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Capital Controls, Sudden Stops, and Current Account Reversals

Sebastian Edwards

2.1 Introduction

During the last few years a number of authors have argued that free capital mobility produces macroeconomic instability and contributes to financial vulnerability in the emerging nations. For example, in his critique of the U.S. Treasury and the International Monetary Fund (IMF), Stiglitz (2002) has argued that pressuring emerging and transition countries to relax controls on capital mobility during the 1990s was a huge mistake. According to him, the easing of controls on capital mobility was at the center of most (if not all) currency crises in the emerging markets during the last decade—Mexico in 1994, East Asia in 1997, Russia in 1998, Brazil in 1999, Turkey in 2001, and Argentina in 2002. These days, even the IMF seems to criticize free capital mobility and to provide (at least some) support for capital controls. Indeed, on a visit to Malaysia in September 2003 Horst Koehler, then the IMF's managing director, praised the policies of Prime Minister Mahathir, and in particular his use of capital controls in the aftermath of the 1997 currency crisis (Beattie 2003).

Supporters of capital controls have argued that restricting capital mobility has two important potential benefits: (a) it reduces a country's vulnerability to external shocks and financial crises; and (b) it allows countries that have suffered a currency crisis to lower interest rates, implement pro-

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growth policies, and emerge from the crisis sooner than they would have otherwise. According to this view, controlling capital outflows would give crisis countries additional time to restructure their financial sector in an orderly fashion.[1]

The evidence in support of these claims, however, has been mostly country specific, and not particularly convincing. Some authors have claimed that by restricting capital mobility Chile was able to avoid the type of macroeconomic turmoil that affected the rest of Latin America during the 1990s (Stiglitz 1999).[2] Also, it has been argued that Malaysia's imposition of controls on capital outflows in the aftermath of the Asian debt crisis helped the country rebound quickly and resume a growth path (Kaplan and Rodrik 2002). According to other authors, however, the experiences of both Chile and Malaysia with capital controls have been mixed at best (Dornbusch 2002; Johnson and Mitton 2001; De Gregorio, Edwards, and Valdes 2000). What is particularly interesting about this debate is that after many years it continues to be centered mostly on the experiences of a handful of countries, and that much of it has taken place at an anecdotal level. There have been very few studies that have provided multicountry evidence on whether capital controls indeed reduce vulnerability or reduce the costs of crises.[3] This paucity of multicountry studies is partially explained by the difficulties in measuring the degree of capital mobility across time and countries (Eichengreen 2001).

In this paper I use a broad multicountry data set to analyze the relationship between restrictions to capital mobility and external crises. The analysis focuses on two manifestations of external crises that have received considerable attention during the last few years: (a) sudden stops of capital inflows, and (b) current account reversals.[4] I am particularly interested in dealing with the following two specific questions:

- Do capital controls reduce the probability of a major external crisis (defined as a sudden stop or a current account reversal)?
- And, once a crisis has occurred, do countries that restrict capital mobility incur in lower costs—measured by reductions in growth—than countries that have a more open capital account?

1. Most well-trained economists would agree that there are trade-offs associated with the imposition of capital controls. Whether the costs offset the benefits is a complex empirical question, whose answer will depend on the specificities of each particular country. Doing a full-blown cost-benefit analysis is well beyond the scope of this paper, however.

2. See, however, De Gregorio, Edwards, and Valdes (2000). Some authors have also argued that the absence of crises in India and China is an indication of the merits of controlling capital mobility. It is difficult, however, to take these claims seriously.

3. There have been, however, a number of cross-country studies that have tried to determine whether capital controls have an effect on economic growth. For a survey, see Eichengreen (2001).

4. For a discussion of these two phenomena see, for example, Calvo, Izquierdo, and Mejía (2004) and Edwards (2004b).

In analyzing these issues I rely on two complementary approaches. First, I use a methodology based on the computation of nonparametric tests and frequency tables to analyze the incidence and main characteristics of both sudden stops and current account reversals in countries with different degrees of capital controls. And second, I use a regression-based analysis that estimates jointly the probability of having a crisis, and the cost of such crisis, in terms of short-term declines in output growth.

The rest of the paper is organized as follows. In section 2.2 I provide a selected survey of recent efforts to measure the degree of capital mobility. I review various indexes, and I discuss their strengths and weaknesses. In section 2.3 I deal with the evolution of capital account restrictions during the last thirty years. The section opens with an analysis of the evolution of capital account openness based on a new index, which I have constructed by combining three data sources: (a) the index developed by Quinn (2003); (b) the index by Mody and Murshid (2002); and (c) country-specific information obtained from various sources, including country-specific sources. Section 2.4 deals with the anatomy of sudden stops and current account reversals. I analyze their incidence and the extent to which these two phenomena are related. This analysis is performed for three groups of countries classified according to the degree of capital mobility: *Low* capital mobility, *Intermediate* capital mobility, and *High* capital mobility countries. My main interest in this analysis is to compare the two extreme groups: *Low* and *High* capital mobility. In section 2.5 I report new results on the costs of external crises characterized by sudden stops and/or current account reversals. I am particularly interested in determining if the cost of a crisis—measured in terms of lower growth—is different for countries with different degrees of capital mobility. I use *treatment regressions* to analyze whether restricting capital mobility reduces vulnerability and the costs of crises. Finally, in section 2.6 I provide some concluding remarks. The paper also has a data appendix.

Before proceeding it is important to stress that in this paper I do not provide a full-fledged cost-benefit analysis of capital controls. I deal in detail with two important aspects of the problem—capital controls and vulnerability, and the growth consequences of crises under different intensity of controls—but I don't cover all the consequences of control policies. In particular, I don't deal with many microeconomic consequences and costs of a policy of capital controls (see Forbes 2003 for this type of discussion).

2.2 Measuring the Degree of Openness of the Capital Account

Most analysts agree that during the last few decades there has been an increase in the degree of international capital mobility. There is less agreement, however, on the exact nature (and magnitude) of this phenomenon. The reason for this is that it is very difficult to measure in a relatively pre-

cise way a country's degree of capital mobility. Indeed, with the exception of the two extremes—absolute freedom or complete closeness of the capital account—it is not easy to provide effective measures that capture the extent of capital market integration. What has been particularly challenging has been constructing indexes that allow for useful comparisons across countries and across time. In this section I review a number of attempts at building *indexes* of capital mobility, and I propose a new measure that combines information from two of the better indexes with country-specific data. I then use this new index to analyze the evolution of capital account restrictions during the last three decades.

Historically, most emerging and transition countries have relied heavily on different forms of capital account restrictions. While throughout most of the post–World War II period these have been aimed at avoiding capital "flight," more recently countries have tried to avoid (or at least slow down) large inflows of capital (Edwards 1999). However, there has long been recognition that legal impediments on capital mobility are not always translated into actual restrictions on these movements. This distinction between *actual* and *legal* capital mobility has been the subject of policy debates, including the debate on the effectiveness of capital controls.

