Recovering from Sudden Stops in Emerging Markets *

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Abstract

This paper provides strong empirical evidence that recovery from emerging markets' current account crises is accompanied by strong growth in financial institutions together with domestic investment and savings. We document a bimodal distribution of post-crisis economic performance. In economies that quickly recover to their pre-crisis peak levels of per capita output, strong per capita investment, credit, deposit and consumption growth accompany the output growth. Other economies simply do not recover from their crises. We show that a simple open economy model with a stylized banking sector can account for the key features of both of these types of episodes when subjected to transitory and permanent total factor productivity shocks.

1 Introduction

Over the past 30 years, international capital markets have been subjected to a large number of financial crises. These episodes lead to an intense interest in the causes and consequences of financial crises. Authors such as Kaminsky and Reinhart (1999) and Calvo, Izquierdo, and Talvi (2006a and b) document the main features of these episodes and theorize about the causes of these crises and how the countries recover.

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Calvo et al. (2006a) define a large subset of these crises as Systemic Sudden Stop episodes, marked by sharp declines in economic activity coincident with precipitous declines in capital inflows and increases in sovereign debt spreads.[1] The focus in their empirical work is on characterizing the post-crisis recovery of the Sudden Stop countries. They find that after Sudden Stops, output recovery is short and steep. However, output growth is not accompanied by a recovery in investment or an expansion in the domestic financial sector or capital inflows. Calvo et al. (2006a and b) dub this post-crisis experience a Phoenix Miracle. Tornell and Westermann (2002) use a different definition of crises, but come to similar conclusions as Calvo et al. (2006a and b).[2]

Based on these findings, Calvo (2007) argues that nothing was fundamentally wrong with these Sudden Stop economies.[3] The crises may have been accidents triggered by external shocks and could have been prevented by the appropriate policy responses. Eichengreen, Gupta, and Mody (2006) cite Calvo (2007) to motivate their analyses of the role that multinational policy institutions and insurance policies can play in preventing capital market crises.[4]

We come to different conclusions about the characteristics of recovery. Our findings can be summarized as follows. First, there is a bimodal distribution in the time to recover to pre-crisis per capita output peaks. Sixty percent of the Sudden Stop economies recover quickly. We subsequently refer to these as *fast-recovery episodes*. In all but one of the remaining Sudden Stop episodes, output does not recover to its pre-crisis peak for 15 or more years. We refer to those episodes as *slow recovery episodes*. Second, investment accounts for the greatest share of output growth in recovering countries. Within three years of the crisis, investment regains half of its lost share in GDP. Third, the investment recovery is financed by strong domestic savings channeled through expanding banking sectors and expanding equity markets. In the vast majority of episodes, recovery in economic activity is coincident with recovery in financial markets. Fourth,

[1] The Tequila crisis episodes, the 1998 Asian currency crises, and the Latin American debt crises in the early 1980s are headline examples of these episodes.

[2] Zarazaga (2007) investigates the role of total factor productivity (TFP) in one of these Phoenix Miracle episodes, Argentina (2002).

[3] Calvo (2007) on page 26 suggests that these episodes may be "preventable accidents," possibly triggered by external shocks.

[4] Eichengreen (2007) cites these results in a similar context. Adalet and Eichengreen (2005) identify similar features of fast-recovery in current account crises before 1970.

slow-recovery episodes are characterized by an absence of recovery in investment and financial markets. Fifth, in both subsets, net foreign capital flows—excluding foreign direct investment (FDI)—fall dramatically after a Sudden Stop. Moreover, these flows do not recover for a prolonged period of time. Sixth, FDI as a share of GDP is largely unaffected by a Sudden Stop Crises. Intriguingly, a country's pre-crisis inflow of FDI, as a percentage of GDP, is a useful predictor of whether the country will recover. Countries that recover from a Sudden Stop have much higher levels of FDI relative to GDP than countries that do not recover.

There are two main reasons why we reach very different conclusions than Calvo et al. (2006) and Tornell and Westermann (2002). First, in contrast to them, we work with per capita economic aggregates. This distinction is important because many of these countries have high population growth rates. Second, we explicitly distinguish between countries that recover and those that do not. Lumping together the two types of countries masks the characteristics of slow- and fast-recovery episodes.

To interpret our findings, we develop and analyze a small open economy model with a stylized banking sector. Specifically, we modify the setup in Correia, Neves, and Rebelo (1995) and Jaimovich and Rebelo (2008) to allow for a simplified version of the banking model in Chari, Christiano, and Eichenbaum (1995). The main shock to the agents' environment is a disturbance to total factor productivity (TFP). This is a stark, reduced-form way of capturing the impact of the crisis on these economies. When these shocks are transitory in nature, we find the model reproduces many of the key features of the fast-recovery episodes, including a quick recovery in the financial sector. When TFP shocks are persistent, the model reproduces the anemic real and financial economic activity that characterizes the slow-recovery economies.

Because of data considerations, we cannot estimate the magnitude and persistence of these TFP shocks in all of the Sudden Stop episodes. However, more detailed data is available for the Korean (1998) episode. Consequently, we estimate TFP for that episode. We find that a model calibrated to the Korean data and subjected to the estimated TFP shock accurately predicts the important features of its fast recovery.

The rest of this paper is divided up into the following sections: In the second section we describe the data and the Sudden Stop episodes. In section three, we characterize the fast-

recovery episodes. In section four, we analyze the slow-recovery episodes and contrast the two types of the episodes. In the fifth section, we use a small open economy model to interpret our findings. In the sixth section, we present the results of our case study of the Korean episode. The seventh section presents conclusions.

2 An Overview of Sudden Stops

Calvo et al. (2006a) identify Sudden Stops based on four criteria that we use as the basis for our sample. First, they limit the sample of candidate crises by considering only emerging markets for which JP Morgan constructs an Emerging Market Bond Index, incidentally suggesting that this is a meaningful indicator that a country is engaged in international capital markets. Second, they construct a distribution of all of the consecutive-year output contractions in this set of countries and eliminate any observation in which the country had a smaller-than-median drop in real GDP. Third, they intersect this subset with episodes in which the fall in capital flows was one standard deviation below the mean and exceeded two standard deviations at least once. Finally, they limit the analysis to those episodes that overlapped with an uninterrupted period of time in which the EMBI[5] spread exceeded the mean by one standard deviation and was punctuated by at least one incidence in which the spread eclipsed the two standard deviation mark. This procedure leaves a sample of 22 Sudden Stop collapses.

In addition to these 22 episodes they identify, we include three additional episodes. These episodes were disqualified from the previous sample only because of the small size of their economic contractions. When measured in per capita terms, Colombia (1999), Ecuador (1983), and Morocco (1981) fall well within the range of these existing 22 episodes. We include them in the following groups:

- The Latin American Debt Crisis episodes: Argentina and El Salvador in 1982; Brazil[6], Chile, Ecuador, Mexico, Peru, and Venezuela in 1983; Uruguay in 1984.

[5]Or an alternate measure of the interest rate in years for which the EMBI spread is not available.

[6]Table (3) shows a decline in Brazil's GDP of 3.41 percent. Over the prior three years, the decline was 7.12 percent. In our procedure, we report the peak as the most recent period in which the country had an increase in real GDP. Brazil had an very minor increase in GDP in 1982, which followed a large decline in 1981. In per capita terms, the peak identified by our method is coincident with the peak cited by Calvo et al. (2006a).

- The East Asian Currency Crisis of 1998: Indonesia, Malaysia, Thailand, and South Korea.
- The Tequila Crisis Episodes in 1994 and 1995: Turkey in 1994; Morocco and Mexico in 1995.
- The Russian crisis episodes immediately preceding and following the turn of the millennium: Russia in 1998; Colombia, Ecuador, and Turkey in 1999; Argentina in 2002.
- A number of unrelated African crisis: South Africa[7] in 1983, Côte d'Ivoire and Nigeria in 1984, and Morocco in 1981.

These countries' indicators are drawn from the World Bank's World Development Indicators (WDI: national accounts and population), the IMF's International Financial Statistics (IFS: banking statistics, a few exchange rates), individual country central banks and statistical agencies (prices and wages), JP Morgan (real exchange rates), the International Finance Corporation and S&P (stock market data), and the IMF's Balance of Payments database (BoP: balance of payments statistics). Tables (1) and (2) contain a more precise description of the sources.

The dates and output contractions characterizing these episodes are summarized in Table (3). The peak on which the output drop is calculated is the most recent period prior to the decline in which real GDP growth was positive, and the trough in this table is the last consecutive year of negative real GDP growth. The drop is the recorded percent decline from peak to trough. Population growth is the average population growth in each of these countries from 1960 to 2005.

The right columns of Table (3) reveal the distinction between recoveries in real per capita indicators and the strictly real terms. In only five episodes do countries recover to pre-crisis output peaks in the same number of years: Mexico (1995), Morocco (1981 and 1995), South Korea (1998), and Russia (1998). Peru (1983), Nigeria (1984), Côte d'Ivoire (1984), and Venezuela (1983) had not recovered to their pre-crises levels of per capita output by 2006. Mexico (1983)

[7]Table (3) shows a decline in South Africa's GDP of -2.22 percent. This stands in contrast to Calvo et al. (2006a), who report that South African output dropped 6.07 percent. Our data source is a more modern edition of the World Development Indicators. Our 2008 World Development Indicators report the larger number; however, multiple vintages of International Financial Statistics and the World Economic Outlook are roughly consistent with the -2.22 percent view. When viewed in per capita terms, the drop in output reported in Table (5) exceeded seven percent, well within the range of output contractions in the rest of the sample.

and Ecuador (1983) need an additional 13 and 14 years, respectively, to recover in per capita output. Argentina (1982) takes an additional five years to recover in per capita terms. Recovery in consumption shows similar distinctions across the categories, although not as dramatic.

Presenting the data in per capita terms deflated with yearly population from the WDI changes the qualitative view of recoveries. Instead of suffering from an approximately eight percent drop, all of which is made up within three years of the trough, these countries suffer from a 12 percent drop from which it takes nearly five years on average to recover. These countries do not recover on a per capita consumption basis for more than six years. This result stands in contrast to the quick two-year recovery cited as the norm by Bordo (2006). To further characterize the post-crisis economies, we generate simple correlations at varying intervals from the trough of the crises. We correlate the log changes in several real per capita indicators measured at varying horizons from the troughs and report the results in Table (4).[8]

The first and most important correlation is between investment and output. Log change relative to the trough in per capita real output, $\Delta log(Y)$, is highly correlated with the analogous measure of investment, $\Delta log(I)$, at the two, four, and seven year horizons. This correlation demonstrates that there is a strong relationship between investment and output that gets even stronger further from the point of the crisis. Also, in contrast to the previously documented observations, output growth is highly correlated with credit growth, $\Delta log(CR)$, and growth in deposits, $\Delta log(Dep)$, at a high level of statistical significance at all reported intervals. Finally, investment is similarly correlated with credit and deposits, the former at 4- and 7-year horizons and the latter at all reported horizons.

The features that give the Phoenix Miracle its name—recovery in economic output without the benefit of a resurgence in the formal credit channels–do not reveal themselves in these

[8]We estimated the following sets of five moments using the RATS nlsystem command as in Doan (2007). For a set S consisting of a pair of economic indicators, and x_h representing the log changes in indicator x over the h years from the trough of the crisis, we estimate:

$$E[x_h - \mu_{x_h}] = 0 \qquad \forall x \epsilon S$$

$$E[(x_h - \mu_{x_h})(z_h - \mu_{z_h}) - \sigma_{x_h,z_h}] = 0 \qquad \forall x, z \epsilon S$$

We computed the point estimate of the correlation and report the p-value for $H(0) : \sigma_{x_h,z_h} = 0$ where $z \neq x$. The results are reported in Table (4).

correlations. These relationships suggest that these indicators move together; increased output is coincident with increased savings and investment. The banks' asset sheets mimic the national accounts data.

To find the features of recovery consistent with those observations, we start by plotting the distribution of the time-to-recovery variable. In Figure (1) we plot the years it takes each economy to achieve pre-crisis output peaks. In the upper panel, we construct the measure based on peaks, troughs, and recoveries in real GDP data. The bottom panel has the same distribution, but peaks, troughs, and recoveries are computed using per capita data. In real terms, a majority of the countries recover within two years, and all but three of the economies achieve their pre-crisis peaks within five years. The bottom histogram shows a clear gap in the distribution. In 15 of the episodes, the countries recover within six years. In nine of the remaining 10 episodes, countries require 15 or more years to get back to the pre-crisis peak level of output. The only episode that does not fall into those two categories is Uruguay (1984).

Therefore, we divide the sample into the 15 "fast-recovery episodes" including Argentina (2002), Brazil (1983), Chile (1983), Colombia (1999), Ecuador (1999), Indonesia (1999), Malaysia (1998), Mexico (1995), Morocco (1981 and 1995), Russia (1998), South Korea (1998), Thailand (1998), and Turkey (1994 and 1999), and the nine "slow-recovery episodes" including Argentina (1982), Côte d'Ivoire (1984), Ecuador (1983), El Salvador (1982), Mexico (1983), Nigeria (1984), Peru (1983), South Africa (1983), and Venezuela (1983). Breaking the sample into two parts allows us to produce average indicators that are consistent with the correlations in Table (4).

To assess the degree to which this distinction merely reflects a continuation of long-run growth trends in these countries, we list the episodes and growth statistics before and after the crises. Cerra and Chaman Saxena (2008) study extensively the effects that crises have on trend growth rates. However, their analysis applies to non-per capita output series, so we reexamine the issue using the per capita indicators. In Table (5), we show the episodes sorted by magnitude of per capita output collapse. We present average growth rates for a decade a short time before the onset of the crisis—13 through four years before the crisis—and compare that against growth in the five years following the trough of the crisis. Output growth following the crisis was a continuation of solid per capita economic growth for a number of episodes like Korea (1998). In

other episodes such as such as Mexico (1983) or Ecuador (1983), the Sudden Stop marked the sudden end of a period of high growth. Mexico (1983) was growing at 3.3 percent per year in per capita output before it endured a crisis from which it failed to recover for 15 years. Ecuador (1983) had even more impressive growth before its crisis marked a sudden and dramatic shift in that country's fortunes. Even El Salvador (1983) shows moderate economic growth pre-dating the Sudden Stop, a trend to which the country did not recover after its catastrophic 33 percent decline in per capita output.[9] The slow-recovery African episodes mark the beginnings of long-term declines in output; in the cases of the Ivory Coast and South Africa, output per capita peaked just before the onset of the crisis.

That the Sudden Stops coincide with such a dramatic change in the economic fortunes of these countries reinforces the view that there are multiple types of crisis and recovery. In some episodes, the countries resume growing at historical or near-historical rates. Others episodes mark a pronounced and sustained deviation from historical growth rates.

We start by developing the facts that characterize the fast-recovery countries. We show that growth in economic output is as much a function of investment and consumption. We make use of national accounts identities to identify domestic savings as the primary source of funds for investment, a conclusion we verify in the country's financial flows and institutions.

3 Fast Recovery From a Sudden Stop Crisis

3.1 The Sources of Growth

The fast-recovery countries are the 15 episodes for which real, per capita economic output reached its pre-crisis peak within six years of the trough of the crisis. We present an overview of the episodes and their aftermaths in a set of indicators presented in Figures (2) and (3). We

[9] Although some of the episodes listed in Table (5) show substantial increases in growth following the crisis, the extent to which the crisis precipitated the onset of the regime change is unclear. Russia (1999) was in a centralized economy or in transition from a centralized economy during much of the 13-year period preceding its crisis; Chile (1983) had a major regime shift in the mid 1970s after which its began to show impressive growth shortly the onset of its crisis; Mexico (1995) had its previous Sudden Stop weighing down GDP growth in the previous 13 years. Ecuador (1999) stands as the final example of an episode in which growth after the crisis was substantially higher.

juxtapose these fast-recovery episodes in the left column with the full-sample indicators in the right. Each indicator is normalized to 100 in the trough of the crisis. In the panels on the left side of the figure, $t = 0$ is the trough of the crisis measured as the last year of negative growth in per capita output. In the graphs on the right, $t = 0$ is measured at the last year of negative annual growth in strictly real output. Furthermore, the graphs on each side of the figure are set to the same scale in order to easily compare the results across specifications. Using these graphs, we can identify the value of using the per capita indicators as well as the importance of dividing the sample into the two subsets.

The upper left panel Figure (2) offers a view of real GDP per capita plotted against the non-per capita GDP. In these countries, changing the indicator to reflect population growth substantially changes the quantitative effect of the recovery, but has little impact on our qualitative assessment. Growth is steep and sustained under both measures. The average per capita real output recovers to its pre-crisis peak in about three years. Within six years of the trough of the crisis, output has grown more than 25 percent on a per capita basis, likely translating into a sustained improvement in economic welfare. Furthermore, the range of the quantile distribution[10] is fairly narrow, demonstrating that recovery is consistently strong across the vast majority of these episodes.

This observation is corroborated by the statistics on consumption in the middle left panel. Private per capita consumption grows more than 21 percent in six years. The qualitative story remains the same as in the strictly real case, however, the increase accounted for by population growth is about one-third of the overall increase in real consumption. In either case, private consumption accounts for a substantial portion of the growth in output.

The lower left panel shows the evolution of real imports and exports. Unsurprisingly, imports drop dramatically during the crisis. Calvo, Izquierdo, and Mejia (2008), among others, note that these crises are roughly coincident with large devaluations in the exchange rate, which make imports less attractive.[11] Furthermore, substantial drops in capital flows make it more

[10]The shaded area represents the range of the marginal distribution after dropping the top two and bottom two observations in the fast-recovery subset. We drop the top three and bottom three observations from the overall sample to get a comparably sized range.

[11]There are a large number of episodes in which a large devaluation occurs within two years of the Sudden Stop crisis. The average of the real exchange rates across these episodes declines approximately 20 percent in

challenging to finance the acquisition of imports. Exports do not display symmetric behavior, and the export growth trend appears to persist, unchanged.[12]

Qualitatively, there is little difference between the 15 episodes in the left and the full sample on the right. Quantitatively, there is a substantial difference: at the six-year horizon, the per capita real output average across all episodes grows by less than 15 percent over the six years, substantially less than the 25 percent that characterizes the fast-recovery episodes. The same can be said for real consumption in which the average per capita consumption from the full sample falls outside the quantiles in the fast-recovery subset. Growth in real per capita exports and real imports are substantially lower than they are among the fast-recovery subgroup, although the they are qualitatively similar. The real indicators for output and consumption in the full sample show similar qualities as the same indicators in the fast-recovery subset.

