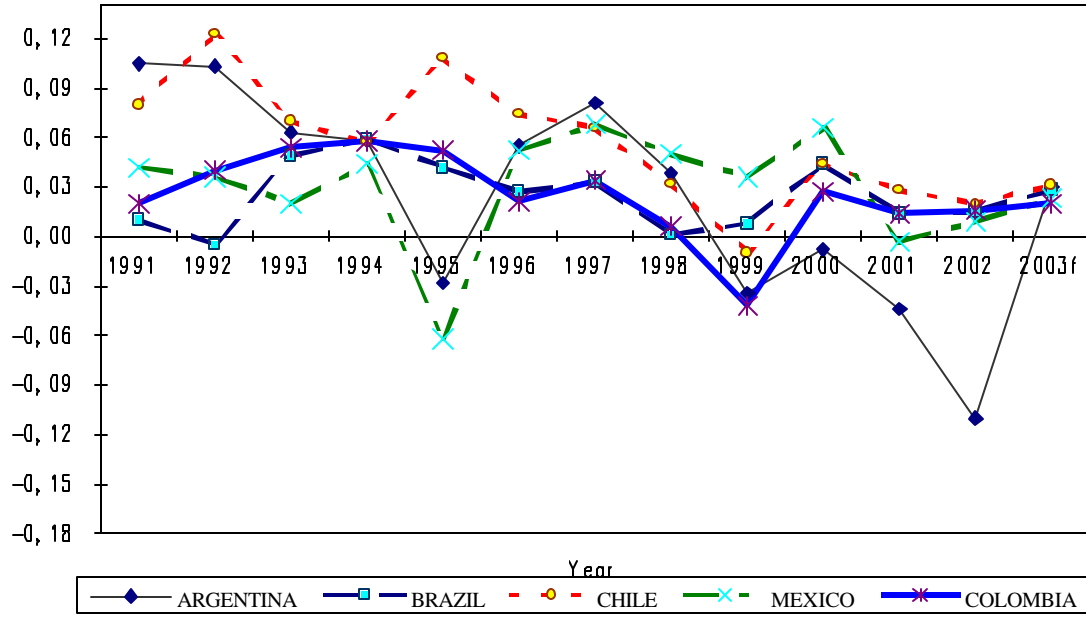


Figure 6

Adjustment of GDP Growth Rates In Latin American Countries in the 1990s



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