There is ample historical evidence suggesting that there have been significant discrepancies between the legal and the actual degree of capital controls. In countries with severe legal impediments to capital mobility—including countries that have banned capital movement—the private sector has traditionally resorted to the overinvoicing of imports and underinvoicing of exports to sidestep legal controls on capital flows (Garber 1998 discusses more sophisticated mechanisms). For example, the massive volumes of capital flight that took place in Latin America in the wake of the 1982 debt crisis clearly showed that, when faced with the "appropriate" incentives, the public can be extremely creative in finding ways to move capital internationally. The question of how to measure, from an economic point of view, the degree of capital mobility and the extent to which domestic capital markets are integrated to the world capital market continues to be the subject of extensive debate. (See Dooley, Mathieson, and Rojas-Suarez 1997 for an early and comprehensive treatment of the subject. See Eichengreen 2001 for a more recent discussion.)

In two early studies Harberger (1978, 1980) argued that the effective degree of integration of capital markets should be measured by the convergence of private rates of return to capital across countries. In trying to measure the effective degree of capital mobility, Feldstein and Horioka (1980) analyzed the behavior of savings and investments in a number of countries. They argue that if there is perfect capital mobility, changes in savings and investments will be uncorrelated in a specific country. That is, in a world without capital restrictions an increase in domestic savings will tend to "leave the home country," moving to the rest of the world. Likewise, if in-

ternational capital markets are fully integrated, increases in domestic investment will tend to be funded by the world at large and not necessarily by domestic savings. Using a data set for sixteen Organization for Economic Cooperation and Development (OECD) countries, Feldstein and Horioka found that savings and investment ratios were highly positively correlated, and concluded that these results strongly supported the presumption that *long-term* capital was subject to significant impediments. Frankel (1991) applied the Feldstein-Horioka test to a large number of countries during the 1980s, including a number of Latin American nations. His results corroborated those obtained by the original study, indicating that savings and investment have been significantly positively correlated in most countries. In a comprehensive analysis of the degree of capital mobility, Montiel (1994) estimated a series of Feldstein-Horioka equations for sixty-two developing countries. Using the estimated regression coefficient for the industrial countries as a benchmark, he concluded that the majority of the Latin American nations exhibited a relatively high degree of capital mobility—indeed, much larger than what an analysis of legal restrictions would suggest.

In a series of studies Edwards (1985) and Edwards and Khan (1985) argued that degree of convergence of domestic and international interest rates could be used to assess the degree of openness of the capital account (see also Montiel 1994). The application of this model to the cases of a number of countries (Brazil, Colombia, Chile) confirms the results that, in general, the actual degree of capital mobility is greater than what the legal restrictions approach suggests. Haque and Montiel (1991), Reisen and Yèches (1993), and Dooley (1995) have provided expansions of this model that allow for the estimation of the degree of capital mobility even in cases when there are not enough data on domestic interest rates, and when there are changes in the degree of capital mobility through time. Their results once again indicate that in most emerging countries true capital mobility has historically exceeded the legal extent of capital mobility. Dooley, Mathieson, and Rojas-Suarez (1997) developed a method for measuring the changes in the degree of capital mobility in emerging countries that recognizes the costs of undertaking disguised capital inflows. The model is estimated using a Kalman filter technique for three countries. The results suggest that all three countries experienced a very significant increase in the degree of capital mobility between 1977 and 1989. Edwards (2000) used a "time-varying coefficients" variant of this approach to analyze the way in which Chile's *actual* degree of capital mobility evolved through time.

Some authors have used information contained in the IMF's *Exchange Arrangements and Exchange Restrictions* to construct indexes on capital controls for a panel of countries. Alesina, Grilli, and Milesi-Ferretti (1994), for example, constructed a dummy variable index of capital controls. This indicator—which takes a value of 1 when capital controls are in

place and 0 otherwise—was then used to analyze some of the political forces behind the imposition of capital restrictions in a score of countries.[5] Rodrik (1998) used a similar index to investigate the effects of capital controls on growth, inflation, and investment between 1979 and 1989. His results suggest that, after controlling for other variables, capital restrictions have no significant effects on macroeconomic performance. Klein and Olivei (1999) used the IMF's *Exchange Arrangements and Exchange Restrictions* data to construct an index of capital mobility. The index is defined as the number of years in the period 1986 and 1995 that, according to the IMF, the country in question has had an open capital account.[6] In contrast to that of Rodrik, their analysis suggests that countries with a more open capital account have performed better than those that restrict capital mobility.[7] Leblang (1997), Razin and Rose (1994), and Chinn and Ito (2002) have also used indicators based on the IMF binary classification of openness. The standard approach is to use line E.2 of the annual summary published in the *Annual Report on Exchange Arrangements and Exchange Restrictions.* In an early attempt to use this IMF report, Edwards (1989) used the detailed information in the individual country pages to analyze the way in which restrictions on capital mobility changed in the period immediately surrounding a major exchange rate crisis.

A major limitation of these IMF-based binary indexes, however, is that they are extremely general and do not distinguish between different intensities of capital restrictions. Moreover, they fail to distinguish the type of flow that is being restricted, and they ignore the fact that, as discussed above, legal restrictions are frequently circumvented. For example, according to this IMF-based indicator, Chile, Mexico, and Brazil were subject to the same degree of capital controls in 1992–94. In reality, however, the three cases were extremely different. While in Chile there were restrictions on short-term inflows, Mexico had (for all practical purposes) free capital mobility, and Brazil had in place an arcane array of restrictions. Montiel and Reinhart (1999) have combined IMF and country-specific information to construct an index on the intensity of capital controls in fifteen countries during 1990–96. Although their index, which can take three values (0, 1, or 2) represents an improvement over straight IMF indicators, it is still rather general, and does not capture the subtleties of actual capital restrictions. These measurement difficulties are not unique to the capi-

5. Edison et al. (2002) provide a very useful summary (table 1 of their paper) of twelve different measures of capital account restrictions used in recent studies on the relationship between capital controls and economic performance.

6. A limitation with this indicator is that it does not say if the index's number (i.e., the percentage of years with restrictions) refers to most recent or most distant years in the time window being considered.

7. As Eichengreen (2001) points out, some authors supplement the information from the IMF's *Exchange Arrangements and Exchange Restrictions* with information on the extent of restrictions on current transactions. See also Frankel (1992).

tal flows literature, however. In fact, as Rodrik (1995) and Edwards (1998) have argued, the literature on trade openness and growth has long been affected by serious measurement problems.

In an effort to deal with these measurement problems, Quinn (1997) constructed a comprehensive set of cross-country indicators on the degree of capital mobility. His indicators cover twenty advanced countries and forty-five emerging economies. These indexes have two distinct advantages over other indicators. First, they are not restricted to a binary classification, where countries' capital accounts are either open or closed. Quinn uses a 0–4 scale to classify the countries in his sample, with a higher number meaning a more open capital account. Second, the Quinn indexes cover more than one time period, allowing researchers to investigate whether there is a connection between capital account *liberalization* and economic performance. This is, indeed, an improvement over traditional indexes that have concentrated on a particular period in time, without allowing researchers to analyze whether countries that open up to international capital movements have experienced changes in performance.[8] In an interesting exercise, Edison and Warnock (2003) compared Quinn's (1997) index with an index based on the number of years that, according to the *Exchange Arrangements and Exchange Restrictions,* a country has had a closed capital account. They found that for most (but not all) countries and periods there was a correspondence between the two indicators.

Chinn and Ito (2002) built a new index based on the IMF binary data. Their index is the average of the first standardized principal component of each of four categories of transactions considered by the IMF. Chinn and Ito consider their index to be in the spirit of the work by Edwards (2001) and Klein and Olivei (1999), and argue that, in contrast with the simple 0–1 IMF-based indexes, theirs is able to capture the intensity of capital restrictions. An advantage of this index constructed by Chinn and Ito is that it is available for 105 countries for the period 1977–97.