The story departs from the existing literature with the investment statistics presented in Figure (3). Well-documented in a wide variety of papers, the sudden and spectacular drop in investment is one of the main features of these episodes. However, per capita investment grows 70 percent and recovers to its original levels in about six years following the crisis in these fast-recovery economies. This differs substantially from the 35 percent increase in the full-sample per capita investment.

Furthermore, in spite of the enormous fall in investment as a share of output in episodes such as Thailand (1998) and Korea (1998), the average recovery in investment as a share of output is much steeper than it is among the whole sample. In the 15-episode subset, investment regains nearly two-thirds of its lost share of GDP within four years following the crisis. While it is unlikely that this indicator regains its previous share because many of these countries were in Mendoza and Terrones (2008) identified credit booms before the crisis, there is a substantial increase in the investment share that significantly eclipses the same indicator constructed for the entire sample.

While the average levels show the path of the recovery, they give little quantitative indication as to how these elements contribute to the recoveries. For this purpose, we appeal to the simple

the years surrounding the crisis. Morocco (1995) is an obvious exception to this trend.

[12]Desai, Foley, and Forbes (2004) have noted that problems in credit markets keep locally-owned exporters from investing in their businesses and expanding production.

national accounts identity:

$$\frac{(1-L)(Y)}{L(Y)} = \frac{(1-L)(C+I+G+NX)}{L(Y)} \tag{1}$$

in which L is a standard lag operator applied to an annual series. GDP and its constituents—consumption, investment, government consumption, and net exports—are all denominated in real, per capita terms.[13] This specification allows us to demonstrate, from an accounting perspective, how each of the four components of output contributes to the recovery.

The top panel in Figure (4) shows the average contribution of each component over the two years preceding, two years following, and five years following the crisis. Each bar in this graph is analogous to one term in Equation (1). The left bar in each group is output growth, and each bar to the right represents one component of output modified by $\frac{(1-L)}{L(Y)}$. The lines lying on top of the bars represent the same quantiles as in the previous figures.[14] The changes in the components on the right side of the equation add up to the change in real per capita GDP reported on the left side. The leftmost group, representing the two years leading to the trough of the crisis, refreshes the well explored features of Sudden Stop Crises. Output among these countries drops almost four percent per year over the two years before the crisis. Investment alone accounts for the greatest share of this drop, while consumption also contributes substantially to the drop in output. The declines in those two components are partially offset by the dramatic decrease in imports.

Following the economic contraction, however, the vast majority of the recovery takes place in investment and consumption. Each of these two components contributes to approximately half of the total recovery in output. Over the entire 46-year span of the panel, investment contributes

[13]This identity only works explicitly for fixed weight real GDP. This identity does not hold with the chain-weighted GDP, in which the real components of GDP need not add up to the whole. In our sample from the 2008 World Development Indicators, the following countries used a form of chain-weighting for the components of GDP: Brazil, Chile, Indonesia, Russia, and South Africa. Previous vintages of the WDI dataset did not necessarily report chain-weighted values for all of those episodes. For the countries with chain-weighted statistics, we use an approximation to the method detailed by the Bureau of Economic Analysis in "Concepts and Methods of the U.S. National Income and Product Accounts," Chapter Four Appendix. In our approximation, we multiply the real growth rate of each component weighted by the component's lagged nominal share of nominal output.

[14]As before, the line represents the range of the middle 11 observations except at five years from the trough, in which case we lose data for Argentina (2002).

0.82 percent toward growth. The average contribution of investment to GDP growth in the two years following the crisis exceeds the average over the entire panel by a factor of 3.5. Investment's contribution in the five years following the trough of the crisis still exceeds this long-term average by more than a factor of two.

Consistent with the average trade statistics presented in Figure (2), net exports contribute negligibly on average to the recovery in output.[15] In spite of the large change in the exchange rates that frequently accompanies the Sudden Stop crises, there is little evidence to suggest that net exports continue to contribute positively and significantly to GDP following the trough of the crisis.

Government consumption does little to contribute to the recovery; the average contribution of government consumption is less than one-eighth of the total output recovery at the five-year horizon and one-tenth at the two-year horizon.[16] Given the lack of contributions between net exports and government consumption, it is clear that without a strong contribution from investment, recovery would be far more subdued.

These fast recovery episodes feature a substantial increase in investment following the trough of the crisis. We apply another national accounting identity to identify the resources that support this investment. In the bottom panel of Figure (4), we disaggregate the components of investment as a share of GDP by appealing to another national accounts identity:

$$\frac{I}{Y} = \frac{S - G - NX + T}{Y} \tag{2}$$

where S is private savings, G is government consumption, NX are net exports, and T consists of taxes net of transfers. We do not have data that allows us to identify individually private and government savings, therefore S and T are reported together as $S + T$. The three right bars in each group add up to the left bar, investment.

While investment collapses in the two years prior to the trough of the crisis, savings and

[15]This is true of nearly all the episodes except for Ecuador (1999) and, to a lesser extent, Turkey (1994) and Mexico (1995). In the first, imports recover strongly such that net exports make a substantial negative contribution to output recovery; in the latter two, net exports make a negative contribution that is about half as large as that in Ecuador (1995).

[16]While not reported separately, Malaysia is an exception this observation; government consumption accounts for more than one-third of output recovery at the five-year horizon.

taxes do not decline. The initial fall in investment as a share of GDP is roughly equivalent to the decline in the contributions of net exports. During and after the crisis, there is growth in the share of savings and net taxes from 37 percent to 40 percent of GDP, a feature mirrored by an even larger increase along the bottom end of the quantile. Combined with the negligibly small observed change in government consumption as a share of GDP (a net increase of 0.05 percent over the range of reported dates), this suggests that the increase in investment can be explained by increased fiscal discipline or increased private savings.

Domestic sources of savings, whether allocated to gross domestic savings or increased fiscal discipline, are typically the sources of this impressive increase in investment following the trough of the Systemic Sudden Stop. We examine information about the foreign and domestic financial markets to validate this conclusion.

3.2 Recovery in the Domestic Financial Sectors

Outside of the national accounts data, the distinction between per capita real and strictly real indicators loses some of its importance. The features of the per capita real data are qualitatively similar to those of the strictly real data, and we omit the latter from our analysis of the banking sector. Seen in the upper left panel of Figure (5), credit to the private economy contracts sharply at the trough of the crisis. Average credit drops by about a quarter in the year preceding the trough of the crisis. A large share of this drop is a result of bank bailouts in a number of episodes in which there is a coincident bank crisis.[17] In some of these cases, the government assumes responsibility for a quantity of the banks' claims on the private economy and protects the banks from risky and defaulting loans. Consequently, these assets now show up as claims on the government instead of claims on the private economy. The dashed line in this panel, representing the combination of loans to the private sector and the government sector, drops extremely little and demonstrates this feature quite strongly. Regardless of the pre-crisis characteristics, the subsequent behavior of both of these series suggests that the creditless recovery is the exception rather than the rule. While there is a wide range of behavior in private credit following the crisis,

[17]There is substantial overlap between this set of Sudden Stop episodes and a number of the banking crises identified by Kaminsky and Reinhart (1999).

the vast majority of episodes exhibit some growth in the subsequent years. The data displayed in the upper left panel of Figure (5) represents this view and shows that the Phoenix Miracle experience is limited to a small subset of the recovering countries.

The features of credit to the private sector in the fast-recovery subset show little resemblance to the full-sample equivalents in the upper right panel. The Calvo et al. (2006a and b) and Tornell and Westerman (2002) creditless recovery presented on the right panel changes to one of substantial and sustained recovery in the financial sector in the graph on the left.

Identical features characterize the other side of the balance sheet. In all of these recovering episodes, bank deposits continue to climb. As shown by the quantiles, in at least 11 of the 13 episodes[18], CPI-deflated per capita deposits increase a minimum of 10 percent over the six years from the trough of the crisis. The average increases by nearly 50 percent, suggesting a sustained confidence in the ability of the financial sectors to play their roles in these recovering economies.

While a large number of these recoveries are characterized by substantial and continuing growth in credit to the private sector, we examine two of the episodes individually to highlight a few sources of heterogeneity. We summarize the banking sectors of two representatives from this group of 15 episodes in Figure (6). The bars represent aggregates across a number of categories, the specifics of which are detailed in the data appendix. We selected three simple categories common to both the liabilities and assets sides of the bank sheets: private, government, and foreign. These three categories are stacked bottom to top and are denominated in real per capita terms.[19] As a point of reference, the real per capita output line that lies on top of the bar graph,

[18]Because of Brazil's hyperinflation in the 1980s, it is difficult to accurately construct some of the real CPI-deflated variables such as bank indicators. With inflation rates eclipsing 1000 percent per year, even series constructed days apart will be inaccurate. Therefore, we exclude Brazil (1983) when reporting any CPI-deflated series. Ecuador (1999) suffers from similar problems, albeit at lower levels of inflation. The measurement difficulties in Ecuador are compounded by the country's dollarization policy in 2000. All of the IFS data for Ecuador is denominated in U.S. dollars, even for the years prior to the crisis. The nominal exchange rate against the U.S. dollar changed by more than 200 percent, which was not matched by a comparable rise in the CPI. Instead of attempting to splice the series together to create a consistent series at the crux of a Sudden Stop that was coincident with very high depreciation and inflation, we omit the banking statistics for this episode. However, very little recovery in bank credit as measured in nominal U.S. dollars in the years following the crisis, suggesting that this may actually be one compelling example of a Phoenix Miracle.

[19]Government is the aggregate of all claims on (liabilities to) the central government, state and local governments, monetary authorities, and public enterprizes both financial and nonfinancial. Foreign assets and liabilities are individual lines in the IFS dataset and required no aggregation. Private credit is line 22d, claims on the private sector. Private liabilities are the sums of demand deposits, time deposits, bonds, restricted deposits, and

is tied to the right axis, and is plotted for the years in which the banking statistics are reported on the graph. The left bar in each pair shows where the money goes (bank assets) and the right bar catalogues the sources of funds (bank liabilities).

Korea (1998) is representative of a sizable subset of the episodes including Russia (1999), Turkey[20] (1994), Morocco (1981)[21], and Morocco (1995). In each of these episodes, the increase in real per capita credit to the private sector increases substantially following the onset of the crisis. Korea shows substantial increases in not only the quantity of loans, but the quantity of domestic deposits. The government and foreigners make only a marginal contribution during the recovery, as assets and liabilities in the private sector account for a vast share of the value on the balance sheets.

Mexico represents a different type of bank recovery that is closer to the experiences in Thailand (1998), Malaysia (1998), Turkey (1999), Chile (1983), and Colombia (1999). These episodes show much more marginal recoveries during the two years following the crisis. In these episodes, however, the worst performing years in credit are roughly coincident with the slowest rates of growth in recovery. On the surface, these episodes are candidates for Phoenix Miracles. Mexico's balance sheet on the bottom panel of Figure (6) reveals why strict examination of the one line on private credit in IFS may understate the amount of new credit in the private economy. According to Honohan and Klingbiel (2000), the Mexican bank bailout cost the central government between six and 20 percent of GDP, money that evidently found its way into bank balance sheets. As the government intervenes, it assumes responsibility for a number of bad loans. This policy is reflected on the increasingly large share of claims on the government that populate the banks' assets. The fact that the claims on the private sector decline marginally over the first two years clearly demonstrates that the banking sector is still viable. In spite of the large number of debts assumed by the central government, the Mexican banks continue lending at a

money market deposits. Not displayed, the other category comprises items that did not fit neatly into those accounts such as reserves, capital accounts, or claims on/liabilities to non-public financial sector institutions. Not every category in IFS was available for every country.

[20]Turkey's recovery is interrupted when it hits another Sudden Stop Crisis in 1999 in which credit declines again.

[21]There is a break in the Moroccan loan data in 1986. Furthermore, Morocco does not report any category of government claims separately in these years.

pace that nearly sustains their level of claims on the private economy. Adding up government and private shares on the asset side of the balance sheet shows an increasing value of the banks' assets, indicative of new loans to the private sector.

Several features common to these two episodes apply to the whole sample. While in many cases, foreign liabilities increase immediately around the trough of the crisis,[22] the trend is that the banks do not depend on foreigners to directly finance their lending operations. In fact, in many of these episodes like Mexico (1995), there is a subsequent decrease in foreign liabilities. S consistent increase in deposits following the trough of the crisis further illustrates the health of the banks. Households or firms are keeping a larger quantity of money in the banking system. While there may be capital controls keeping money from going abroad through the formal banking sector, there are few examples in which the level of foreign assets increases, and fewer still in which foreign assets grow as a share of total bank liabilities. Finally, the lack of foreign assets demonstrates that, in spite of a large swing in the current account, money is not flowing out of the country in vast quantities through the banking sector.

In addition to the banking sector, money can finance investment through other instruments such as equities. We present the average CPI-deflated, per capita stock market capitalizations in the top panel in Figure (7).[23] In the bottom panel, the solid line represents the average number of companies listed on the exchange, normalized to 100 at the trough. While there is a large amount of volatility in the stock markets prior and subsequent to the trough of the crisis, the average value of the stock markets increases dramatically. Additionally, there is nearly a 20 percent average increase in the number of listings on these exchanges. This suggests that, in addition to borrowing from a functioning banking system, a growing number of firms access capital through the equity market.

Between these growing banking sectors and equities markets, there is evidence to show that domestic institutions are funding the investment growth that characterize the fast-recovery

[22]These figures are denominated in real per capita local currency, therefore, the significant depreciation observed in our data and by Calvo et al. (2008) is going to inflate the value of the stock of foreign liabilities.

[23]Argentina drops out of the sample again after 2006; therefore, the shaded area represents the middle 10 observations five and six years after the trough of the crisis. Furthermore, Korean data on stock market listings are not available. Korea has two stock markets; the source reported one for a number of years after which it switched to reporting the aggregate of both.

episodes. The strength of the domestic financial institutions combined with the increase of domestic savings suggests that foreigners do not fund these recoveries, an observation we verify by examining balance of payments data.

3.3 Foreign Contributions

The current account, as reported in the IMF's BoP data, can be disaggregated into three components: the capital account, the financial account, and a measurement error. The capital account, as defined by the IMF, is principally composed of remittances and debt forgiveness. The financial account is composed of all of the loans, bonds, direct investment, equity investment, trade credit, and other transactions between country residents and foreigners. We disaggregate the financial account into foreign direct investment (FDI) and net inflows minus FDI.[24]

The average flows for the fast-recovering countries are shown in Figure (8). The current account balance is the left-hand bar in each group. The right two bars add up to the left one net of the capital account and any measurement error. That the current account deficit falls during the crisis is unsurprising; this is one of the primary features that defines Sudden Stop crisis. However, the source of foreign capital inflows continues to remain dry for years after the crisis. The financial account, minus foreign direct investment, approaches six percent of GDP and remains negative for years following the crisis. Therefore, foreign funds bought with bonds, loans, and equities are not the source of new investment funds. On average, these economies are still exporting slowly declining quantities of capital for a few years following the crisis. This observation is consistent with the view that net exports make a minimal contribution toward output growth.

Although the current account moves very sharply during the crisis and recovery periods, FDI remains very stable as a share of GDP. FDI remains steady at approximately two percent of GDP during and after the crisis. This observation has a wide number of interpretations about which we defer discussion until we compare this measure of inflows across the two subsets of episodes.

[24] We also considered a separate specification in which we lumped FDI with equities; however, the only countries in which this made a perceptible difference were Korea and Thailand.

While there remain significant inflows of foreign direct investment, overall financial flows fall to the point that there is no expectation that they alone can finance the rapid expansion in domestic investment we illustrated in the previous section. This view is consistent with all of the national accounts data on recovery, which suggest that net exports contribute very little toward investment rates.

4 Persistent Crisis

4.1 Accounting for a Lack of Growth

On the other end of the bimodal distribution are those countries in which economic growth is stagnant for decades after the Sudden Stop crisis. Real per capita economic output does not reach its previous peak for at least 15 years for the nine episodes that constitute the slow-recovery subset. Figure (9) presents average indicators analogous to the ones used to define successful recoveries.[25]

The upper left panel shows the contrast between the levels of real GDP and per capita real GDP. Looking at the strictly real GDP figure, one can mistakenly infer that these countries are recovering from their respective crises. On average, these countries get back to their previous levels of output in four years. The story told by the per capita indicator, however, is entirely different. While there is some marginal recovery that immediately follows the trough of the crisis, per capita output actually drops in the five following years. These countries produce the same output per capita six years after the trough of the crisis as they do at the bottom of the crisis. The quantile shows that this feature is not particular to select episodes within this sub-sample of Sudden Stops, but that this feature defines the group. This figure, set against the full sample in the upper right panel, shows that the slow-recovery experience is far removed from the full-sample average.

[25]The blue bands represent the range of the marginal distribution at each year from the horizon, excepting the top and bottom observations. In the case of per capita real GDP, investment, exports, imports, private credit, and deposits, the blue band represents the middle seven observations. For consumption, it represents the middle six observations; data on private and government consumption is not disaggregated for Argentina around its 1983 crisis.

Consumption, detailed in the middle left panel, is even worse. Per capita real consumption is approximately five percent lower six years after the trough. The per capita indicators leave no doubt that these countries fail to recover and that some subset of them is substantially worse off than it was at trough of the crisis. Imports and exports show a markedly different path than they do in the full sample. Imports drop precipitously, moving in the same but exaggerated direction when compared to the subset of fast-recovery episodes. However, imports do not make up any ground following the trough of the crisis. Exports similarly remain completely stagnant in spite of the exchange rate depreciations and devaluations that typically accompany these crises.