More recently, Quinn, Inclan, and Toyoda (2001) and Quinn (2003) used detailed data obtained from the IMF to develop a new index of capital mobility for fifty-nine countries. This index goes from 1 to 100, with higher values denoting a higher degree of financial integration. Thus, countries with stricter capital controls have a lower value of this index. For a small number of these countries the index is available for the period 1950–99; for most of them it is available for five years: 1959, 1973, 1982, 1988, and 1997. And for a core number of countries the index is available since 1890 (for details see Quinn 2003). Mody and Murshid (2002) also used IMF data as the bases for their index of financial integration. This index covers 150 countries for (most of) the period 1966–2000, and is tabulated from a value of 0

8. Note, however, that the basic information used by Quinn to construct this index also comes from the IMF's *Exchange Arrangements and Exchange Restrictions.*

to 4. This index takes the value of 0 in the case that a country has a closed capital account, has a closed current account, places restrictions on their exports receipts, and operates under multiple exchange rates. Both these new indexes (Quinn and Mody-Murshid) represent a significant improvement over previous attempts at measuring the variation across time and countries of capital restrictions.

In a recent paper Miniane (2004) has proposed a new measure based on detailed country-specific data compiled by the IMF. Since 1996 the IMF's *Annual Report on Exchange Rate Arrangements and Exchange Restrictions* has published a very detailed and disaggregated index of capital account restrictions that distinguishes between thirteen different categories. This level of disaggregation is a marked improvement over the pre-1996 *Annual Report* data, which considered only six categories—bilateral payment arrangements, restrictions on current account transaction payments, restrictions on capital account, import surcharges, advanced deposits on imports, and export proceeds surrendering. Miniane has extended the more detailed thirteen-category index backward to 1983 for thirty-four countries. He shows that this new measure is more accurate than the older, less detailed one.

Although these new indexes on capital restrictions represent a major improvement with respect to earlier indicators, they still have some limitations, including the fact that, in spite of the authors' efforts, the indexes do not distinguish sharply between different types of restrictions (i.e., controls on foreign direct investment versus portfolio flows; controls on inflows versus controls on outflows).[9] Second, these indexes tend to blur the distinction between exchange restrictions—including the required surrendering of exports' proceeds—and capital account restrictions. Third, they do not deal in a systematic way with the fact that many countries' controls are (partially) evaded. This means that an ideal index of capital account restrictions would make a correction for the effectiveness of the controls (see De Gregorio, Edwards, and Valdes 2000 for an attempt to deal with this issue for the case of Chile).

Most of the indexes discussed above have tried to capture the overall degree of capital mobility in particular countries at a particular moment in time. A number of authors, however, have concentrated on the degree of openness of the stock market. Most of these studies have tried to analyze the effect of the *opening* of the stock market on several macroeconomic and microeconomic variables. For this reason, these studies make a significant effort to date correctly different liberalization efforts. Early and ambitious efforts along these lines were made by Bekaert (1995), Bekaert and Harvey

9. The Quinn (1997) index considers separately capital account receipts and payments. The Johnston and Tamirisa (1998) paper is one of the few where an attempt is made to distinguish between controls on capital inflows and on various types of outflows. Their index, however, covers only one year. For related work see Tamirisa (1999).

(1995, 2000), and Bekaert, Harvey, and Lundblad (2001). An important point made by these authors is that using the official or legislative dates of stock market liberalization may be highly misleading. For this reason, the authors use data on actual net capital flows to date stock market liberalization episodes in a score of countries. More specifically, they argue that liberalization episodes may be dated by identifying *break points* in the net capital flows data.[10] In a recent study, Edison and Warnock (2003) have used data on stock markets compiled by the International Finance Corporation to construct a new index of restrictions on ownership of stock by foreigners. This index—which was constructed for twenty-nine countries—has a high degree of correlation with the index by Bekaert, Harvey, and Lundblad (2001).[11] Shatz (2000) has built an index on capital account restrictions on the basis of restrictions on foreign direct investment in fifty-seven countries. This index has been used by Desai, Foley, and Forbes (2004) in a study on the way in which multinational firms deal with capital controls.

The selective survey presented in this subsection vividly captures the difficulties that researchers have encountered in their efforts to measure the degree of capital mobility of particular countries at particular points in time. It also shows that this is a rapidly moving area of research, which is likely to continue to evolve in the future. Most recent efforts to improve measurement have focused on moving away from coarse "closed-open" binary indexes, and have dealt with two issues: (a) capturing the fact that when it comes to controls there are "grey areas," and that there are gradations of restrictions; and (b) allowing comparisons of the intensity of controls across countries and time. In both of these areas there have been considerable improvements in the last few years.

2.3 The Evolution of Capital Mobility in the World Economy: 1970–2001

In this section I analyze the evolution of capital mobility in a large number of countries—both advanced and emerging—during the last three decades. The first step is to discuss a new index on capital mobility; I then provide evidence of the extent to which countries have liberalized their capital account in the last ten years.

In order to analyze the evolution of capital account restrictions I constructed a new index on capital mobility that combines information from Quinn (2003) and Mody and Murshid (2002), with information from country-specific sources. In creating this new index I followed a three-step procedure. First, the scales of the Quinn and Mody and Murshid indexes were

10. See also Henry (2000).

11. See Edison et al. (2002) for a survey of studies on the effect of capital account restrictions on stock markets.

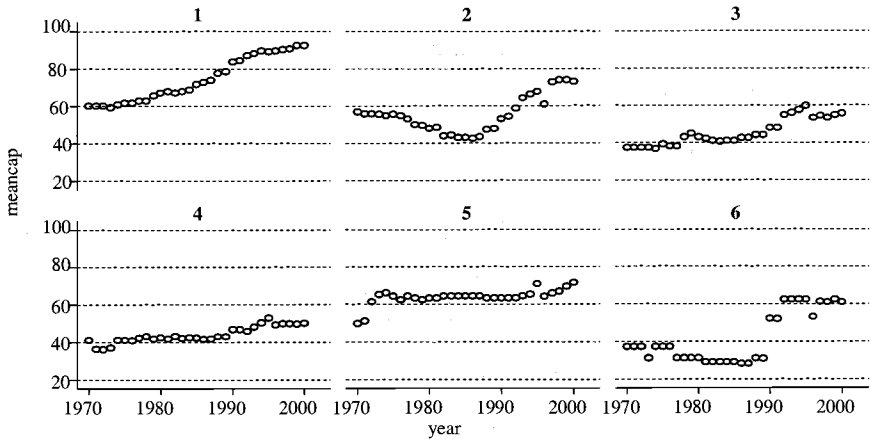

Fig. 2.1 Capital mobility index, 1970–2000

Note: Figure shows graphs by region code: 1 = industrial countries, 2 = Latin America and Caribbean, 3 = Asia, 4 = Africa, 5 = Middle East, 6 = Eastern Europe.

made compatible. The new index has a scale from 0 to 100, *where higher numbers denote a higher degree of capital mobility;* a score of 100 denotes absolutely free capital mobility. Second, I use Stata's "impute" procedure to deal with missing observations in the new index. In order to impute *preliminary* values to the missing observations I use data on the two original indexes (Quinn and Mody-Murshid), their lagged values, openness as measured by import tariff collections over imports, the extent of trade openness measured as imports plus exports over GDP, and GDP per capita.[12] In the third step, I use country-specific data to revise and refine the preliminary data created using the "impute" procedure discussed above. The new index covers the period 1970–2000, and has data for 163 countries (although not every country has data for every year). It is important to note that although this new index is a clear improvement over alternative indexes, it still has some shortcomings, including the fact that it does not distinguish very sharply between restrictions on capital inflows and restrictions on capital outflows.[13]

In figure 2.1 I present the evolution of the new index for six groups of countries: (a) industrial countries, (b) Latin America and the Caribbean, (c) Asia, (d) Africa, (e) the Middle East and North Africa, and (f) Eastern Europe. This figure clearly captures the fact that the degree of capital mobility has increased in every one of these six regions during the last three

12. See Aizenman and Noy (2004) on the relationship between trade account openness and capital account openness.

13. See the discussion in the preceding section for an analysis of the shortcomings of different indexes. See also Eichengreen (2001) and Edwards (1999).

decades. A comparison of the 1970–89 and 1990–2000 periods suggests that, on average, the industrial countries made the most progress in moving toward greater capital mobility; their average index went from 66.5 to 88.8. The Middle East and North African countries, on the other hand, experienced only moderate capital account liberalization. Their capital mobility index went from an average of 41.3 to 49.1. Figure 2.1 also shows that this process of financial openness has followed different patterns in the different regions. For instance, in the industrial countries it has been a relatively smooth process; in the Latin American countries, on the other hand, it is possible to see stricter capital account restrictions during the 1970s and 1980s, with an increase in the extent of capital mobility in the 1990s. In Asia, there was an increase in capital mobility during the early 1990s, followed by a somewhat abrupt imposition of controls after the 1997 crises. Since then, capital mobility has increased somewhat. Not surprisingly, Eastern Europe is the region that has experienced the greatest discrete jump in the degree of capital mobility.

As a way of gaining further insights into the evolution of capital mobility during the period 1970–2001, I used data on the new index on capital mobility to divide the sample into three equal-size groups depending on the extent of mobility. These groups have been labeled *High, Intermediate,* and *Low* mobility.[14] This three-way division of the sample clearly captures the fact that the degree of capital mobility has increased significantly during the last thirty years. In 1970, 44 percent of the observations corresponded to *Low* mobility; 26 percent to *Intermediate;* and 30 percent to *High* mobility. In the year 2000, in contrast, 24 percent of the observations corresponded to *Low* mobility; 25 percent to *Intermediate;* and 52 percent to *High* mobility. Table 2.1 contains summary data on the index of capital mobility for the *Low* and *High* mobility groups.[15] As may be seen, the mean and median values of the index are very different across groups. Indeed, a test with the equality of means indicates that the null hypothesis is rejected at a high degree of confidence (t-statistic = 136.9).

In order to illustrate which type of country belongs to each group, in table 2.2 I present a list of a subset of nations with *High* and *Low* capital mobility. These subsets focus on the extremes of the distributions and capture countries with *Very High* mobility (index value equal or higher than 87.5) and *Very Low* mobility (index value lower or equal to 12.5).[16] As may

14. Since the unit of analysis is a country-year observation, and there has been a trend toward higher capital mobility (see figure 2.1), most observations in the *High* mobility group correspond to recent country-year observations. Likewise, by construction most (but by no means all) observations in the *Low* mobility group correspond to early (1970s and 1980s) country-year observations.

15. In much (but not all) of the analysis that follows I will deal only with the *Low* and *High* restrictions groups. That is, in many of the results that follow the group of countries with *Intermediate* restrictions has been dropped.

16. These break points were selected in an arbitrary fashion.

Table 2.1 **Capital mobility index by group**

Group	Mean	Median	Standard deviation
Low capital mobility	30.0	37.5	9.9
High capital mobility	82.5	87.5	12.3

Table 2.2 **Countries with very high and very low capital mobility**

A. Very high capital mobility

1970–1979		1980–1989		1990–2000	
Bahrain	87.5	United States	95.0	Austria	87.5
The Gambia	87.5	Antigua and Barbuda	87.5	Belgium	96.6
Germany	96.3	Bahrain	87.5	Canada	100.0
Hong Kong, China	95.0	Germany	98.8	Denmark	100.0
Lebanon	87.5	Hong Kong, China	100.0	Estonia	87.5
Panama	100.0	Kuwait	87.5	Finland	95.4
Switzerland	93.8	Lebanon	87.5	France	90.9
United Arab Emirates	87.5	The Netherlands	92.5	Germany	100.0
		Panama	95.0	Guatemala	100.0
		Singapore	100.0	Hong Kong, China	100.0
		Switzerland	100.0	Ireland	93.1
		United Arab Emirates	87.5	Italy	96.6
		United Kingdom	100.0	Kuwait	87.5
		United States	100.0	Kyrgyz Republic	87.5
		Uruguay	95.0	Latvia	87.5
		Vanuatu	87.5	Lebanon	87.5
				Lithuania	87.5
				The Netherlands	100.0
				New Zealand	93.1
				Norway	100.0
				Singapore	97.7
				Sweden	87.5
				Switzerland	100.0
				United Arab Emirates	87.5
				United Kingdom	100.0
				United States	100.0
				Uruguay	93.1
				Vanuatu	87.5

B. Very low capital mobility

China	0.0	Bangladesh	12.5		
Ethiopia	12.5	Iceland	12.5		
Iceland	12.5	Morocco	10.0		
Morocco	3.8	Sri Lanka	12.5		
South Africa	7.3				
Sri Lanka	12.5				

Notes: Very high capital mobility countries are those with average mobility index higher than or equal to 87.5. Very low capital mobility countries are those with average mobility index lower than or equal to 12.5.

Table 2.3 Countries with major changes in capital mobility index

A. From high to low capital mobility

1970–1974	1975–1979	1980–1984	1985–1989	1990–1994	1995–2000
	Uruguay	Barbados Grenada Haiti Mexico Nicaragua Paraguay			

B. From low to high capital mobility

		Australia Norway Uruguay	Portugal	Argentina Costa Rica El Salvador Grenada Hungary Mexico Paraguay Peru The Philippines Trinidad and Tobago	Colombia Ecuador Egypt Guyana Haiti Iceland Israel Jamaica Jordan Kenya Laos Mauritania Nicaragua Rwanda Uganda Zambia

Notes: Panel A shows countries with high capital mobility index in period $t-1$ and low capital mobility index in period t. Panel B shows countries with low capital mobility index in period $t-1$ and high capital mobility index in period t. Index is high if it is higher than 50, low if it is lower than 50.

be seen, while the number of countries with *Very High* capital mobility increased from decade to decade, the number with *Very Low* mobility declined, until in the 1990–2000 decade there were no nations with an index value below 12.5.