The left panels of Figure (10) highlight investment. Investment never recovers at all, either in levels or as a percent of GDP. Real investment per capita drops to a level from which there is no improvement. While there are a select few episodes in which investment recovers as a share of GDP, there of no subsequent improvement in this indicator on average. The average of the entire sample in the bottom right panel is depressed by the episodes in the slow-recovery subset. As was the case with GDP, investment remains depressed for years following the crises. This lack of growth stands in sharp contrast to the strong investment that characterizes the fast-recovery episodes.

As before, we take these indicators and report the degree to which they contribute to output growth. We construct the contributions to output growth as a function of the components using the same equation as last time. We report those features in three of the panels in Figure (11). In this analysis, we report Nigeria (1983) and Argentina (1983) separately from the other seven episodes. Argentina did not disaggregate private and government consumption; therefore, we only report the investment and net exports data. Nigeria began exporting oil in greater quantities shortly following its crisis, distinguishing it from the other episodes.

The upper left panel shows a picture that clearly demonstrates the lack of growth across all sectors of the economy. The economy is equally stagnant across all sectors of these economies. For the seven aggregated episodes and Argentina (1982), there is no incidence at either the two- or five-year horizons for which any of the components contributes significantly to growth or decline. Government spending and net exports play practically no role in accounting for changes to per capita output during the post-crisis period. Even investment and consumption, the two

largest components of output, average contributions that are economically indistinguishable from zero.

Nigeria (1983) is unique to both groups due to the strong, positive impact of net exports on output growth. In spite of exceptionally strong performance in the export markets, there is a further decline in investment, and government and private consumption both contribute significantly and negatively to changes in per capita real GDP. Individual welfare, if accurately represented by consumption, continues to suffer long after the initial output collapse, in spite of a near-recovery in terms of per capita output.

In the bottom right panel of Figure (11), we illustrate the familiar features of investment—a sharp drop followed by a marginal recovery. In this case, however, savings and taxes decline as a share of GDP over time. Savings and taxes net of transfers declines from 36.7 percent 36.0 percent at the crisis, and then falls again to 33.7 percent of GDP in the following five years. Given the negligible change in government consumption as a share of GDP, we infer that some combination of private and government savings declines following the crisis.

These figures strongly validate the decision to split the sample between the two modes in the distribution of time-to-recovery. The indicators suggest that Sudden Stops in slow-recovery episodes are catastrophic events—the drop in output is sudden, persistent, and dramatic. Output or consumption per capita statistics indicate that people in these countries suffered tremendously and benefitted from very little subsequent relief. We expect to see these features reflected in the international and domestic financial indicators. The national accounts identities suggest that there is very little additional foreign money coming from abroad, and the domestic banks never recover.

The banking sector, represented in the two left panels of Figure (12), satisfies this prediction. Claims on the private sector decline precipitously and fall again several years after the crisis. Any bank bailout reflected as loans to the government on the balance sheet is eventually overwhelmed by continuing and persistent declines in credit. The same behavior characterizes the other side of the balance sheet as well: Deposits in CPI-deflated per capita terms drop show a persistent and constant downward trend.

The right two panels in the figure show deposits and credit averaged over the whole sample.

These aggregate indicators are the products of two very different experiences, each of which is characterized on the left sides of Figures (12) and (5) respectively. The blue shading represents 2/9, 8/9 quantiles and reveals that there is not more than one episode in which bank credit is higher six years from the trough of the crisis.

In most of these episodes, the banking statistics are coincident with the balance of payments statistics, and except for Mexico and Argentina, there is little foreign participation on either side of the balance sheet. Foreign institutions are not bailing out these banks, and money is not flowing abroad through the deposit banking sector. In Argentina and Mexico, the crisis is coincident with an expansion of foreign liabilities. Furthermore, as the banking sectors in these two countries decline further, the foreign liabilities occupy a larger share of overall liabilities.

Credit to the private economy remains depressed in all of these countries. In some cases the collapse continues unabated, even though the government is bailing out the banks in Argentina, Peru, and Mexico.[26] On the other side of the balance sheet, the deposits are stagnant or decline further over the course of the seven years following the trough. This suggests that people are either unable or unwilling to put money in the banks.

The rate and degree at which the domestic banking sector disintegrates varies substantially across the episodes. On one end, Argentina (1982), South Africa (1983), and Mexico (1983) all show similar stagnation before marginally rallying more than four years after the crisis. Côte d'Ivoire (1984), Peru (1983), Nigeria (1984), El Salvador (1982), and Venezuela (1983) suffer through a complete failure in their banking sectors. We present the features of Argentina (1982) in the top panel of Figure (13) to show the characteristics of the stagnant group, and we use El Salvador (1982) in the bottom panel of Figure (13) as an example of the banking sectors that completely collapse.

There are very few consistent features in the equities markets. Some of the markets grow considerably—possibly because these markets are very young—but there are no features common to this subset of episodes. A large number of them continue to decline in real, per capita market capitalization, but a few increase spectacularly. A similar pattern emerges along with

[26]These three episodes are all listed in the Kaminsky and Reinhart (1999) list of Twin Crises. Argentina shows an increase in government participation in the banks on both the assets and liabilities side in 1982, Mexico and Peru on the assets side in 1984.

the number of listed firms. It is difficult to attribute too much significance to the equities markets in these episodes because, unlike the exchanges in the fast recovery countries, most of these exchanges have very few listings and are extremely volatile. Furthermore, with the exception of South Africa, most of these exchanges' market capitalizations can be measured as single digit percentages of GDP.

Overall, the domestic financial institutions' indicators largely mirror the features of the national accounting statistics. International capital flows follow much the same pattern in the set of slow recoveries as it does in the other group. The most striking feature in Figure (14) is the very feature that defines these sudden stop crises: a sharp decline in the financial inflows in these countries. The financial account drops from more than nine percent of GDP in the year before the crisis to about nothing. After several years, these countries begin importing capital again to the tune of three to four percent of GDP. As before, the levels of net foreign direct investment inflows remain constant before and after the crisis.

4.2 Comparing Crises

On the surface, there is little difference between the foreign components of the post-crisis experiences in the two groups of countries. Net exports contribute almost nothing to economic growth in either case, and net inflows do not contribute any capital to the countries. Financial accounts fall similarly as a share of GDP in both sets of countries, and they never return. Imports drop precipitously in both sets of countries, and the crisis has little effect on the trend of real exports in either case.

FDI, as a share of output, shows a similar pattern across episodes. On average, there is little change across the trough of the crisis. However, the episodes in which the countries recover quickly distinguish themselves as having much higher shares of FDI.[27] There is not a single episode among the slow-recovering economies in which FDI approaches the average of the recovering countries, either prior to or after the crisis. The strong FDI inflows may

[27]South Korea's foreign direct investment is deceptively small both before and after the crisis. There are substantial inflows in the form of equities investment that equal or exceed FDI before the crisis; presuming that equities substitute for some FDI. Of the episodes for which equities inflows are available, South Korea and Thailand are the only two for which net equities inflows are roughly comparable to levels of FDI near the crises.

reveal investors' beliefs about prospects for fast recovery. Alternately, the strong FDI may be a reflection of the timing of the crises. All of the slow-recovery episodes are located in the early 1980s, whereas the bulk of the fast-recovery episodes are in 1990s. While Chile (1983) and Brazil (1983) had pre-crisis FDI that substantially eclipsed the slow-recovery average as a share of GDP, Morocco (1981) does not.

Where the differences in the foreign sector limited to a subset of the indicators, they are first-order in the domestic sectors. Among the slow-recovery economies, investment and consumption on a per capita basis remain stagnant for years following the onset of the crisis. The domestic banking sector typically contracts at varying rates of speed. In some episodes, private credit continues to dry up even further after the crisis, and people demonstrate their lack of faith in the banking sector by withdrawing their deposits. While all of the countries suffer from immediate and substantial drops in welfare, in the fast-recovery episodes, the banks and private sector economy recover to deliver increases in consumption and output without relying on large capital inflows to finance this growth. The other economies remain stagnant across most dimensions. The effects of the Sudden Stop persist for decades.

Examined separately, investment and banking sector statistics follow a path that is highly consistent with the correlations presented in Table (4). The average statistics of the aggregate sample, in which the recovery appears to be creditless, are created from of two very different types of episodes. While the creditless recovery presents many theoretical challenges, the two episodes considered separately fit well with our small open economy model. This model, with a stylized banking sector and subjected to two different types of TFP shocks, manages to simulate many of the features that characterize these two categories of recovery.

5 A Small Open Economy

We formulate a model of a small open economy (SOE) that will duplicate many of the features for both types of crisis. Although we use one model to account for both types of episodes, we choose two different calibrations to match the features specific to the two subsets of Sudden Stop recoveries. We apply a temporary TFP shock to model the effects of the Sudden Stop and fast

recovery, and we use a permanent TFP shock to simulate the Sudden Stops without recovery.

While Calvo et al. (2006) note that TFP declines in these countries at the onset of these crises, they assume that this empirically observed fact does not represent an actual decline in the productivity of capital and labor. Other features including, but not limited to the loss of organizational capital or decline in the quality of imported materials may account for components of this observed TFP drop. Regardless of the underlying mechanism that accounts for this observation, we conduct this simulation to demonstrate ability of these reduced-form shocks to match the empirical features of recovery.

5.1 The Model

Our SOE model takes as a base the models in Correia et al. (1995) and Jaimovich and Rebelo (2008). With an approach similar to Jaimovich and Rebelo (2008), we tie down the steady state level of foreign debt with a debt-elastic interest rate analogous to the one presented in Schmitt-Grohe and Uribe (2003). We also include a much-simplified version of the bank in Chari et al. (1995). The bank borrows at the world interest rate and lends to households for investment and to firms for their wage and capital bills.

At the beginning of the period and after any uncertainty is resolved, the household borrows money from the bank, which in turn borrows from the world market. The household pays upfront for the investment goods it orders. The firm borrows money to rent capital from the household and hire labor. It produces a generic good which is used to pay back the bank loans. Finally, using its wages and capital income, the household pays back any outstanding loans and collects any interest on foreign assets, chooses new levels of foreign bonds, and consumes the remainder.

5.1.1 The Household

A household solves its problem by choosing levels of investment (I_t), capital (K_{t+1}), consumption (C_t), work effort (N_t), and one-step-ahead, non-state-contingent bonds (B_{t+1}). More precisely, the household solves:

$$\max_{C_t,N_t,I_t,K_{t+1},B_{t+1}} E_0 \sum_{t=0}^{\infty} \frac{\beta^t}{1-\sigma}[u(C_t, N_t)]$$

subject to the following budget constraint:

$$C_t + I_t(1 + r_t^l) + G_t + \frac{B_{t+1}}{1 + r_t} \leq w_t N_t + r_t^k K_t + B_t$$

in which G_t is the exogenously determined level of government consumption and r_t is the world interest rate at which the household can purchase one-period securities. The household orders investment goods I_t at the beginning of the period, and borrows $I_t(1 + r_t^l)$ from the bank to finance the investment. This money is paid back at the end of the period out of the earnings on capital and labor, $w_t N_t + r_t^k K_t$. We impose the no-Ponzi condition:

$$E_0 \lim_{t\to\infty} \frac{B_{t+1}}{\prod_{t=0}^{\infty}(1 + r_t)} = 0$$

We use the utility function from Greenwood, Huffman, and Horcowitz (1988):

$$u(C_t, N_t) = (C_t - \psi X_t N_t^{\nu})^{1-\sigma}$$

where X_t is a scale factor. These GHH preferences have the advantage of emphasizing co-movement between the TFP shock and the labor and consumption responses. Traditional preferences, as defined in Correia et al. (1995), do not generate enough of a consumption response to a strong, temporary drop in TFP to match the empirically observed drop in consumption during the crisis. The evolution of the scale term is defined by the following deterministic relationship:

$$X_{t+1} = X_t \gamma_x$$

We employ capital adjustment costs used by Christiano, Eichenbaum and Evans (2005) in which the cost of adjustment is a function of this period's investment relative to last period's investment:

$$K_{t+1} = (1-\delta)K_t + (S(\frac{I_t}{I_{t-1}}))I_t$$

We assume $S(\gamma_x) = 1$ so that there are no costs for investment along the steady-state growth path. Furthermore, we assume that $S'(\gamma_x) = 0$ and $S''(\gamma_x) \equiv \chi > 0$ so that there are positive adjustment costs for any level of investment deviating from the steady-state path of growth.

Government consumption is taken as a determined variable that grows over time such it remains a constant share of output along the stead-state growth path:

$$G_{t+1} = \gamma_x G_t$$

5.1.2 The Technology

The firm has access to a Cobb-Douglas production technology:

$$Y_t = A_t K_t^{1-\alpha}(X_t N_t)^{\alpha}$$

in which A_t is TFP. We assume that TFP evolves according to:

$$\ln A_{t+1} = \overline{a} + \rho \ln A_t + \epsilon_t$$

The firm chooses K_t and N_t to maximize its profit function:

$$A_t K_t^{1-\alpha}(X_t N_t)^{\alpha} - (1 + r_t^l)(w_t N_t + r_t^k K_t)$$

paying r_t^l interest for money borrowed at the beginning of the period to pay the wage and capital rental bill.

5.1.3 The Financial Markets

The bank borrows money at the beginning of the period to fulfill one of the roles of the bank in Chari et al. (1995). It lends money to households for investment and to the firm for its wage and capital rental bills. However, unlike the bank in that model, the banks here do not consume

any productive resources. The bank is competitive and earns no profits: therefore, the lending rate, r_t^l, is also equal to the rate at which it can borrow money on the international market, r_t. Most foreign borrowing, particularly during crises, is going to be denominated in a foreign currency making the world interest rate the most relevant choice. The total amount repaid at the end of the period to the international lender is:

$$(1 + r_t^l)(I_t + w_t N_t + r_t^k K_t)$$

Therefore, the trade balance is:

$$TB_t = \frac{B_{t+1}}{1 + r_t} - B_t + r_t^l(I_t + w_t N_t + r_t^k K_t)$$

We assume that the debt elastic interest rate takes a form similar to that used by Schmitt-Grohe and Uribe (2003) and Jaimovich and Rebelo (2008):

$$r_t = r^* - \phi(e^{\frac{B_t}{X_t} - \bar{b}} - 1)$$

We include the scale term so debt or assets are constant as a share of output along the steady-state growth path. In order to exclude those uninteresting and undesirable scenarios in which the households in this small open economy accumulate assets without bound or borrow at the limit, we set the world interest rate:

$$r^* = \frac{\gamma_x^\sigma}{\beta} - 1$$

In this formulation, the interest rate varies as the stock of foreign assets or debt deviates from its steady-state value. As the stock of assets increases, the interest rate declines. Additional debt results in a slightly higher real interest rate.

5.2 Calibration

We use two parameterizations, one for each type of recovery. Some of the parameters are derived from the facts developed in the preceding sections, others are borrowed from related literature.

From Greenwood et al. (1988), we take the parameters governing household utility: we set $\sigma = 2$ and $\nu = 1.7$. We set ψ such that work consumes 20 percent of the household's endowed time across each specification. The income share to labor, $\alpha = .65$, is well within the range of international estimates by Gollin (2002). We selected a depreciation rate of 0.08 that is consistent with the figure used in Mendoza and Durdu (2006). We set the discount rate to be equal to $\beta = \frac{1}{1.03^{.25}}$.

We choose scaled government consumption such that $\frac{G}{Y}$ is equal to 0.123 for the fast recovery episodes, 0.118 for the slow-recovery episodes. The average real per capita GDP growth in all of the 15 countries that experienced fast recovery is 2.65 percent; the same figure in the other subset of countries is 1.03 percent. Therefore, in all of the experiments replicating the experience of fast recovery, we set $\gamma_x = (1.0265)^{.25}$, so that steady-state growth replicates the figure observed in the data; $\gamma_x = (1.01)^{.25}$ in the other group. We choose $\overline{b}$ to match the reported trade balance in each of the subgroups' panels. In the fast-recovery cases, the trade deficit accounts for about 0.26 percent of output. In the other cases it is 0.84 percent. We set $\overline{a} = 0$ such that the steady-state TFP is equal to one, and we set the persistence parameter ρ on the shocks to 0.90, slightly smaller than the 0.95 used by Neumeyer and Perri (2005). Higher levels of ρ lead to very deep crises and very slow recoveries that are not easy to reconcile with any of the features of the studied episodes.

We choose two different parameterizations for the investment adjustment cost parameter χ. For the fast-recovery episodes, we chose the value $\chi = 0.50$, which is the "small adjustment costs in investment" specification in Christiano et al. (2005). High capital adjustment costs cause investment to respond too weakly to the TFP shock, and none at all cause wild swings in investment vastly out of proportion to the actual experiences. For the slow-recovery economies, we selected a value $\chi = 2.0$, which is in the middle of the range for the models estimated in Christiano et al. (2005).

5.3 Results

In both cases, we begin the crisis at the start of the third quarter of the year. We selected the magnitude of the TFP shock such that the simulation would generate output drops over two years that mirrored those reported in Figures (4) and (11). In the first experiment, we induce a temporary 10 percent drop in TFP. Work effort drops precipitously in tandem with the fall in TFP. Combining the households' first-order necessary conditions with respect to labor and consumption yields the result that labor is a direct function of TFP and the capital stock:

$$N_t = (\frac{\alpha A_t k_t^{1-\alpha}}{\psi \nu})^{\frac{1}{\nu-\alpha}}$$

in which $k_t = \frac{K_t}{X_t}$ is the scaled value of the capital stock. Therefore, the drop in TFP leads to an immediate and substantial decline output and work effort.

We assume that the economy is in steady state prior to the crisis and that the fall in TFP occurs in the third quarter of the year, we construct the contributions and report them in top right panels of Figure (15). We report the empirical contributions in the left panels of Figure (15). Both sets of figures are set to the same scale to facilitate comparison. The model reproduces a large number of the empirical features of crisis and recovery. The initial simulated decline in investment and consumption somewhat understates their observed contractions, also reflected in a weaker-than-expected response in the trade balance. However, following the trough of the crisis, the model captures all of the important features of recovery. Investment makes the largest individual contribution toward recovery, followed by consumption. At the five-year horizon, investment slows down marginally. Simulated net exports decline to levels only slightly larger than the levels observed in the data.