Finally, in table 2.3 I present a list of countries that during a five-year period experienced major changes in the extent of capital mobility. Panel A in table 2.3 lists countries that moved from *High* to *Low* mobility. As may be seen, there are relatively few nations that went through a rapid and extreme closing of the capital account. Interestingly, all cases correspond to countries in Latin America and the Caribbean, and took place during the first half of the 1980s when the region was going through the debt crisis. In panel B of table 2.3 I have listed countries that have gone through rapid capital account liberalizations—these are countries that within five years have gone from *Low* mobility all the way to *High* capital mobility—skip-

ping, as it were, the adolescence stage of capital mobility. As may be seen, during the 1980s one emerging country (Uruguay) and three OECD countries—Australia, Norway, and Portugal—went through this rapid liberalization process. In contrast, during the 1990s an increasingly large number of emerging countries—including many in Latin America and Africa—liberalized their capital accounts rapidly.

2.4 The Anatomy of Current Account Reversals and Sudden Stops: Is There a Difference between High and Low Capital Mobility Countries?

Recent discussions on external crises have tended to focus on two related phenomena: (a) *sudden stops of capital inflows,* defined as situations in which the flow of capital coming into a country is reduced significantly in a very short period of time; and (b) *current account reversals,* or major reductions in the current account deficit that take place within a year or two.[17] In this section I analyze these two phenomena during the last thirty years, and I rely on nonparametric tests to investigate whether their incidence and main characteristics have been different for countries with *High* capital mobility and countries with *Low* mobility.

2.4.1 Incidence of Sudden Stops and Reversals

In this paper I have defined a "sudden stop" episode as an abrupt and major reduction in capital inflows to a country that up to that time had been receiving large volumes of foreign capital. More specifically, I imposed the following requirements for an episode to qualify as a sudden stop: (a) the country in question must have received an inflow of capital (relative to gross domestic product [GDP]) larger than its region's third quartile during the two years prior to the sudden stop; (b) net capital inflows must have declined by at least 5 percent of GDP in one year.[18] On the other hand, a "current account reversal"—reversal, in short—is defined as a reduction in the current account deficit of at least 4 percent of GDP in one year.[19]

17. The term "sudden stops" was introduced by Rudi Dornbusch and has been popularized by Guillermo Calvo and his associates. On sudden stops see, for example, Calvo, Izquierdo, and Mejía (2004) and Edwards (2004a, 2004b). On current account reversals see Milesi-Ferretti and Razin (2000), Edwards (2002, 2004a, 2004b) and Guidotti, Sturzenegger, and Villar (2003). See Taylor (2002) for a fascinating discussion of long-term trends in current account dynamics. On the long-term interplay between capital flows and the current account, see Obstfeld and Taylor (2004).

18. In order to check for the robustness of the results, I also used two alternative definitions of sudden stops, which considered a reduction in inflows of 3 and 7 percent of GDP in one year. Due to space considerations, however, I don't report detailed results using these definitions.

19. I also used an alternative definition. The qualitative nature of the results discussed below was not affected by the precise definition of reversals or sudden stops. See Edwards (2002).

Table 2.4 **Incidence of sudden stops**

Region	No sudden stop	Sudden stop
Industrial countries	96.3	3.7
Latin America and Caribbean	92.2	7.8
Asia	94.9	5.1
Africa	93.4	6.6
Middle East	88.7	11.3
Eastern Europe	93.7	6.4
Total	93.6	6.4
No. of observations	2,943	
Pearson		
Uncorrected χ^2 (5)	18.84	
Design-based $F(5, 14710)$	3.76	
p-value	0.002	

Table 2.5 **Incidence of current account reversals**

Region	No reversal	Reversal
Industrial countries	97.6	2.4
Latin America and Caribbean	84.0	16.0
Asia	87.9	12.1
Africa	83.4	16.6
Middle East	84.0	16.0
Eastern Europe	85.0	15.0
Total	87.2	12.8
No. of observations	2,975	
Pearson		
Uncorrected χ^2 (5)	77.88	
Design-based $F(5, 14870)$	15.57	
p-value	0.000	

Table 2.4 presents tabulation data on the incidence of sudden stops for the period under study; table 2.5 contains data on the incidence of current account reversals. In both tables I have considered six groups of countries—industrial countries, Latin America and the Caribbean, Asia, Africa, the Middle East and North Africa, and Eastern Europe. Each table also includes a Pearson test for equality of incidence across groups of countries. As may be seen, the total historical incidence of sudden stops has been 6.4 percent. Different countries, however, have experienced very different realities, with the incidence being highest in the Middle East (11.3 percent) and lowest in the industrial nations (3.7 percent). The tabulation on reversals in table 2.5 indicates that the aggregate incidence rate has been 12.8 percent; Latin America, Africa, and the Middle East have had the

highest incidence at 16 percent, and the industrial countries have had the lowest incidence at 2.4 percent.

From an analytical perspective sudden stops and reversals should be highly related phenomena. There is no reason, however, for their relationship to be one to one. Indeed, because of changes in international reserves it is perfectly possible that a country that suffers a sudden stop does not experience at the same time a current account reversal. In table 2.6 I present two-way frequency tables for the sudden stops and the current account deficit reversal, both for the complete sample and for the six regions. The table shows that for the complete sample (3,106 observations) 46.8 percent of countries subject to a sudden stop also faced a current account reversal. At the same time, 22.8 percent of those with reversals also experienced (in the same year) a sudden stop of capital inflows. The regional data show that joint incidence of reversals and sudden stops has been highest in Africa, where approximately 59.3 percent of sudden stops happened at the same time as current account reversals, and in Latin America, where 25 percent of reversals coincided with sudden stops. Notice that for every one of the regions, as well as for the complete sample, the Pearson χ^2 tests have very small *p*-values, indicating that the observed differences across rows and columns are significant. That is, these tests suggest that although there are observed differences across these phenomena, the two are statistically related. Interestingly, these results do not change in any significant way if different definitions of reversals and sudden stops are used, or if alternative configurations of lags and leads are considered.

2.4.2 Sudden Stops, Reversals, and Capital Controls

The tabulation results presented above on sudden stops and current account reversals (tables 2.5 and 2.6) did not group countries according to their degree of capital mobility. In table 2.7 I report the incidence of both sudden stops and current account reversals for the three categories of capital mobility defined above: *High, Intermediate,* and *Low* capital mobility. The table also presents the *p*-values for Pearson tests on the equality of incidence across regions, as well as *t*-statistics (and their *p*-values) on the equality of incidence under *High* mobility and *Low* mobility on the one hand, and equality of incidence under *High* mobility and *Intermediate* mobility, on the other hand (these tests are presented at both the country-group and aggregate levels). The results obtained may be summarized as follows:

- For the complete sample, the incidence of current account reversals is significantly lower for countries with *High* capital mobility than for countries with either *Intermediate* or *Low* mobility. This aggregate result is somewhat deceiving, however, since there are marked differ-

Table 2.6 **Incidence of current account reversals and sudden stops**

	All countries: Sudden stop		
Reversal	0	1	Total
0	2,587	107	2,694
	96.0	4.0	100.0
	89.1	53.2	86.7
1	318	94	412
	77.2	22.8	100.0
	11.0	46.8	13.3
Total	2,905	201	3,106
	93.5	6.5	100.0
	100	100	100
Pearson χ^2 (1)		209.65	
p-value		0.000	

	Industrial countries: Sudden stop			Latin America: Sudden stop		
	0	1	Total	0	1	Total
0	552	19	571	605	24	629
	96.7	3.3	100.0	96.2	3.8	100.0
	98.2	82.6	97.6	87.1	44.4	84.0
1	10	4	14	90	30	120
	71.4	28.6	100.0	75.0	25.0	100.0
	1.8	17.4	2.4	13.0	55.6	16.0
Total	562	23	585	695	54	749
	96.1	3.9	100.0	92.8	7.2	100.0
	100	100	100	100	100	100
Pearson χ^2 (1)		23.06			67.60	
p-value		0.000			0.000	

	Asia: Sudden stop			Africa: Sudden stop		
	0	1	Total	0	1	Total
0	328	12	340	689	22	711
	96.5	3.5	100.0	96.9	3.1	100.0
	87.7	60.0	86.3	85.2	40.7	82.4
1	46	8	54	120	32	152
	85.2	14.8	100.0	79.0	21.1	100.0
	12.3	40.0	13.7	14.8	59.3	17.6
Total	374	20	394	809	54	863
	94.9	5.1	100.0	93.7	6.3	100.0
	100	100	100	100	100	100
Pearson χ^2 (1)		12.32			68.85	
p-value		0.001			0.000	

(*continued*)

Table 2.6 (continued)

	Middle East: Sudden stop			Eastern Europe: Sudden stop		
	0	1	Total	0	1	Total
0	185	13	198	195	11	206
	93.4	6.6	100.0	94.7	5.3	100.0
	88.5	54.2	85.0	89.9	64.7	88.0
1	24	11	35	22	6	28
	68.6	31.4	100.0	78.6	21.4	100.0
	11.5	45.8	15.0	10.1	35.3	12.0
Total	209	24	233	217	17	234
	89.7	10.3	100.0	92.7	7.3	100.0
	100	100	100	100	100	100
Pearson χ^2 (1)		19.90			9.47	
p-value		0.000			0.002	

ences in incidence across groups of countries.[20] As may be seen from table 2.7, for industrial countries the incidence of reversals has been significantly smaller in countries with *High* mobility. In Asia, on the other hand, countries with *Low* mobility have had a significantly lower incidence of reversals than nations with *High* capital mobility. For the rest of the country groups there are no statistical differences in the incidence of reversals across degrees of capital mobility.

- For sudden stops, the results for the complete sample suggest that there are no statistical differences in incidence across countries with different degrees of capital mobility. At the country-group levels there are some differences, however. For industrial countries the incidence of sudden stops is smaller under *High* capital mobility; the opposite is true for the Asian and Eastern European countries. The *t*-statistics in table 2.7 indicate that for Latin America, Africa, and the Middle East there are no statistical differences in the incidence of sudden stops according to the degree of capital mobility.

The results presented in table 2.7 were obtained when the contemporaneous value of the index was used to classify countries as having a *High, Intermediate,* or *Low* degree of capital mobility. It is possible to argue, however, that what matters is not the degree of capital mobility in a particular year but the policy stance on capital mobility in the medium term. In order to investigate whether an alternative classification makes a difference, I reclassified countries as *High, Intermediate,* and *Low* capital mobility using the average value in the index in the previous five years. The results obtained are reported in table 2.8; as may be seen, the results are very similar to those reported in table 2.7.

20. Indeed, according to the Pearson test the null hypothesis of equality of incidence across country-group categories is strongly rejected.

Table 2.7 **Incidence of current account reversals and sudden stops by categories of capital mobility (one-year average for capital mobility index)**

	Current account reversals					Sudden stops				
				t-test					*t*-test	
	High	Intermediate	Low	H = I	H = L	High	Intermediate	Low	H = I	H = L
Industrial countries	1.1	3.5	16.7	1.71	6.40**	2.3	7.9	11.1	2.72**	3.01**
Latin America	14.6	18.2	15.9	1.04	0.44	7.2	7.1	8.9	0.05	0.72
Asia	16.1	18.0	7.3	0.35	2.65**	11.7	4.1	1.1	1.85	4.22**
Africa	14.3	19.7	15.0	1.31	0.18	5.9	8.1	5.5	0.80	0.16
Middle East	13.8	11.4	20.3	0.40	1.12	11.5	6.8	13.7	0.84	0.42
Eastern Europe	14.0	24.4	5.1	1.24	1.34	14.3	4.7	0.0	1.52	2.58**
Total	9.1	17.1	13.7	5.27**	3.45**	6.1	7.2	6.2	0.91	0.03
p-value	0.000	0.007	0.012			0.000	0.846	0.000		

Note: t-tests reported are absolute values.
**Significant at the 5 percent level.

Table 2.8 **Incidence of current account reversals and sudden stops by categories of capital mobility (five-year average for capital mobility index)**

	Current account reversals					Sudden stops				
				t-test					*t*-test	
	High	Intermediate	Low	H = I	H = L	High	Intermediate	Low	H = I	H = L
Industrial countries	1.0	3.4	18.8	1.91	6.86*	2.4	5.8	12.5	1.89	3.19*
Latin America	14.9	16.0	14.8	0.32	0.03	7.7	7.9	7.7	0.06	0.01
Asia	15.3	21.5	5.6	1.17	2.96*	11.9	6.7	0.6	1.23	4.51*
Africa	12.8	19.4	15.0	1.49	0.54	5.6	8.1	5.6	0.79	0.00
Middle East	15.1	8.5	22.8	1.19	1.16	12.7	8.5	12.5	0.77	0.03
Eastern Europe	10.0	18.8	0.0	0.58	1.65	20.0	6.3	3.7	1.05	1.63
Total	8.7	15.9	13.1	4.82*	3.07*	6.2	7.6	5.7	1.18	0.43
p-value	0.000	0.001	0.001			0.000	0.972	0.003		

Note: t-tests reported are absolute values.

**Significant at the 5 percent level.

2.4.3 Banking Crises

In this subsection I investigate whether sudden stops and current account reversals have historically been related to banking crises. A number of authors have argued that one of the costliest effects of external shocks is that they tend to generate banking crises and collapses. Most analyses on this subject have focused on the joint occurrence of devaluation crises and banking crises; see, for example, the discussion in Kaminsky and Reinhart (1999). In this subsection I take a slightly different approach, and I investigate whether sudden stops and major current account deficits—not all of which end up in devaluation crises, as established in Edwards (2004b)—have been associated with banking crises. I address this issue in tables 2.9 and 2.10, where I present two-way tabulations for current account reversals and a dummy variable that takes the value of 1 if in that year there has

Table 2.9 **Banking crises and current account reversals**

	Total sample: Banking crisis			High mobility: Banking crisis		
Reversal	0	1	Total	0	1	Total
0	2,443	118	2,561	956	59	1,015
	95.4	4.6	100.0	94.2	5.8	100.0
	87.1	86.1	87.0	90.7	92.2	90.8
1	363	19	382	98	5	103
	95.0	5.0	100.0	95.2	4.9	100.0
	12.9	13.9	13.0	9.3	7.8	9.2
Total	2,806	137	2,943	1,054	64	1,118
	95.3	4.7	100.0	94.3	5.7	100.0
	100.0	100.0	100.0	100.0	100.0	100.0
Pearson χ^2 (1)		0.10			0.16	
p-value		0.75			0.91	
	Intermediate mobility: Banking crisis			Low mobility: Banking crisis		
	0	1	Total	0	1	Total
0	608	22	630	879	37	916
	96.5	3.5	100.0	96.0	4.0	100.0
	83.0	75.9	82.7	86.3	84.1	86.2
1	125	7	132	140	7	147
	94.7	5.3	100.0	95.2	4.8	100.0
	17.1	24.1	17.3	13.7	15.9	13.8
Total	733	29	762	1019	44	1063
	96.2	3.8	100.0	95.9	4.1	100.0
	100.0	100.0	100.0	100.0	100.0	100.0
Pearson χ^2 (1)		0.98			0.17	
p-value		0.32			0.68	