We also perform the experiment with a seven percent permanent decline in TFP and calibrated to the features of the other group of episodes. In this case, however, the TFP shock is instantaneous and permanent. The effect on output is immediate and strong. Both consumption and investment account for a majority of the decline in output, both in roughly equal proportion to that of the observed episodes. Net exports grow as these countries cut back on investment and output, again in proportion to the level seen in the actual experiences. Following the crisis,

the model accurately fits the data. The simulation shows economic stagnation across all sectors, a result that perfectly characterizes the average experience of the slow-recovery episodes.[28]

In Figure (16), we report the value of the simulated loans that are used to finance investment and the firm's short-term obligations. The upper panel shows the loans in the fast-recovery scenario normalized to 100 at the trough of the crisis. Although the fall in the data is much more modest, the path of recovery over the subsequent five years is highly consistent with the actual experiences. Given that a lot of the drop in observed private credit is on account of a government bailout, a feature we chose not to model, it is completely unsurprising that the model under-predicts the drop in bank loans. The simulated drop is much closer to the government plus private loans line presented from the upper left panel of Figure (5).

The simulated loans also follow the same pattern of decline in the slow-recovery data, although there is no feature of the model that allows for subsequent declines in the banking sector years after the trough of the crisis. Although the TFP shock was calibrated to simulate the approximate fall in output over the two years preceding the crisis, this simple, stylized banking sector still manages to capture the approximate features of the banking sector during and immediately after the crisis.

The magnitude of every feature is not accurately captured in these two examples, a simple model with a shock to TFP replicates many of the features we document. While available data limits our ability to directly estimate the models and the shocks, we turn to Korea (1998) as an country in which we can approximate the TFP shock.

6 The Asian Currency Crisis: Korea, 1998

We calibrate our model and the TFP shock to the 1998 Korean episode in an experiment related to one conducted by Zarazaga (2007).[29] We begin by approximating the capital stock, using Dhareshwar and Nehru (1993) estimates of a base-year level of capital from which we construct

[28]The simulated trough occurs several years after the onset of the crisis in contrast to the data, although the decline following year "zero" is very modest. The vast majority of the simulated output contraction occurs within the first two years.

[29]Zarazaga(2007) conducted a similar experiment for Argentina. He used Argentina data to construct a TFP series that he used as a shock in a closed-economy, neoclassical growth model.

the series. Using capital stock, employment, and output, we compute the TFP. Calibrating the model to the specifics of the Korean episode, we simulate the model using the constructed TFP series, report the national accounts indicators, and compare the marginal product of labor against a CPI-deflated wage series and the simulated loans against our lending data.

We start with the capital stock data from Dhareshwar and Nehru (1993) based in 1976. To remain consistent with their estimates, we begin by taking the quarterly real fixed capital formation[30] and normalizing it to the investment series reported in the same year from which Dhareshwar and Nehru constructed their estimates. We chose a constant four percent annual depreciation rate, a value that is close to the five percent depreciation rate used in Correia et al. (1995) for Portugal. This rate is well within the range of depreciation rates that characterize the Dhareshwar and Nehru (1993) estimates. Our procedure produces an excellent fit of our capital stocks through the remainder of their time series, which ends in 1990.[31]

We compute TFP from the following equation:

$$\ln y_t = \ln A_t + (1-\alpha)\ln k_t + (\alpha)\ln N_t$$

in which we use quarterly labor statistics, real output, and the constructed capital stock. The lower case letters represent the absolute levels divided by the scale factor X_t. We construct $\ln(X_t)$ such that it grows at the linear trend at which log output in the Korean economy grew from 1990 to 2008.

We retain many of the features of the earlier calibration for Korea with a few exceptions. We set $\psi = 3.11$ to make employment occupy 20 percent of the labor endowment. Capital adjustment costs are set to the virtually nonexistent level of $\chi = 0.2$. The income share to labor is set to $\alpha = 0.7$, in line with the range of estimates specific to Korea provided by Gollin (2002). The scale factor grows at $\gamma_x = 1.0109$ which is the rate of growth in a linear trend of log real per capita output from 1990 to the present. Scaled government consumption was chosen such that it is equal to 11.6 percent, which is the value immediately before the crisis as well as the

[30] Series reported by the Bank of Korea via Haver Analytics.

[31] The average absolute error between our approximation and their data from 1977 through 1990 is 0.75 percent and is greatest in 1978.

average since 1990. Finally, we set $\bar{b}$ to match the average trade balance since 1990.

The path of the shock to TFP is completely known to households at the onset of the crisis. We apply nine quarters of lower TFP after which it reverts back to the level estimated in 1997 immediately before the crisis. During the course of the crisis, the TFP drops approximately 10 percent in the first quarter, hitting bottom at nearly 13 percent down in the third quarter.

Figure (17) shows the simulation results. The actual data is presented in the top panel on the same scale. The simulation does a poor job replicating the magnitude of the change in the trade balance and under-predicts the fall in investment during the crisis, perhaps as a consequence of not modeling the Mendoza and Terrones (2008) identified pre-crisis credit boom. The model does, however, capture most of the major features of recovery. The model accurately replicates the observation that investment and consumption contribute strongly toward growth, the latter marginally more than the former in the two years after the crisis. In both cases, the trade balance contributes negatively, albeit at nearly economically insignificant levels. Government consumption, set at a pre-determined level prior to and through the crisis, contributes very little toward output growth. At the five-year horizon, the model again does a credible job replicating the actual Korean experience. Investment no longer represents the major engine of growth prior to the crisis, a distinction that now belongs to consumption. Net exports over this horizon contribute an economically insignificant amount to growth, another feature that exactly matches the Korean experience.

We also compare the simulated real wage and bank loans against the data. The real wage index is the CPI-deflated real wage in manufacturing. We present both series, normalized to one in 1997Q4, the period in which we begin the simulation.[32] The comparison for wages is presented in the top panel of Figure (18), the loans in the bottom panel. In both cases, the model predicts the recovery path. In the case of the real wage, the model predicts an immediate decline in the real wage followed by a relatively quick return to the trend.[33] The simulated loans fall during the crash, which stands in contrast to the actual experience. However, following the crisis, loans grow at a rate very similar to that observed in the data.

[32]There is also a decline in the real wage preceding the crisis that we do not attempt to model.

[33]While the nominal wage does not decline in the data, a sudden and modest rise in the inflation rate causes the CPI-deflated wage to drop.

The TFP shock applied to the model yields a plausible set of features for the recovery period. Although the model does a poor job of capturing the fall in investment and the rise in the trade balance at the onset of the crisis, we made no attempt to model the credit and investment boom preceding the crisis. The model parameterized to the Korean experience, as well as the models calibrated to each subset of recoveries, demonstrates a capacity to match the major empirical features of Sudden Stop recovery.

7 Conclusion

We examine a class of international financial crisis known as Systemic Sudden Stops. Calvo et al. (2006) define these crises as events during which economic activity declines, interest rate spreads increase, and capital inflows collapse. Steep and fast recovery without investment or credit characterize their findings on post-crisis economic behavior.

We reevaluated the same set of episodes using per capita data. The distribution of post-crisis economic indicators is bimodal, leading to the conclusion that there are there are two different types of recoveries. The national accounts of the fast-recovery episodes reveal that growth in investment is highly correlated with output and funded largely through increased domestic savings. The increased domestic savings is reflected in the financial data, which shows growth in deposits and lending. Foreign money is not a major source of financing. Stagnant economic activity characterizes the slow-recovery Sudden Stop episodes. The decline in the sum of private and government savings is mirrored by a fall in the bank deposits and loans from levels to which these indicators never recover.

The story of recovery told in each of these groups separately is a story that can be generated by a model of a small open economy based on Correia et al. (1995) and Jaimovich and Rebelo (2008). Using parameterizations that are calibrated directly from the data or drawn from estimates in the related literature, temporary and permanent TFP shocks can generate a set of outcomes that largely reflect the empirical features of these episodes.

A significant shortcoming in our model is that it relies on a reduced-form explanation for the process of crisis and recovery. Calvo et al. (2006a) assert that it is difficult to attribute the

observed drop in TFP to changes in technology. In future work, we plan to address their concerns through a detailed structural model that offers a precise mechanism through which countries recover from Sudden Stop crises. At the same time, we plan to account for the ex-ante diversity in the recovery experience. We also plan to explore the role of FDI in crisis recovery. High FDI, as a share of output, may predict recovery from economic crisis. Alternately, this feature may simply be correlated with the dates in which the crises occurred and the fundamentally different episodes that characterize each decade. Carefully determining the accuracy with which FDI predicts recovery may lead to future policy research.

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Table 1: Data Sources

Variable	Source
National Accounts	
Real GDP	World Bank World Development Indicators (WDI) - GDP (constant LCU and current LCU)
Population	WDI - Population, total
Investment	WDI - Gross capital formation (constant LCU and current LCU)
Consumption	WDI - Household final consumption expenditure, etc. (constant LCU and current LCU)
Exports	WDI - Exports of goods and services (constant LCU and current LCU)
Imports	WDI - Imports of goods and services (constant LCU and current LCU)
Government Consumption	WDI - General government final consumption expenditure (constant LCU and current LCU)
Banking Sectors	
Credit	Bank Claims on the Private Sector. IMF International Financial Statistics (IFS). Line 22d.
Government Assets	IMF IFS Lines 20c + 22a + 22b + 22c
Foreign Assets	IMF IFS Line 21
Other Assets	IMF IFS Lines 20 + 22f + 22g
Deposits	IMF IFS Line 24 + 25 + 26aa + 26ab + 26b
Government Liabilities	IMF IFS Lines 26d + 26g
Foreign Liabilities	IMF IFS Line 26c
Other Liabilities	IMF IFS Lines 26j + 27a
Balance of Payments	
Current Account	IMF Balance of Payments (BoP) database, Line 4993
Financial Account	IMF BoP database, Line 4995
Foreign Direct Investment	IMF BoP database, Line 4555
Equity Liabilities	IMF BoP, Line 4660

Table 2: Data Sources

Variable	Source
Prices and Interest Rates	
Real Wages	Korea: Avg. Mon. Mfg. Earnings, SA, aggregated quarterly; NSO / HAVER
Real Exchange Rates	JP Morgan Real Broad Exchange Rates unless noted Cote d'Ivoire, Nigeria, Morocco, Russia, South Africa, Uruguay (IFS) Turkey (OECD)
Stock Market	1980 to 1998: International Financial Corporation Emerging Stock Markets Factbook 1999 to 2005: Standard and Poors' Global Stock Markets Factbook
CPI	IFS except for: Chile, Indonesia, Korea, Malaysia, Thailand (Central Banks / Statistics Agencies)

Table 3: Systemic Sudden Stop Episodes

Country	Trough	Output Drop	Population Growth	Years to Recovery: Real GDP	Real GDP per Capita	Real Cons.	Real Cons. per capita
Argentina	1982	-10.36	1.30	10	15	n/a	n/a
Argentina[2]	2002	-18.35		3	4	4	4[1]
Brazil[2]	1983	-3.41	1.75	1	4	0	1
Chile[2]	1983	-13.72	1.52	3	4	6	8
Colombia[2]	1999	-4.20	2.17	2	6	3	6
Cote d Ivoire	1984	-6.50	3.23	2	22[1]	0	14
Ecuador	1983	-3.18	2.08	1	15	2	19
Ecuador[2]	1999	-6.30		2	4	2	3
El Salvador	1982	-29.07	1.63	12	24[1]	10	15
Indonesia[2]	1998	-13.13	1.62	5	7	3	4
Malaysia[2]	1998	-7.36	2.47	2	5	2	5
Mexico	1983	-4.80	1.74	2	15	6	9
Mexico[2]	1995	-6.22		2	2	3	4
Morocco[2]	1981	-6.58	1.84	1	1	1	4
Morocco[2]	1995	-6.58	1.84	1	1	1	1
Nigeria	1984	-21.87	2.66	5	22[1]	22[1]	22[1]
Peru	1983	-12.33	1.96	3	22	2	3
Russia[2]	1998	-5.30	0.14	1	1	1	1
South Africa	1983	-2.22	2.16	1	22	5	23[1]
South Korea[2]	1998	-6.85	0.97	1	1	2	2
Thailand[2]	1998	-11.74	1.35	4	5	4	5
Turkey[2]	1994	-5.46	1.96	1	2	2	2
Turkey[2]	1999	-4.70		1	5	1	1
Uruguay	1984	-19.96	0.69	7	8	7	8
Venezuela	1983	-10.25	2.33	4	23[1]	3	23

[1]Recovery censored after 2006.

[2]Episodes highlighted in gray are categorized as fast-recovery episodes.

Table 4: Correlations Across Episodes

	2 years	4 years	7 years
$\rho(\Delta log(Y), \Delta log(I))$	0.545*	0.754*	0.775*
	0.008	0.001	0.000
$\rho(\Delta log(Y), \Delta log(C))$	0.707*	0.738*	0.833*
	0.005	0.000	0.001
$\rho(\Delta log(Y), \Delta log(CR))$	0.406*	0.609*	0.682*
	0.021	0.001	0.019
$\rho(\Delta log(Y), \Delta log(Dep))$	0.560*	0.655*	0.773*
	0.003	0.002	0.004
$\rho(\Delta log(CR), \Delta log(Dep))$	0.525*	0.793*	0.887*
	0.003	0.002	0.014
$\rho(\Delta log(C), \Delta log(CR))$	0.138	0.419*	0.631*
	0.446	0.018	0.029
$\rho(\Delta log(I), \Delta log(CR))$	0.116	0.413*	0.420*
	0.509	0.012	0.048
$\rho(\Delta log(I), \Delta log(Dep))$	0.410**	0.568*	0.440*
	0.015	0.005	0.035

* Significant at the 95% level. An observation is defined as $\Delta log(X)_i = log(X_{T_i+h,i}) - log(X_{T_i,i})$, where T_i is the date of the Sudden Stop episode and h is the number of years from the trough. C is consumption, I is investment, Dep are deposits, CR is credit to the private sector, and Y is output. All variables are denominated in real per capita terms.

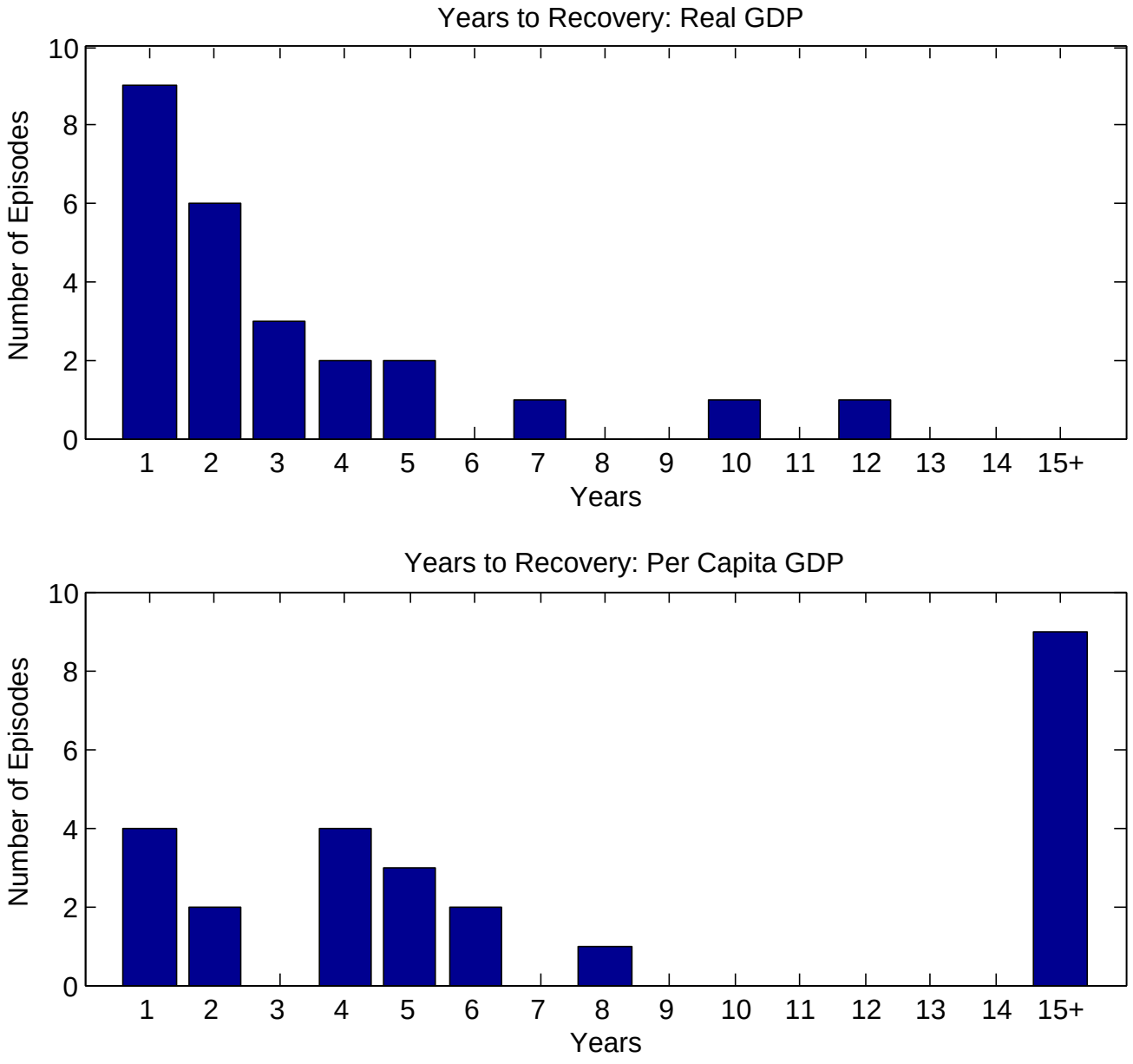


Figure 1: Distribution of years for recovery to pre-crisis peak levels of output. The top histogram displays the distributions of the time required to recover to the pre-crisis peak in real GDP; the bottom displays the same for real per capita GDP.

Table 5: Performance Before and After

		Output Drop	Average Growth T-13 to T-4	Average Growth T+1 to T+5
El Salvador	1982	-32.81	1.83	0.38
Cote d'Ivoire	1984	-31.69	0.82	-1.78
Nigeria	1984	-30.03	2.04	2.70
Argentina	2002	-21.70	2.76	7.82
Uruguay	1984	-21.52	2.65	3.53
Venezuela	1985	-17.51	-0.86	0.26
Peru	1983	-16.45	1.12	1.14
Chile	1983	-16.42	0.86	5.15
Indonesia	1999	-14.76	5.72	3.19
Thailand	1998	-13.67	7.64	3.86
Brazil	1983	-13.34	5.92	2.82
Argentina	1982	-13.05	1.25	0.34
Malaysia	1998	-9.64	4.19	2.80
Mexico	1983	-8.96	3.33	-0.93
Morocco	1995	-8.73	2.68	2.46
Ecuador	1983	-8.17	4.28	0.82
Mexico	1995	-7.86	-0.62	3.95
Ecuador	1999	-7.63	0.45	3.50
South Korea	1998	-7.52	7.47	5.67
South Africa	1983	-7.06	1.00	-0.50
Colombia	1999	-6.88	2.55	1.42
Turkey	1994	-6.25	3.23	2.65
Turkey	1999	-5.56	2.19	2.49
Morocco	1981	-5.09	3.69	3.22
Russia	1998	-5.04	-8.85	7.05

Output drop during the crisis, growth rates before the crisis and during recovery. T demarcates the trough of the Systemic Sudden Stop crisis; the exact date for the trough of each episode in per capita output is listed next to the country. All statistics constructed from real per capita output data.

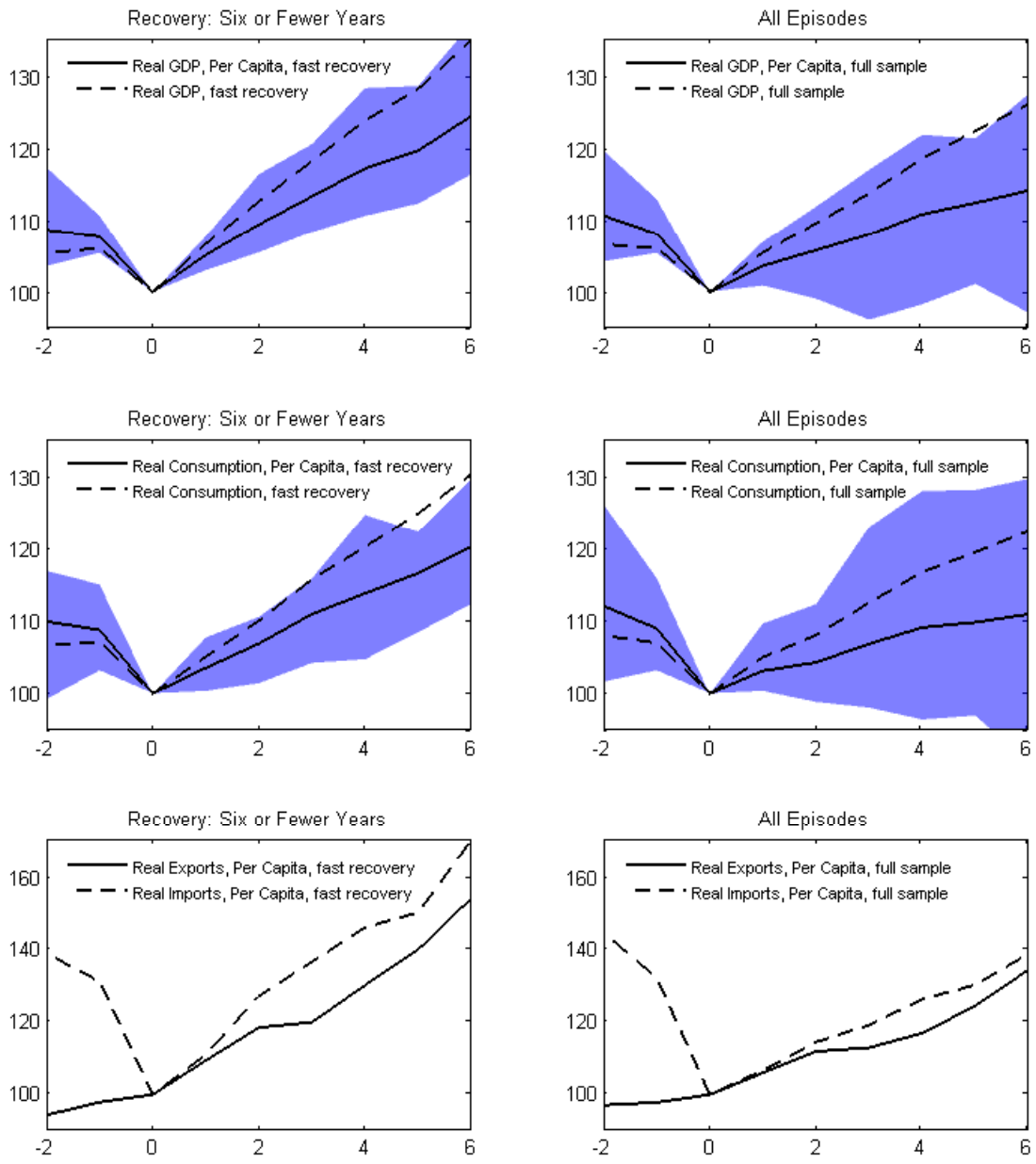


Figure 2: Average Economic Performance Subsequent to a Crisis. Countries in which recovery occurs within six years on a per capita real output basis. Argentina (2002) not available from years five and six. The blue shading represents the range of the marginal distribution at each period, except for the top two and bottom two observations in fast recoveries, the top three and bottom three in the full sample.

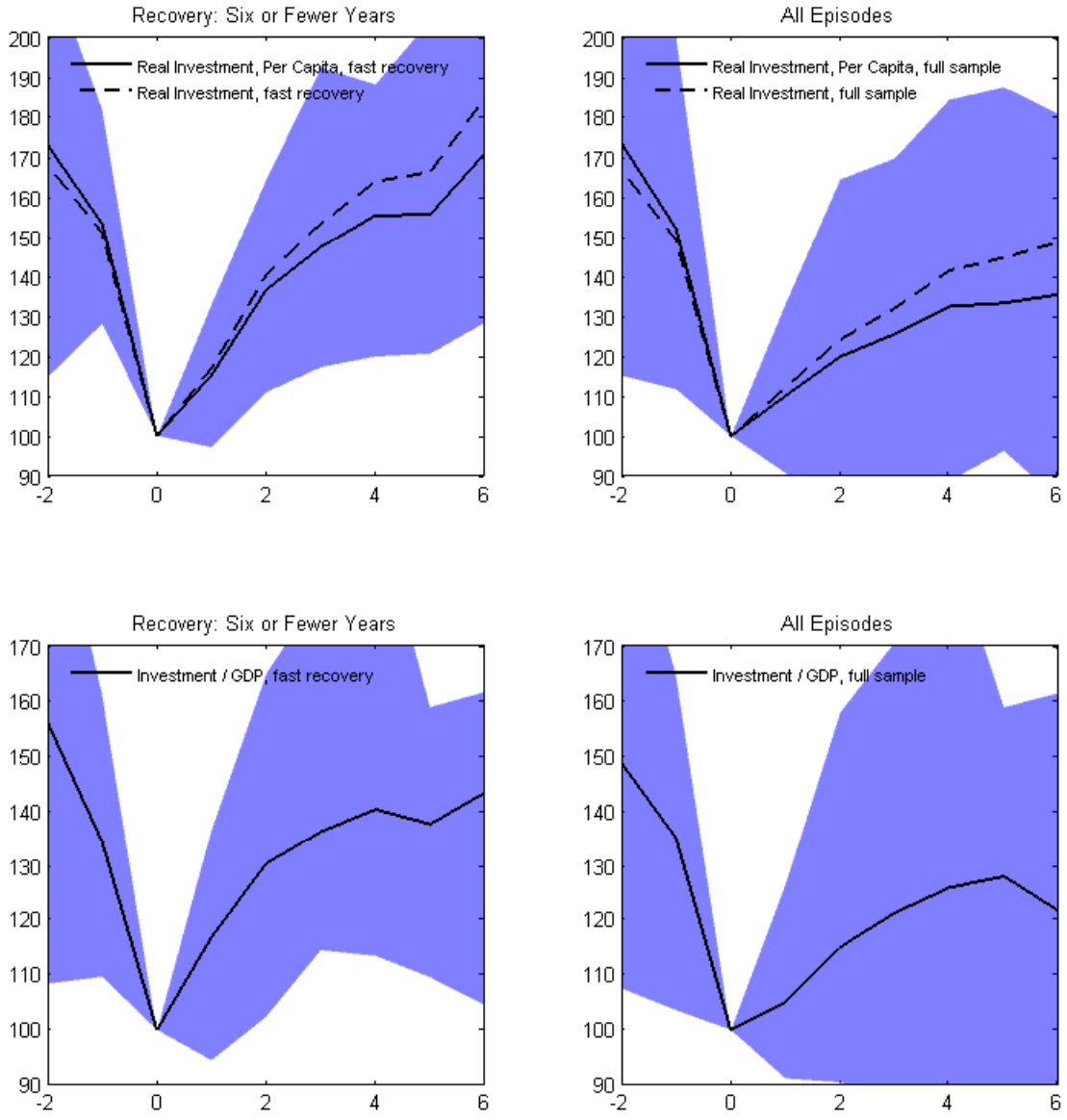


Figure 3: Average Economic Performance Subsequent to a Crisis. Countries in which recovery occurs within six years on a per capita real output basis. Argentina (2002) not available from years five and six. The blue shading represents the range of the marginal distribution at each period, except for the top two and bottom two observations in fast recoveries, the top three and bottom three in the full sample.

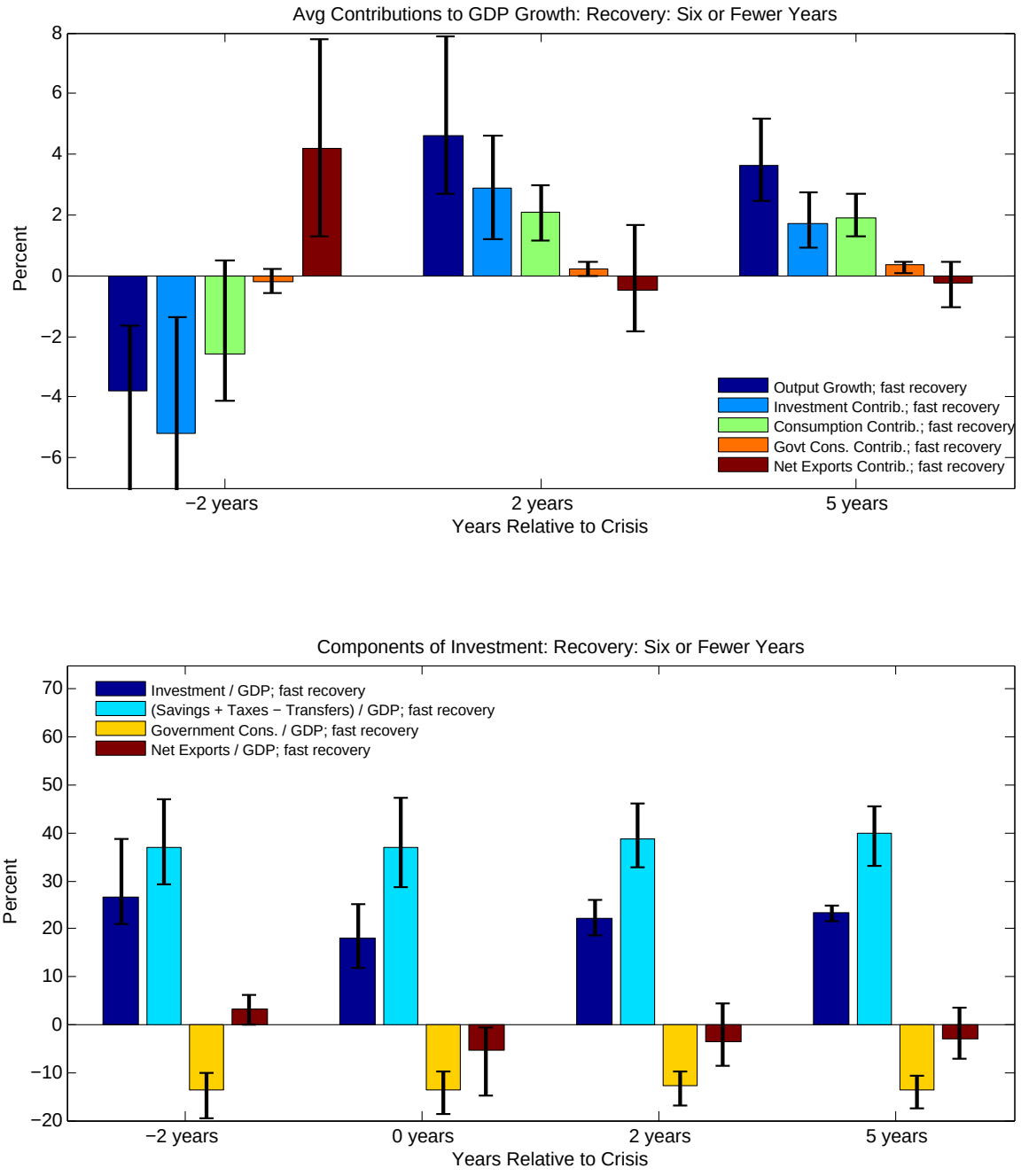


Figure 4: Contributions to Growth Subsequent to a Crisis. Countries in which recovery occurs within six years. Each bar in the top panel is a component of $\frac{(1-L)(Y)}{L(Y)} = \frac{(1-L)(C+I+G+NX)}{L(Y)}$. Each bar is an average of the countries' average contributions for that component in years $T+1$ to $T+h$, in which T is the trough of the crisis and h is the number of years ahead; for negative years, each bar is the same for years $T-1$ and T. The lines represent the range of the marginal distribution at each period after dropping the top two and bottom two observations. The bottom panel shows the contribution of the components of investment as a fraction of GDP, based on $\frac{I}{Y} = \frac{S-G-NX+T}{Y}$.

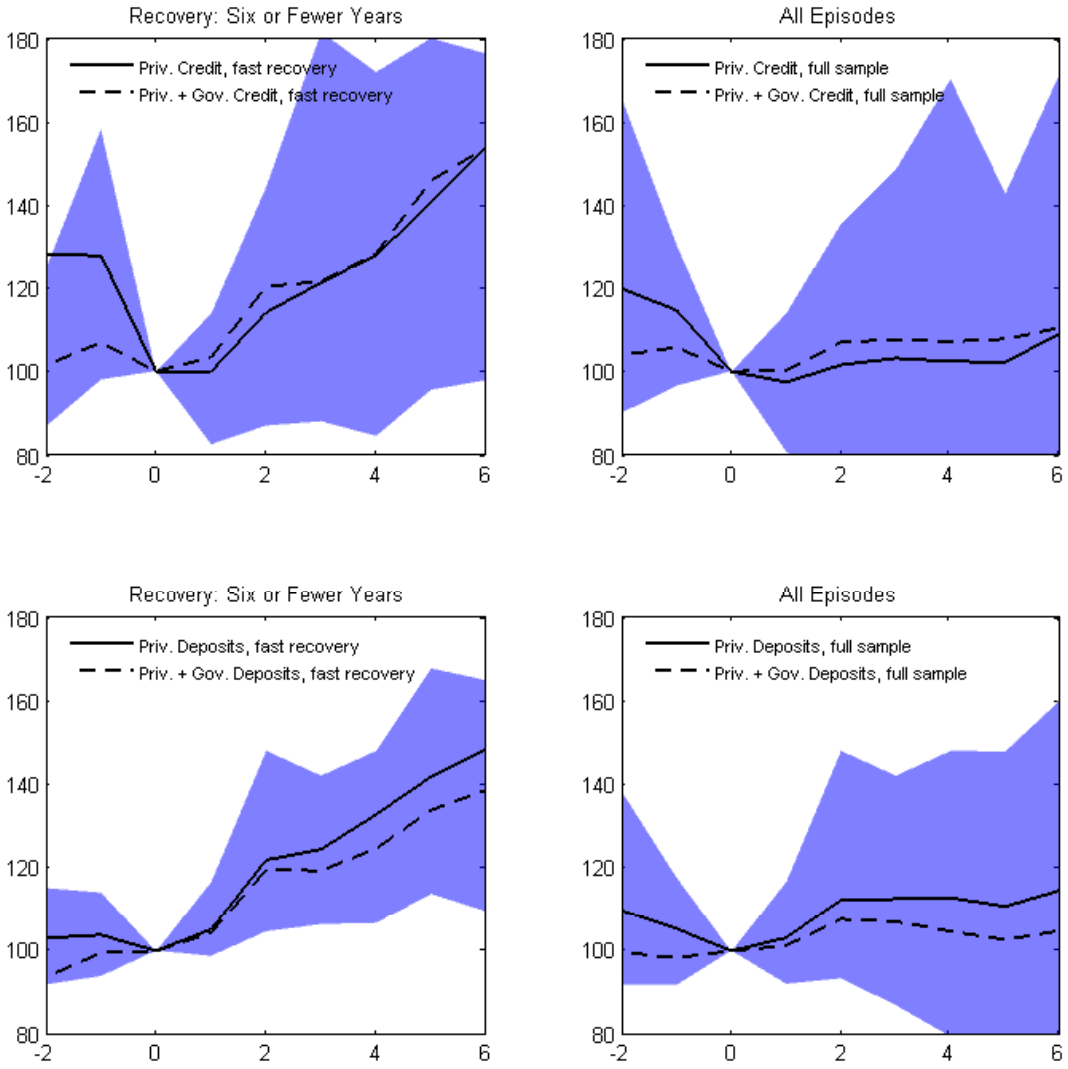


Figure 5: Average Economic Performance Subsequent to a Crisis. Countries in which recovery occurs within six years on a per capita real output basis. Argentina (2002) not available from years four through six. Brazil (1983) and Ecuador (1999) not present. Credit in Morocco (1981) not available in years five and six. The blue shading represents the range of the marginal distribution at each period, except for the top two and bottom two observations in the left panels, the top three and bottom three observation in the right panels.