Table 2.10 **Banking crises and sudden stops**

	Total sample: Banking crisis			High mobility: Banking crisis		
Sudden stop	0	1	Total	0	1	Total
0	2,587	128	2,715	980	59	1,039
	95.3	4.7	100.0	94.3	5.7	100.0
	93.4	93.4	93.4	93.6	92.2	93.5
1	182	9	191	67	5	72
	95.3	4.7	100.0	93.1	6.9	100.0
	6.6	6.6	6.6	6.4	7.8	6.5
Total	2,769	137	2,906	1,047	64	1,111
	95.3	4.7	100.0	94.2	5.8	100.0
	100.0	100.0	100.0	100.0	100.0	100.0
Pearson χ^2 (1)		0.00			0.20	
p-value		0.99			0.66	
	Intermediate mobility: Banking crisis			Low mobility: Banking crisis		
	0	1	Total	0	1	Total
0	688	28	716	919	41	960
	96.1	3.9	100.0	95.7	4.3	100.0
	92.7	96.6	92.9	93.8	93.2	93.8
1	54	1	55	61	3	64
	98.2	1.8	100.0	95.3	4.7	100.0
	7.3	3.5	7.1	6.2	6.8	6.3
Total	742	29	771	980	44	1024
	96.2	3.8	100.0	95.7	4.3	100.0
	100.0	100.0	100.0	100.0	100.0	100.0
Pearson χ^2 (1)		0.62			0.03	
p-value		0.43			0.87	

been a banking crisis (table 2.9), and for sudden stops and banking crises (table 2.10).[21] All panels in table 2.9 (see, in particular, the Pearson χ^2 tests for independence of rows and columns) show that there has not been a significant relationship between reversals and major banking crises. Interestingly, this is the case for all three capital mobility groups.

The results in table 2.10 refer to sudden stops and banking crises, and are very similar. They indicate that there has been no significant relationship—at any level of capital mobility—between sudden stops and banking crises (see the Pearson χ^2 tests for independence of rows and columns). It is important to note that this is the case independent of the lag-lead structure considered. In sum, the results reported in tables 2.9 and 2.10 indicate that,

21. The data on banking crises are from Glick and Hutchison (1999). When an alternative definition of reversals is used the results are similar to those reported in this section.

contrary to what some critics of capital account liberalization have argued, higher capital mobility has not been associated with a higher occurrence of banking crises; banking crises have occurred at the same rate in countries with *High, Intermediate,* and *Low* capital mobility.[22]

2.5 Capital Controls and the Costs of External Crises

According to the analysis presented in the preceding section, there is no clear evidence supporting the view that Low capital mobility countries—that is, countries that impose heavy restrictions (or controls) on the mobility of capital—have a significantly lower incidence of sudden stops or current account reversals. In this section I take the analysis a step further and investigate whether current account reversals and sudden stops have historically had significant costs in terms of lower GDP growth. More important in terms of the current paper, I analyze whether the (potential) costs of sudden stops and reversals have been different in countries with different degrees of capital mobility.

The section is organized as follows: I first present a preliminary analysis, where I compare growth before and after sudden stops and current account reversal episodes, for countries with different degrees of capital mobility. I then present results obtained from an econometric analysis that estimates jointly—using treatment regressions—the probability of having a crisis and the effect of the crisis on GDP growth. As pointed out, the main interest in this analysis is to determine whether the extent of capital mobility plays a role in explaining countries' propensity to having crises, and the costs associated with crises.

2.5.1 Sudden Stops, Current Account Reversals, Capital Controls, and Growth: A Preliminary Analysis

In table 2.11 I present a before-and-after analysis of GDP per capita growth for sudden stops and reversals. This analysis has been done for all countries, as well as for countries grouped according to their degree of capital mobility. The "before" data correspond to average GDP per capita growth during the *three years* before the crisis. I have computed two "after" rates of growth: (a) the year of the crisis, and (b) the average during three years after the crisis. Panel A in table 2.11 contains the results for one year after the crisis; panel B contains results for three years after the crisis. The first four columns in both panels of table 2.11 contain the average difference in the rate of growth per capita after and before the crisis. Column (1) is for all countries; columns (2) through (4) are for countries with *High, In-*

22. I also analyzed the incidence of sudden stops, current account reversals, and IMF programs. The results obtained indicate that there is no relationship between sudden stops and reversals on the one hand, and IMF programs on the other.

Table 2.11 GDP per capita growth: Before and after

Event	All (1)	High (2)	Intermediate (3)	Low (4)	High – Intermediate (5)	High – Low (6)
			A. Results for one year after crisis			
Reversal	–0.37	–0.54	0.75	–1.21	–1.29	0.67
	(1.07)	(0.71)	(1.54)	(2.18)**	(1.44)	(0.71)
Sudden stop	–0.88	–1.29	0.08	–1.27	–1.37	–0.02
	(1.84)	(1.60)	(0.09)	(1.52)	(1.17)	(0.02)
			B. Results for three years after crisis			
Reversal	–0.09	–0.25	0.75	–0.69	–1.00	0.44
	(0.34)	(0.51)	(2.12)**	(1.54)	(1.66)	(0.66)
Sudden stop	–0.61	–0.31	0.19	–1.55	–0.50	1.24
	(1.64)	(0.58)	(0.31)	(2.11)**	(0.62)	(1.36)

Notes: The "before" data correspond to average GDP per capita growth during the three years before the crisis. In panel A, "after" rate of growth is for year of the crisis. In panel B, "after" is average growth rate during three years after the crisis. *t*-tests reported (in parentheses) are absolute values.

**Significant at the 5 percent level.

termediate, and *Low* capital mobility. The numbers in parentheses are *t*-statistics for the null hypothesis that the "before" and "after" rates of growth are equal. The final two columns, columns (5) and (6), are difference-in-difference columns, which report the difference in the before and after growth rates for High and Intermediate and High and Low capital mobility; that is, the number in column (5) is equal to column (2) minus column (3). The number in parentheses is for the null hypothesis that this difference-in-difference is equal to zero.

As may be seen from table 2.11, these preliminary results suggest that, generally speaking, there are no significant differences in growth before and after the crises; this is the case for all categories of capital mobility. Notice that only three out of the twenty-four *t*-statistics in table 2.11 are significant at conventional levels. As emphasized above, however, these results are only preliminary, since no attempt has been made to control for other factors or to incorporate the determinants of the probability of a crisis.[23] In the subsection that follows I deal with these issues by using a treatment regression methodology.

2.5.2 An Econometric Analysis

In this subsection I present results from an econometric analysis that deals with two questions: (a) does a higher degree of capital mobility increase the probability of a crisis (defined as a sudden stop or as a current

23. Hong and Tornell (2005), however, have used a similar methodology and found that there are growth effects of crises. Their definition of crisis, however, is different from the two definitions I have used here.

account reversal), and (b) does the degree of capital mobility affect the cost of crises once they occur? The discussion proceeds as follows: I first present a simple analysis on the effects of sudden stops and current account reversals on growth (the following subsection); I then present results from the joint estimation of crises' probabilities and dynamics of growth equations (the succeeding subsection).