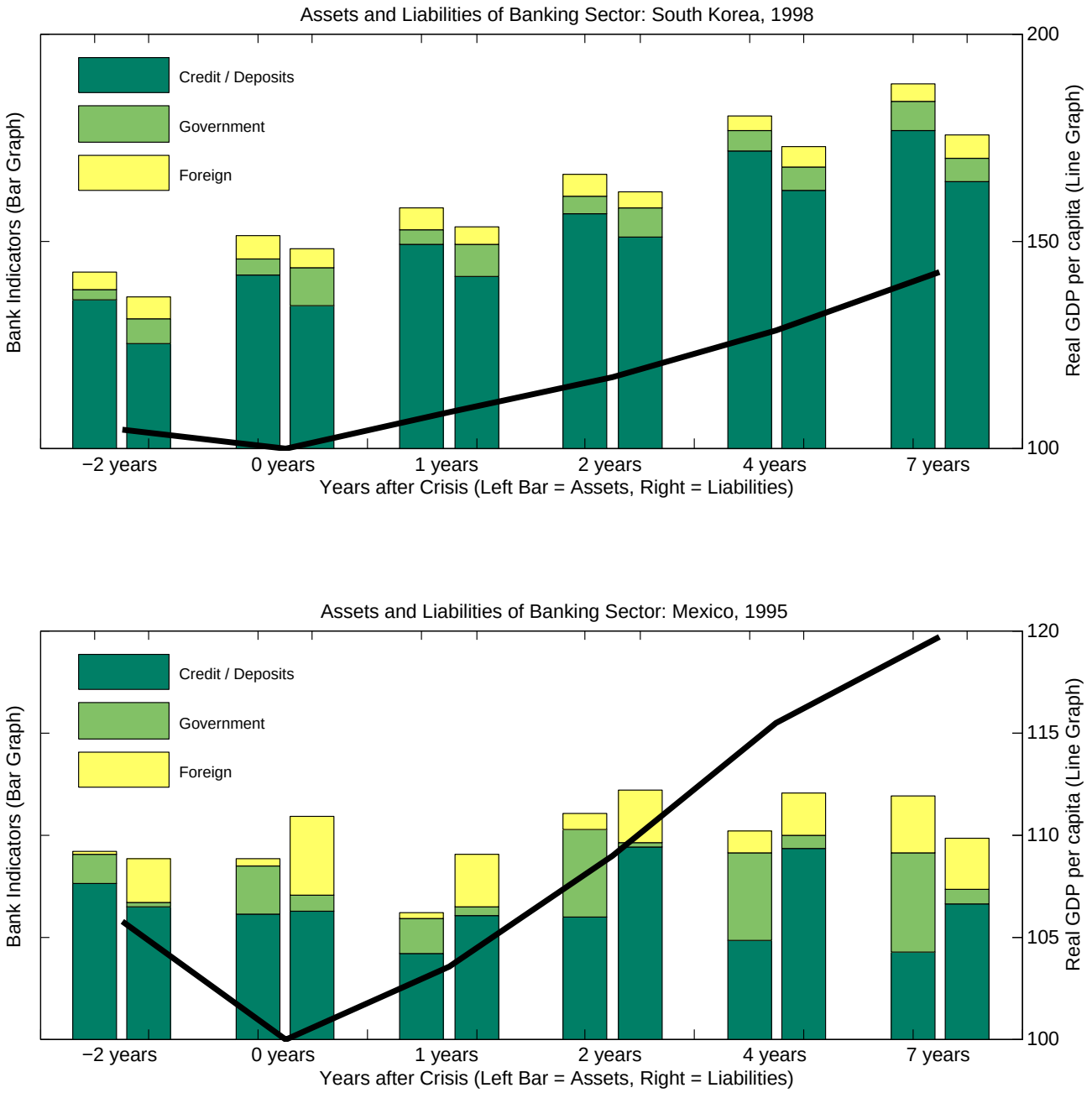


Figure 6: Distribution of Bank Assets in Selected Economies: Countries in which recovery occurs in five or fewer years. Each pair of bars represents the IFS distribution of real, per capita assets and liabilities. The left bar represents the distribution of assets, the right bar represents the distributions of liabilities. The thick black line is the real per capita GDP.

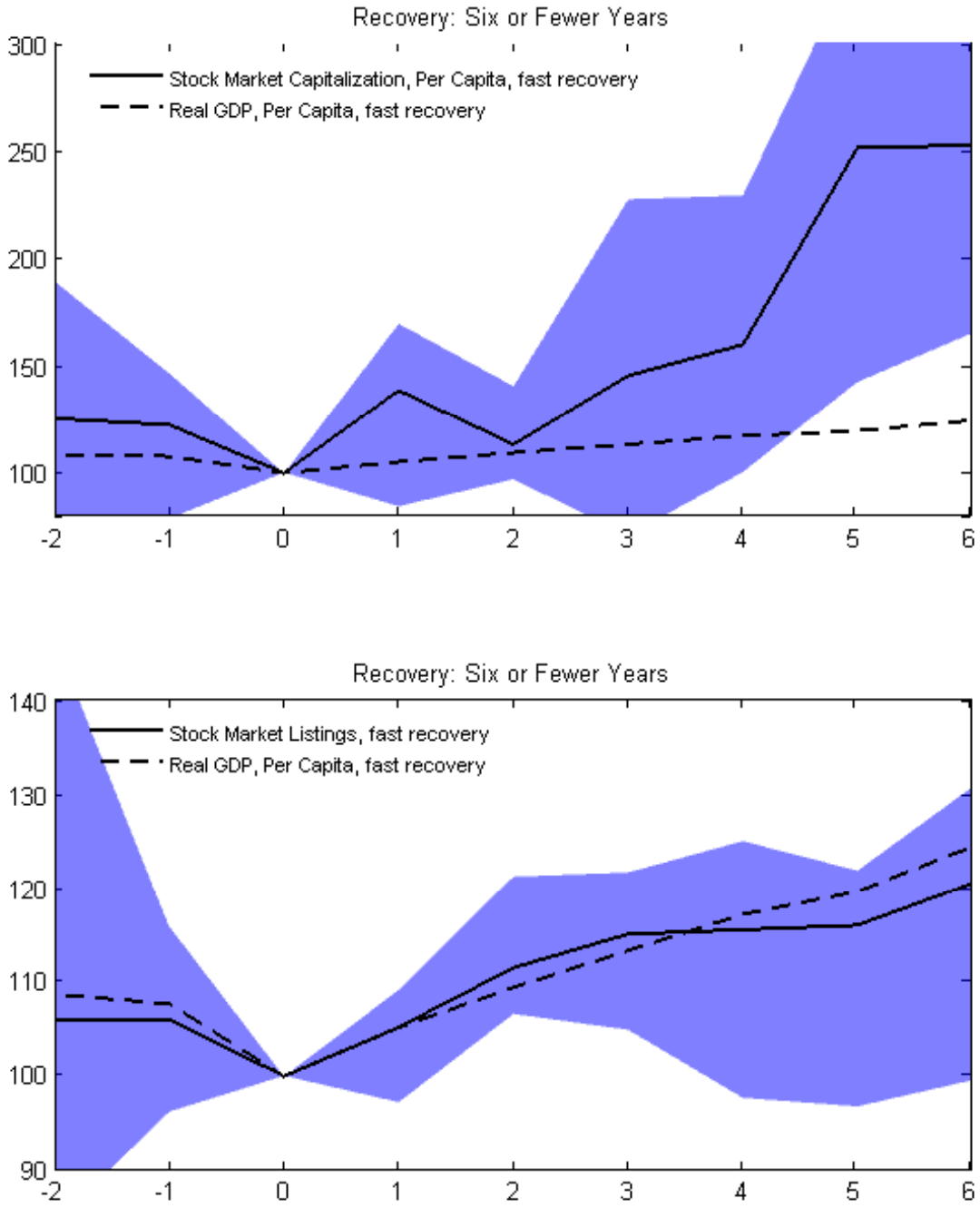


Figure 7: Stock Market Capitalization. The dark black line is the average CPI-deflated per capita stock market capitalization over the set of episodes in which recovery occurs in six or fewer years. The dashed line is real per capita output. The shading represents the marginal distribution excepting the top two and bottom two observations. All episodes are normalized to 100 at the trough of the distribution.

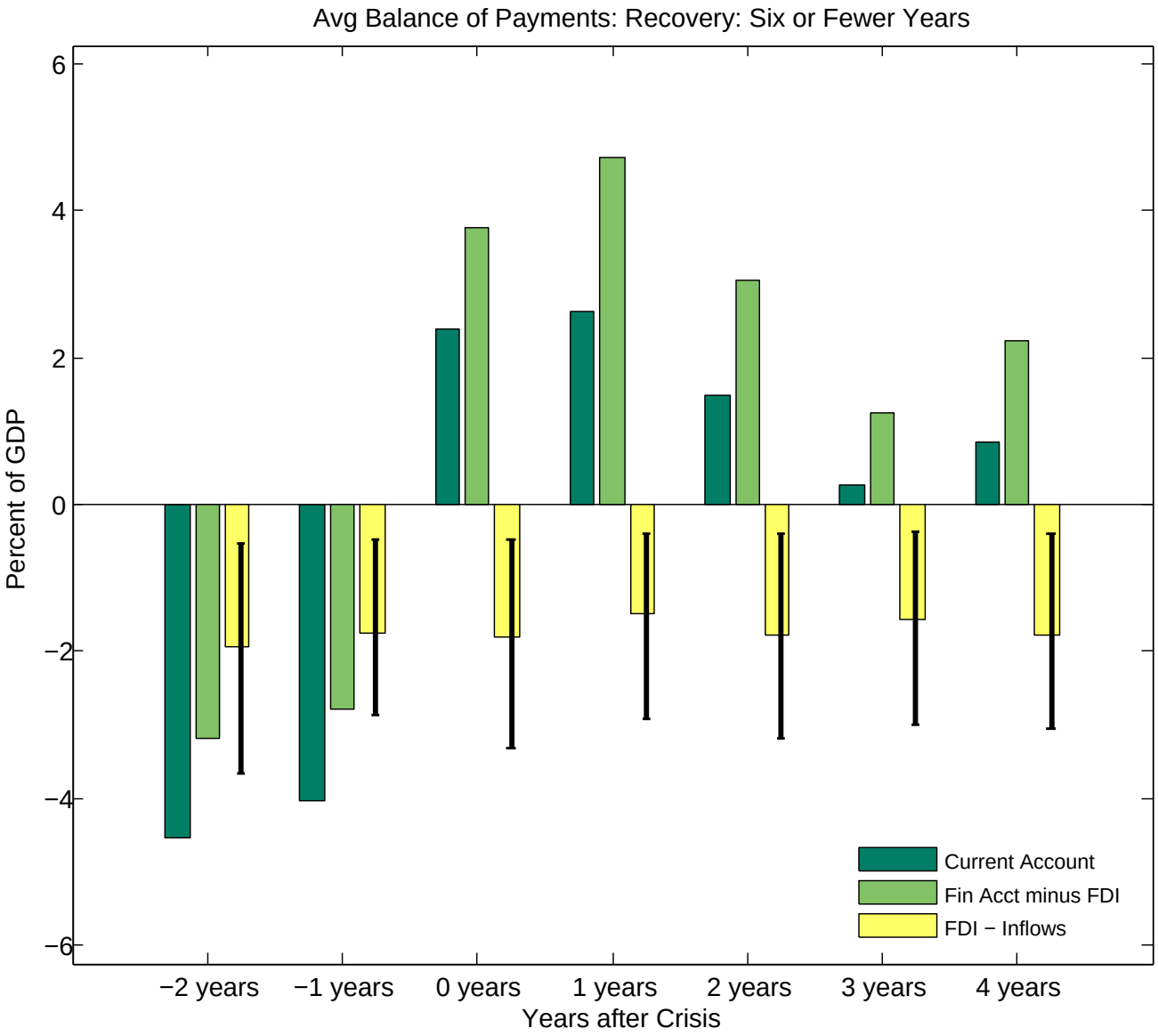


Figure 8: Net Financial Inflows by Category. The left bar represents the current account deficit. The right two bars should—net of measurement error and the IMF's capital account—add up to the current account deficit. This represents an average of the 15 fast-recovery episodes.

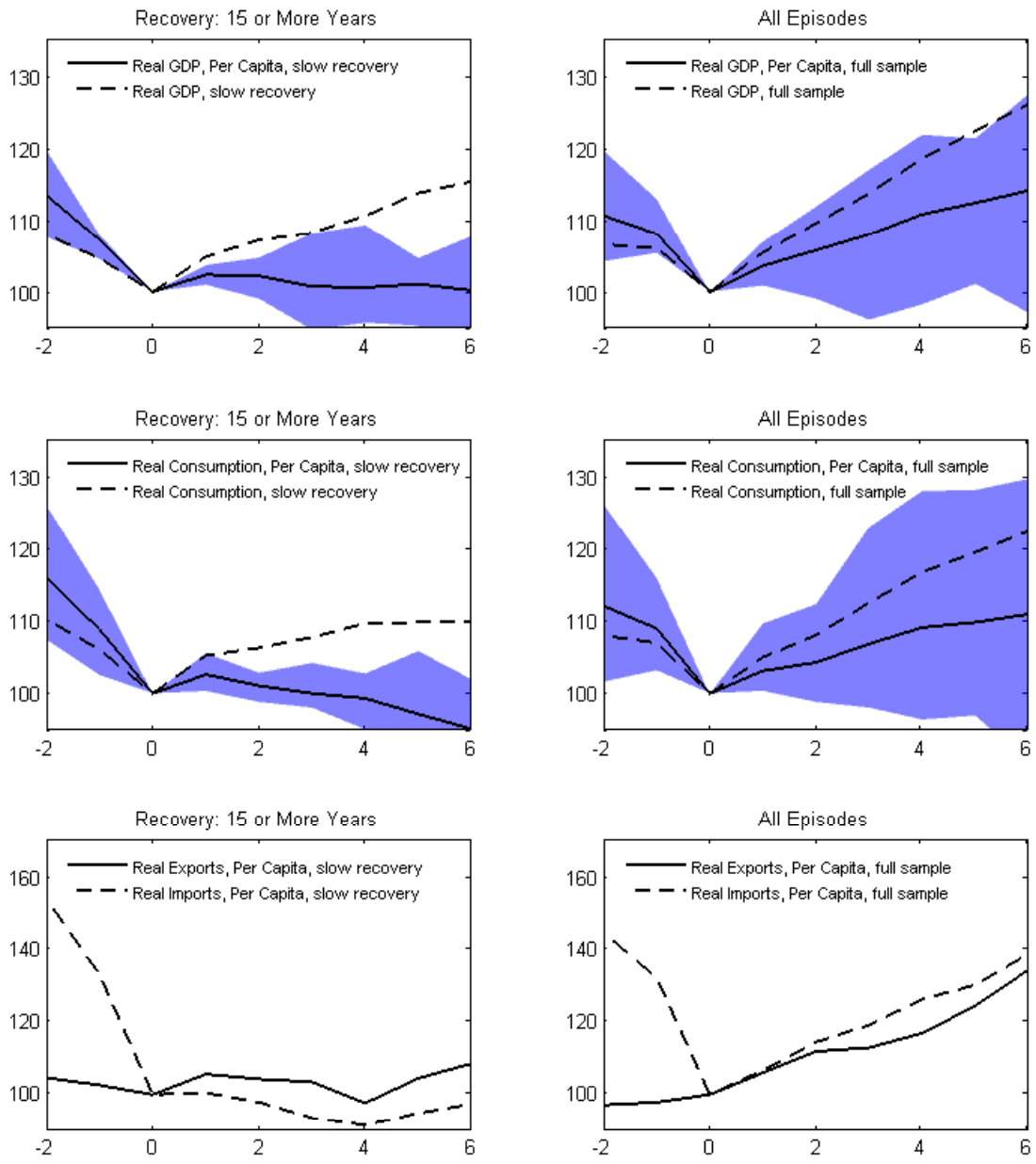


Figure 9: Average Economic Performance Subsequent to a Crisis. Countries in which recovery occurs in 15 or more years on a per capita real output basis. The blue shading represents the range of the marginal distribution at each period, except the top observation and bottom observation for the slow recovery episodes; the marginal distribution excluding the top three and bottom three observations for the full sample.

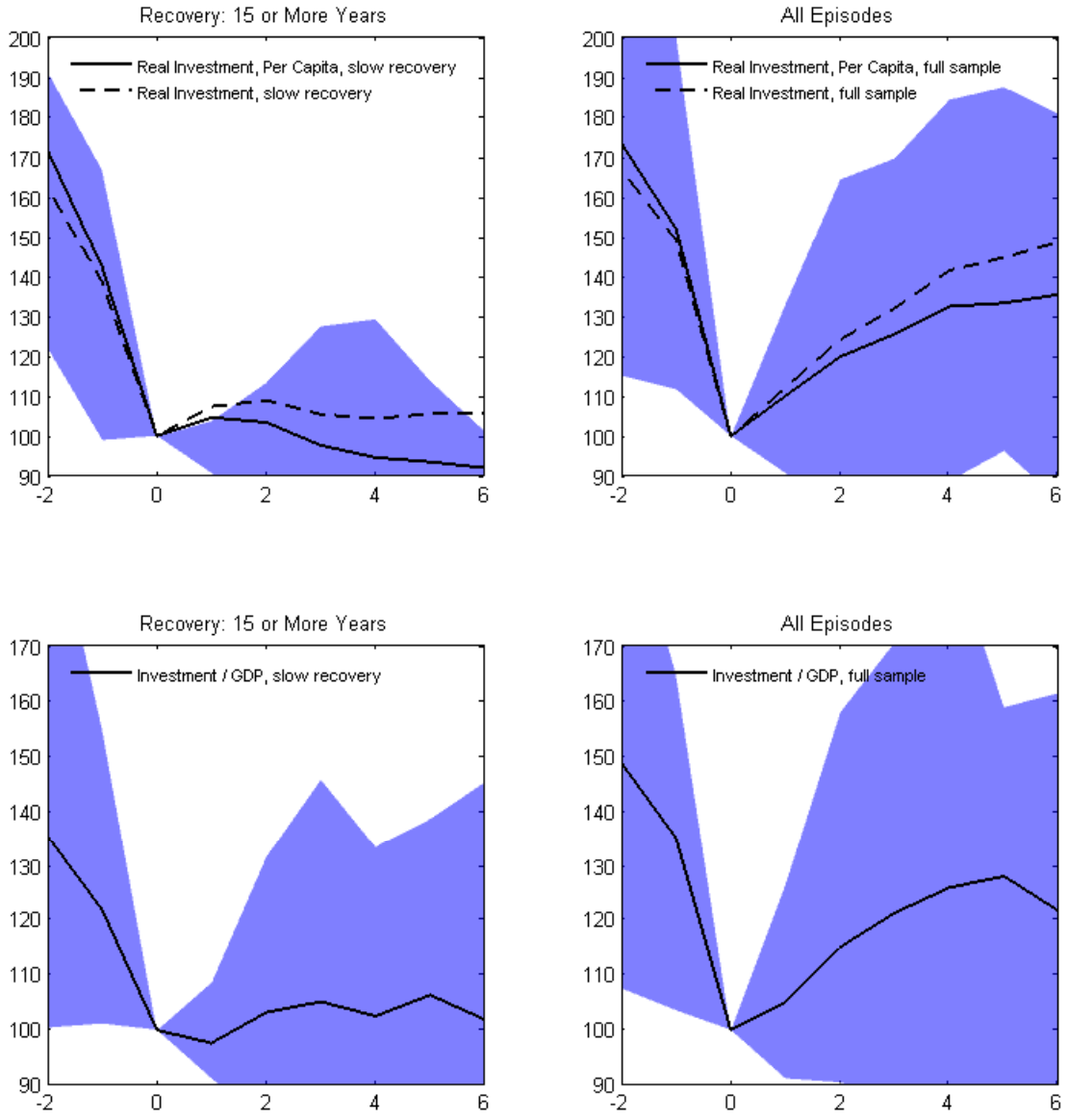


Figure 10: Average Economic Performance Subsequent to a Crisis. Countries in which recovery occurs in 15 or more years on a per capita real output basis. The blue shading represents the range of the marginal distribution at each period, except the top observation and bottom observation for the slow recovery episodes; the marginal distribution excluding the top three and bottom three observations for the full sample.

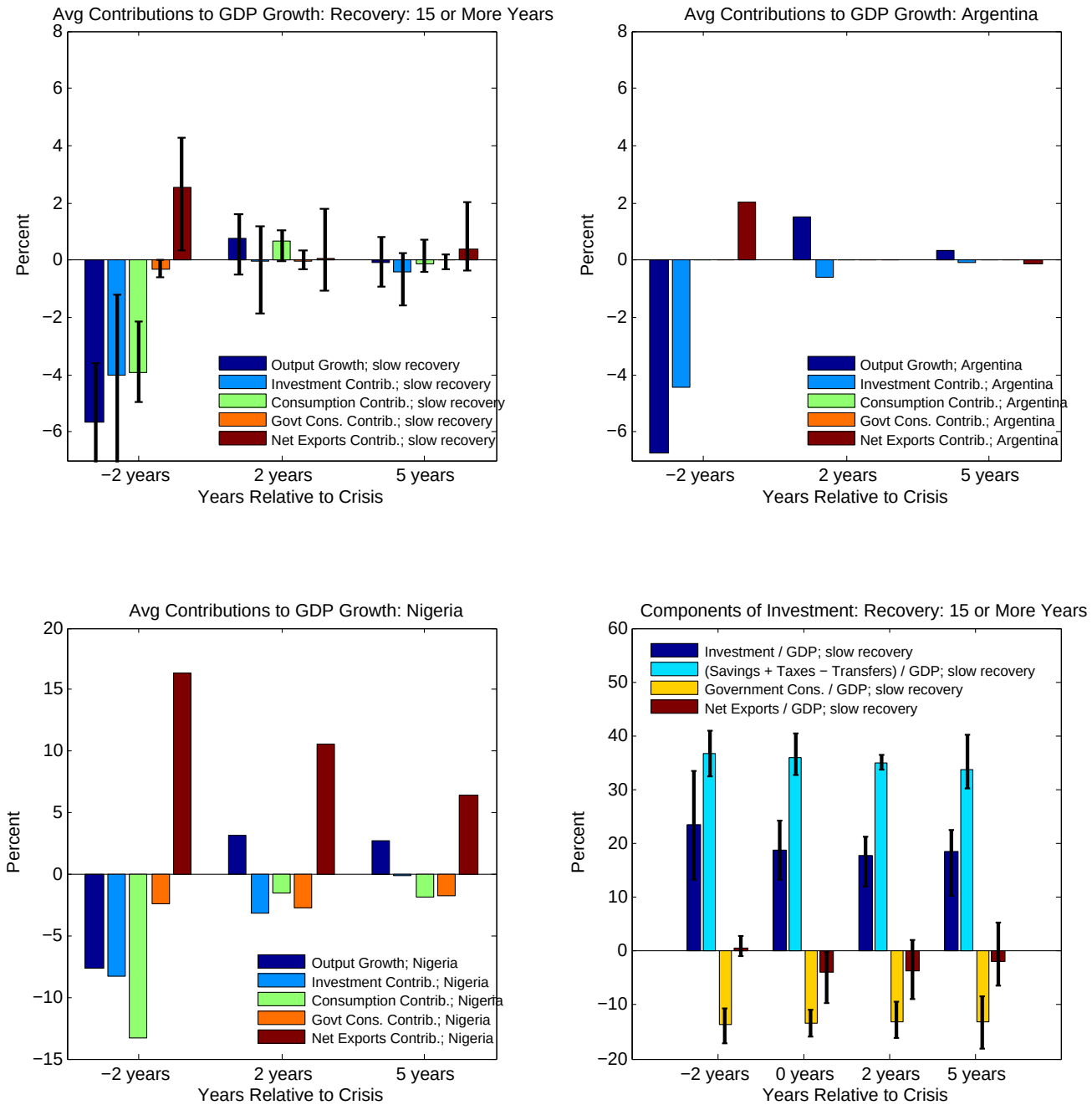


Figure 11: Average Economic Performance Subsequent to a Crisis. Countries in which recovery occurs in 15+ years on a per capita real output basis. Each bar in the top panel is a component of $\frac{(1-L)(Y)}{L(Y)} = \frac{(1-L)(C+I+G+NX)}{L(Y)}$. Each bar is an average of the countries' average contributions for that component in years $T+1$ to $T+h$, in which T is the trough of the crisis; for negative years, each bar is the same for years $T-1$ and T. The lines represent the range of the marginal distribution at each period, excluding the top observation and the bottom observation. The bottom panel shows the contribution of the components of investment as a fraction of GDP, based on $\frac{I}{Y} = \frac{S-G-NX+T}{Y}$.

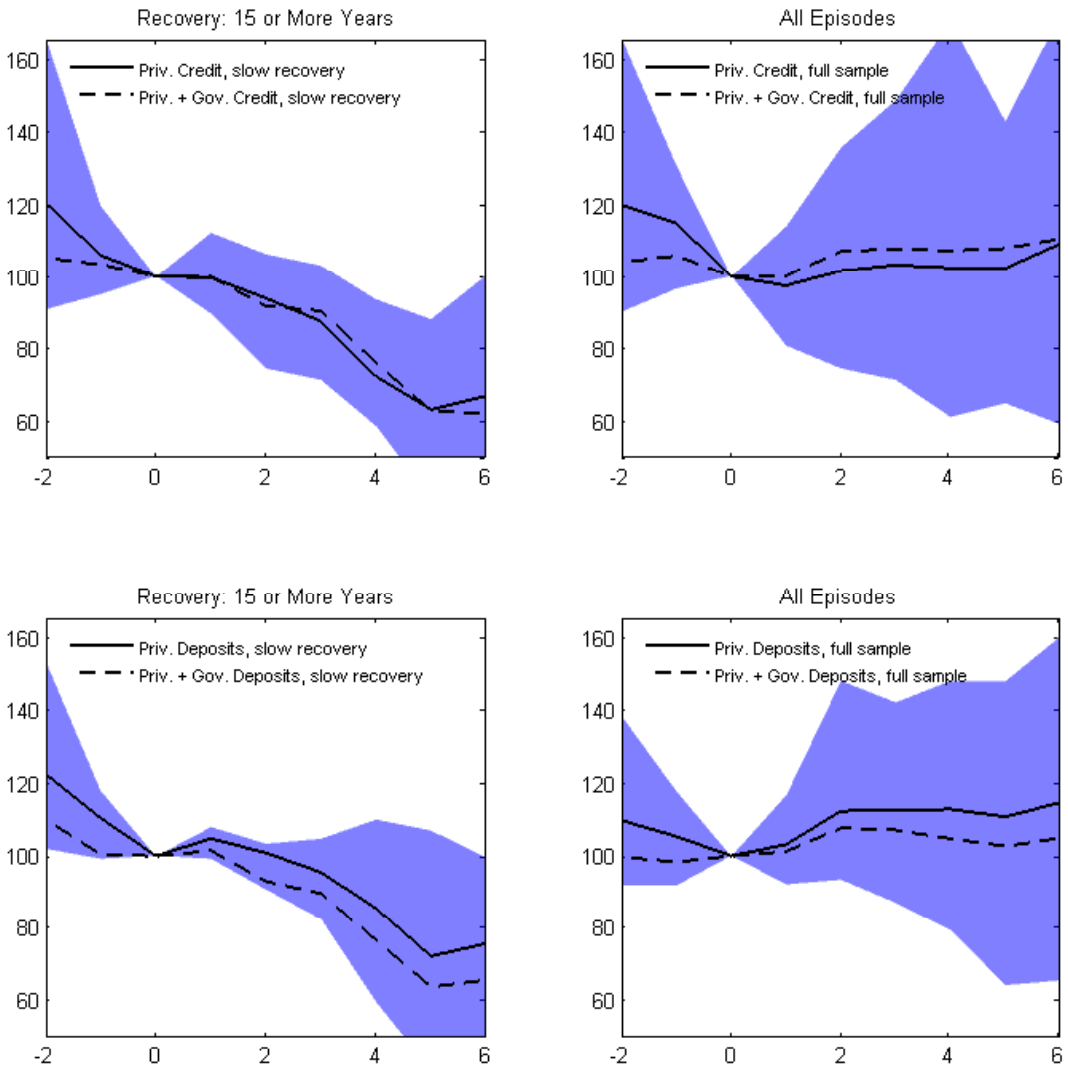


Figure 12: Average Economic Performance Subsequent to a Crisis. Countries in which recovery occurs in 15+e years on a per capita real output basis. The blue shading in the left-side panels represents the range of the marginal distribution at each period, except for the top and bottom individual observations; in the right-side panels, they represent the marginal distribution at each period, except for the top and bottom three observations.

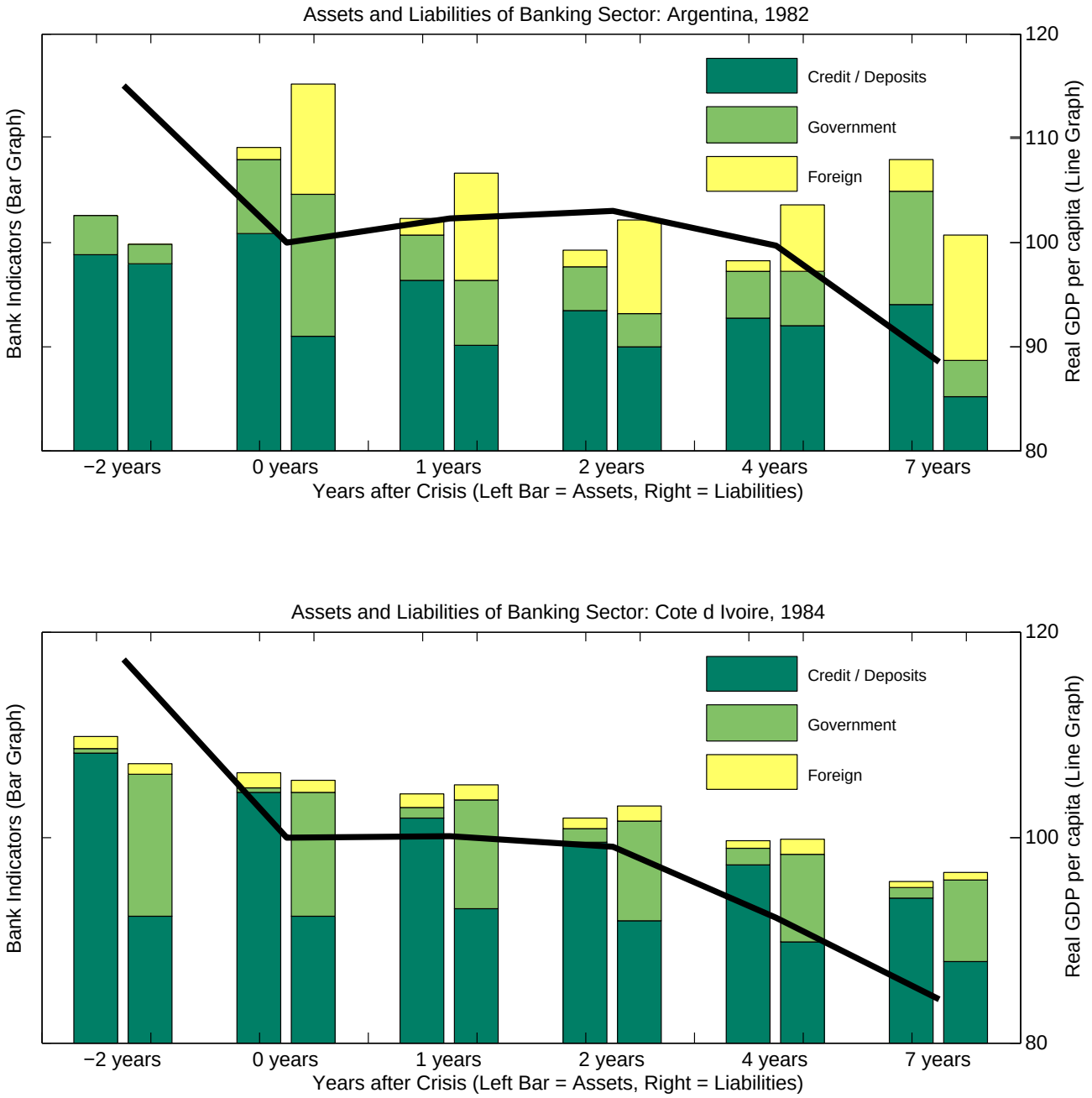


Figure 13: Distribution of Bank Assets in Selected Economies. Countries in which recovery occurs in 15 or more years. Each pair of bars represents the IFS distribution of real, per capita assets and liabilities. The left bar represents the distribution of assets, the right bar represents the distributions of liabilities. The thick black line is the real per capita GDP.

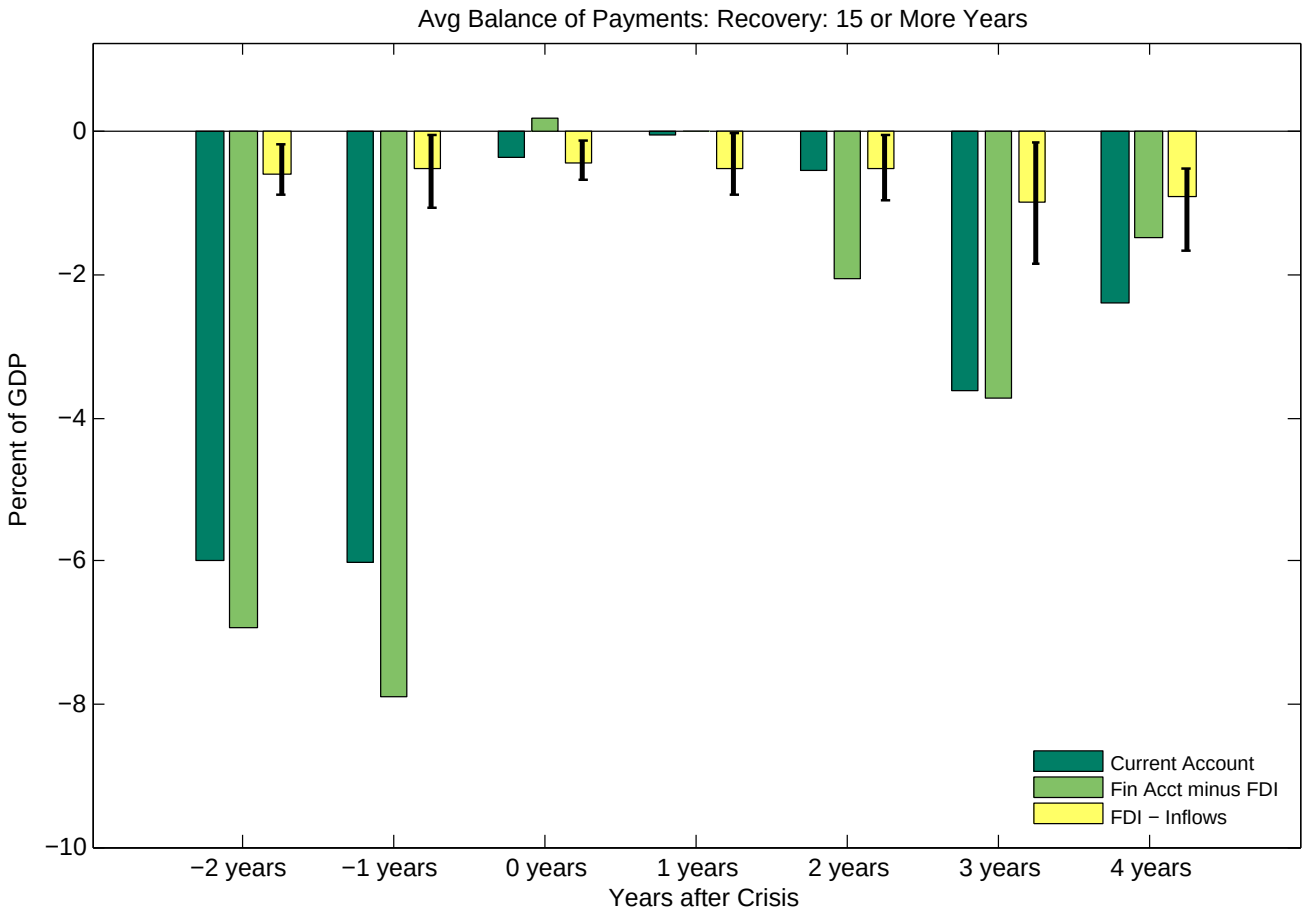


Figure 14: Net Financial Inflows by Category: The left bar represents the current account deficit. The right two bars should–net of measurement error and the IMF's capital account–add up to the current account deficit. This represents an average of the nine slow-recovery episodes.

Table 6: Model Calibration

Name	Symbol	Temporary TFP shock	Permanent TFP shock	Korea (1998)
Discount factor	β	$\frac{1}{1.03^{.25}}$	$\frac{1}{1.03^{.25}}$	$\frac{1}{1.03^{.25}}$
Utility Curvature	σ	2.0	2.0	2.0
Labor Curvature	ν	1.7	1.7	1.7
Labor Weight	ψ	3.57	4.08	2.95
Income Share to Labor	α	0.65	0.65	0.70
Tech. Growth	γ_x	$1.0265^{.25}$	$1.0103^{.25}$	$1.0443^{.25}$
Prod. Persistance	ρ	0.9	n.a.	n.a.
Capital Adj. Costs	χ	0.5	2.0	0.2
Foreign Assets	$\overline{b}$	0.995	0.500	0.438
Government Spending	g	0.076	0.063	0.056
Depreciation Rate	δ	$1-(0.92)^{.25}$	$1-(0.92)^{.25}$	$1-(0.96)^{.25}$
Int. Rate Flexibility	ϕ	0.001	0.001	0.001

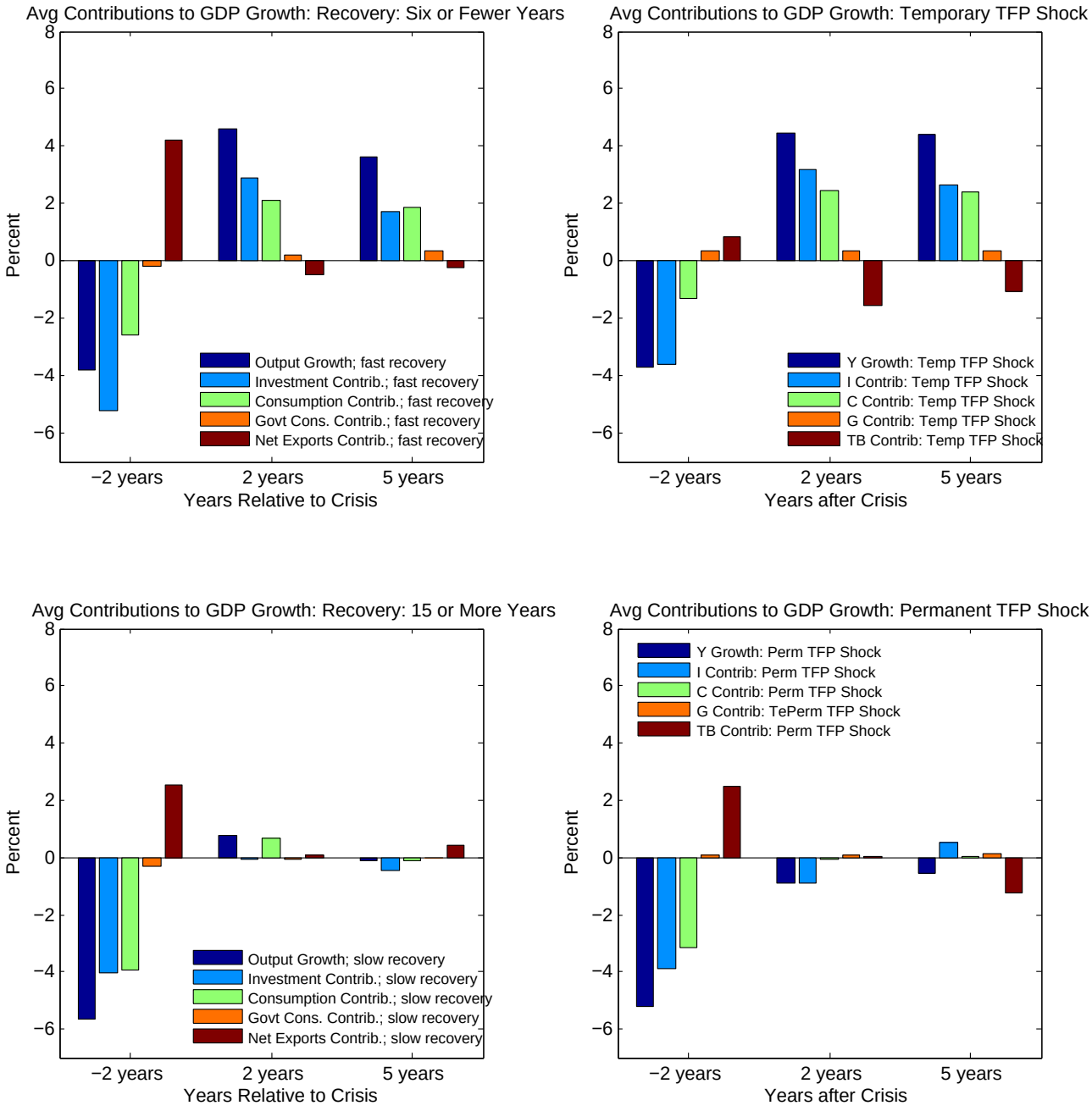


Figure 15: Contribution to GDP growth after to a shock to TFP. TFP shock occurs in third quarter of year prior to $T = 0$.

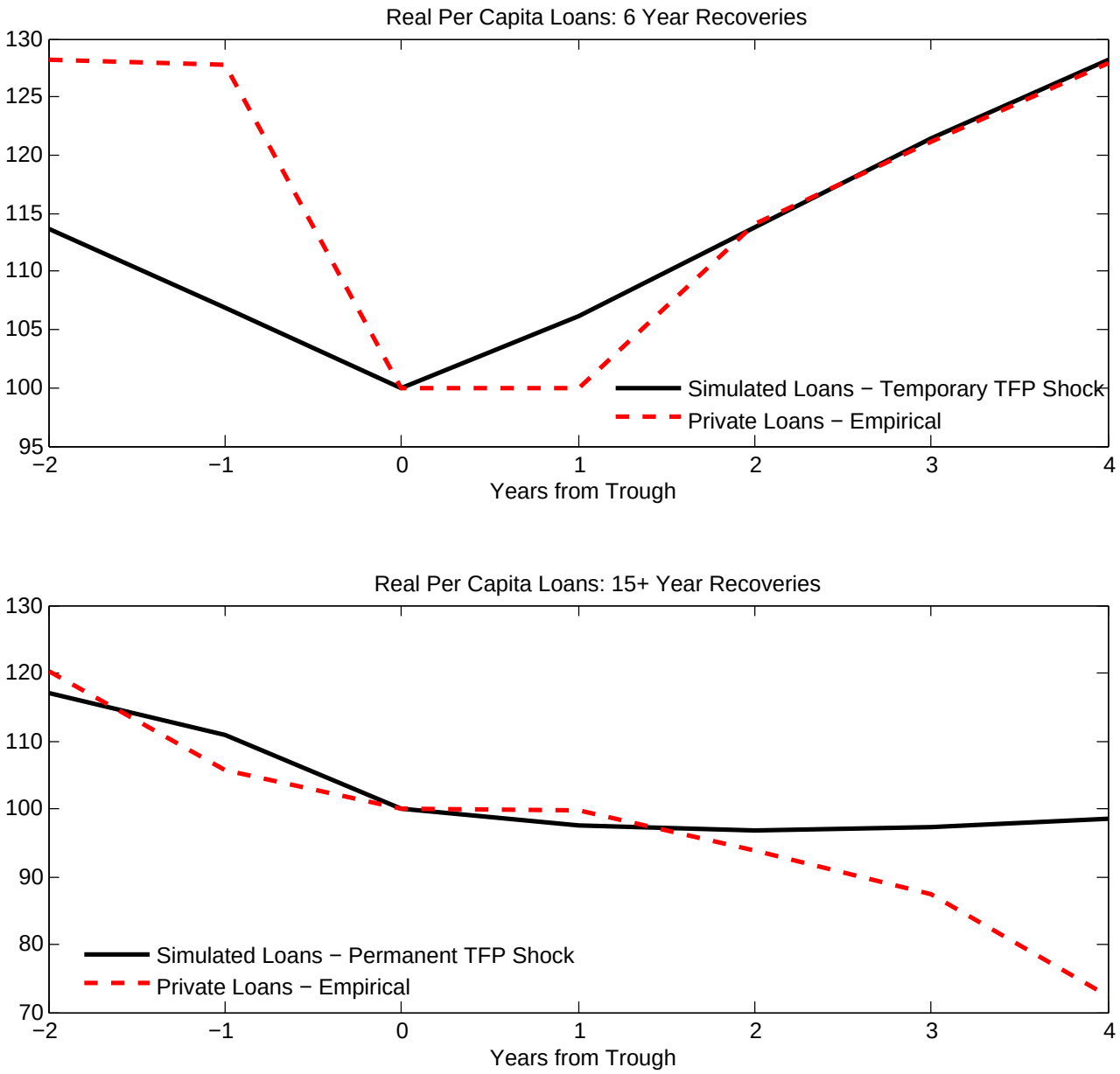


Figure 16: Private bank credit, per capita. Normalized to 100 at the trough of the crisis.

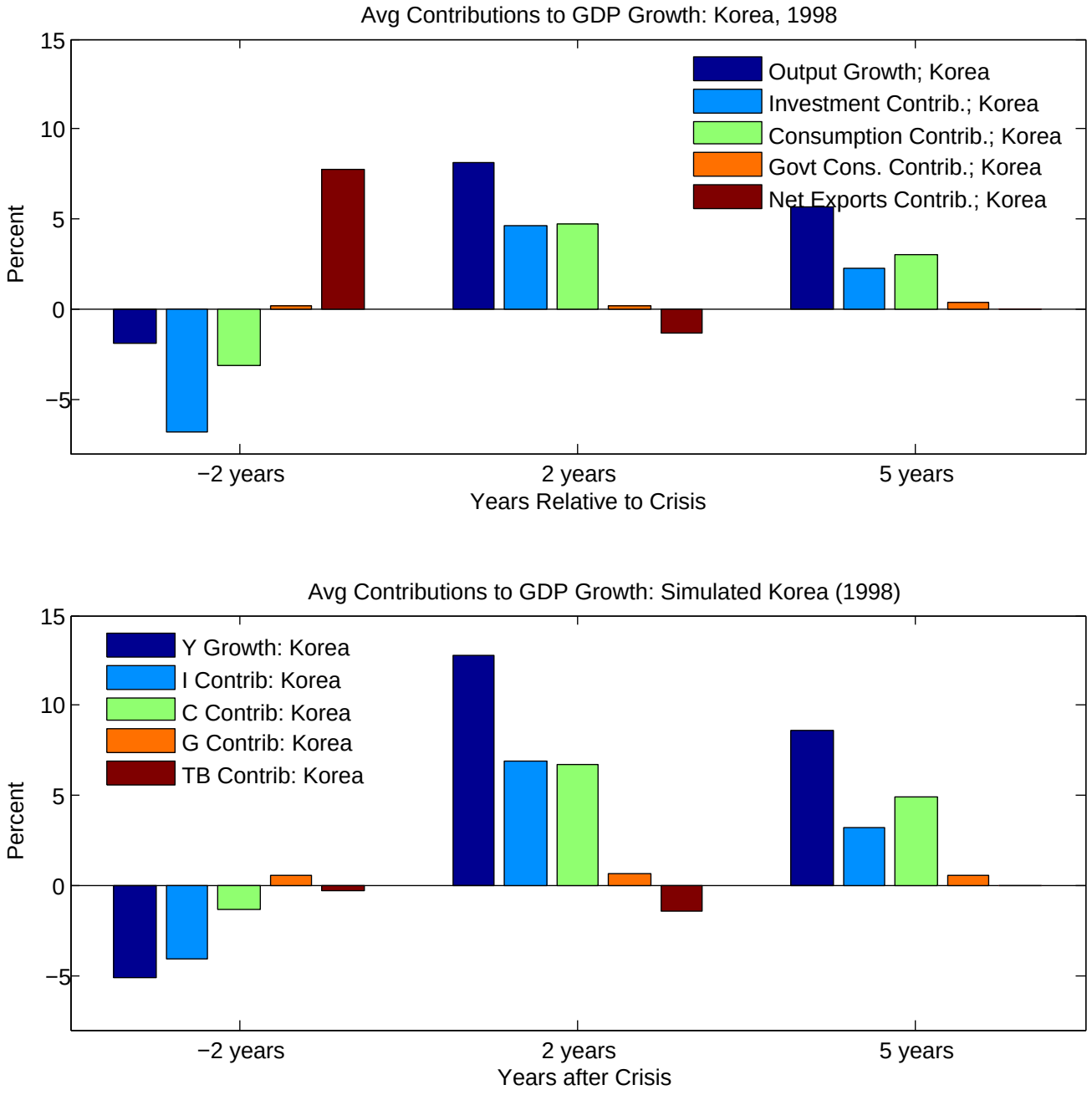
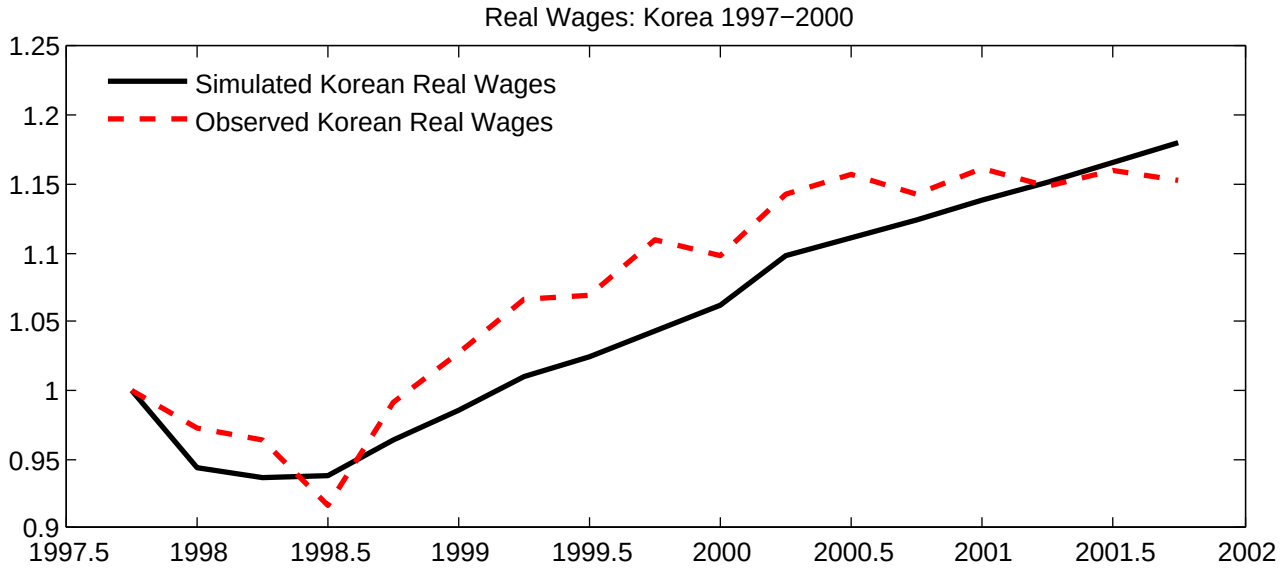


Figure 17: Contribution to GDP growth after to a shock to TFP.



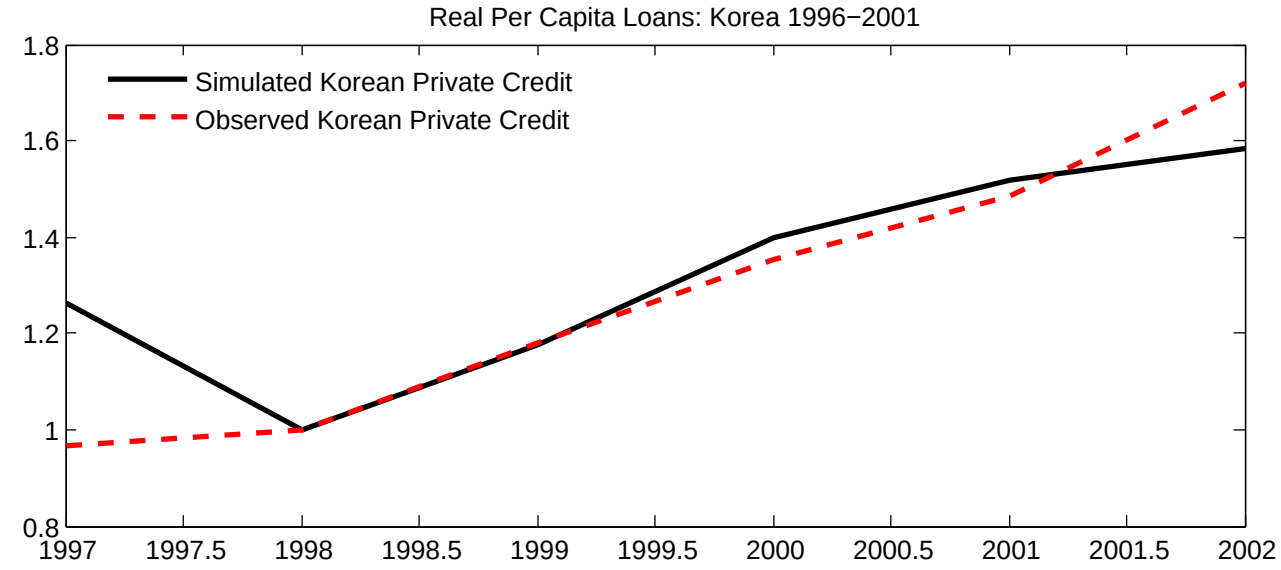


Figure 18: Simulated and empirically observed Korean real wages and loans during the Asian Currency Crisis. Loans normalized to 100 in 1998; real wages normalized to 1 in 1997Q4, the period in which the simulated crisis begins.