Growth Effects of Sudden Stops and Current Account Reversals: Preliminary Econometric Results

As in Edwards and Levy Yeyati (2005), the point of departure of the empirical analysis is a two-equation formulation for the *dynamics* of real GDP per capita growth of country j in period t. Equation (1) is the long-run GDP growth equation, while equation (2) captures the growth dynamics process.

$$g_j^* = \alpha + \mathbf{X}_j\beta + \mathbf{R}_j\theta + \omega_j. \tag{1}$$

$$\Delta g_{tj} = \lambda(g_j^* - g_{t-1,j}) + \varphi v_{t,j} + \gamma u_{t,j} + \xi_{t,j}. \tag{2}$$

I have used the following notation: g_j^* is the long-run rate of real per capita GDP growth in country j; $\mathbf{X}_j$ is a vector of structural, institutional, and policy variables that determine long-run growth; $\mathbf{R}_j$ is a vector of regional dummies; α, β, and θ are parameters; and ω_j is an error term assumed to be heteroskedastic. In equation (2), $g_{t,j}$ is the rate of growth of per capita GDP in country j in period t. The terms $v_{t,j}$ and $u_{t,j}$ are shocks, assumed to have zero mean, to have finite variance, and to be uncorrelated among them. More specifically, $v_{t,j}$ is assumed to be an external terms-of-trade shock, while $u_{t,j}$ captures other shocks, including sudden stops and current account reversals. $\xi_{t,j}$ is an error term, which is assumed to be heteroskedastic (see equation [3] below for details), and λ, φ, and γ are parameters that determine the particular characteristics of the growth process. Equation (2), which has the form of an equilibrium correction model (ECM), states that the actual rate of growth in period t will deviate from the long-run rate of growth due to the existence of three types of shocks: $v_{t,j}$, $u_{t,j}$ and $\xi_{t,j}$. Over time, however, the actual rate of growth will tend to converge toward its long-run value, with the rate of convergence given by λ. Parameter φ, in equation (2), is expected to be positive, indicating that an improvement in the terms of trade will result in a (temporary) acceleration in the rate of growth, and that negative terms-of-trade shocks are expected to have a negative effect on $g_{t,j}$.[24] The main interest from the perspective of the current paper is whether *sudden stops* and *current account reversals* have a negative effect on growth; that is, whether coefficient γ is significantly negative. In the actual estimation of equation (1), I used

24. See Edwards and Levy Yeyati (2005) for details.

Table 2.12 **Current account reversals, sudden stops, and growth (GLS estimates)**

	Eq. (1) R.E.	Eq. (2) F.E.	Eq. (3) R.E.	Eq. (4) F.E.	Eq. (5) R.E.	Eq. (6) F.E.
Constant	–0.15	–0.14	–0.27	–0.25	–0.14	–0.10
	(1.16)	(1.41)	(2.62)***	(2.44)**	(1.32)	(0.97)
Growth gap	0.82	0.86	0.81	0.87	0.82	0.88
	(42.10)***	(42.73)***	(40.18)***	(41.62)***	(40.76)***	(42.28)***
Change in terms of trade	0.06	0.07	0.07	0.07	0.08	0.08
	(12.65)***	(12.19)***	(11.31)***	(10.74)***	(12.18)***	(11.75)***
Reversal	–2.01	–2.10			–1.80	–1.97
	(6.64)***	(6.72)***			(5.50)***	(5.82)***
Sudden stop			–1.23	–1.25	–0.54	–0.60
			(2.82)***	(2.77)***	(1.19)	(1.31)
No. of observations	1,821	1,821	1,641	1,641	1,635	1,635
Countries	90	90	81	81	81	81
R^2	0.49	0.49	0.51	0.51	0.52	0.52

Notes: R.E. = random effect; F.E. = fixed effect; *t*-tests reported (in parentheses) are absolute values; country-specific dummies are included, but not reported.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

dummy variables for sudden stops and reversals. An important question, and one that is addressed in detail in the subsection that follows, is whether the effects of different shocks on growth are different for countries with different degrees of capital mobility.

The system in equations (1) and (2) was estimated using a two-step procedure. In the first step I estimate the long-run growth equation (1) using a cross-country data set. These data are averages for 1974–2000, and the estimation makes a correction for heteroskedasticity. These first-stage estimates are then used to generate long-run predicted growth rates to replace g_j^* in the equilibrium error correction model in equation (2). In the second step, I estimated equation (2) using a generalized least squares (GLS) procedure for unbalanced panels; I used both random effects and fixed effects estimation procedures. The data set covers 157 countries, for the 1970–2000 period; not every country has data for every year, however. See the appendix for exact data definition and data sources.

The results from the first-step estimation of equation (1) are not reported due to space considerations.[25] Table 2.12 presents the results from the

25. In estimating equation (1) for long-run per capita growth, I follow the now standard literature on growth, as summarized by Barro and Sala-i-Martin (1995), and use average data for 1974–2000. In terms of the equation specification, I include the following covariates: the log of initial GDP per capita; the investment ratio; the coverage of secondary education; an index of the degree of openness of the economy; the ratio of government consumption relative to GDP; and regional dummies for Latin American, sub-Saharan Africa, and transition economies. The results are quite standard and support what has become the received wisdom on the empirical determinants of long-term growth.

second-step estimation of the growth dynamics equation (2). The first two equations refer to current account reversals, while the next two equations focus on sudden stops. Finally, in the table's equations (5) and (6) I included both the sudden stops and the reversals variables as regressors.

The estimated coefficient of $(g_j^* - g_{t-1,j})$ is, as expected, positive, significant, and smaller than 1. The point estimates are on the high side—between 0.81 and 0.88—suggesting that, on average, deviations between long-run and actual growth get eliminated rather quickly. For instance, according to equation (1) in table 2.12, after three years approximately 90 percent of a unitary shock to real GDP growth per capita will be eliminated. Also, as expected, the estimated coefficients of the terms-of-trade shock are always positive and statistically significant, indicating that an improvement (deterioration) in the terms of trade results in an acceleration (deceleration) in the rate of growth of real per capita GDP. As may be seen from equations (1) and (2) in the table, the coefficient of the current account reversals variable is significantly negative, indicating that reversals result in a deceleration of growth. The point estimate is –2.01, indicating that, with other things given, a reversal has on average resulted in a 2 percent reduction in short-term growth on average. The results from equations (3) and (4) in the table refer to sudden stops. They show that the estimated coefficients of the sudden-stop dummies are significantly negative, with a point estimate that ranges from –1.23 to –1.25. This suggests that while sudden stops also have a negative effect on per capita growth, their impact on growth has not been as severe as the impact of reversal episodes.

The results in the table 2.12 equations (5) and (6), where both the current account reversals and the sudden-stop dummies have been included, are particularly interesting: while the reversal dummies continue to be significantly negative, the coefficient for the sudden-stop dummy is not significant any longer. This suggests that what is costly—in terms of lower GDP per capita growth—is *not* a sudden stop per se. Indeed, according to these results, what is costly in terms of lower growth is a current account reversal. This is an important finding, since it suggests that countries that experience a sudden stop but are able to avoid a current account reversal, through the use of international reserves, will not face a significant decline in growth. Moreover, this result suggests that sudden stops have an indirect (negative) effect on growth. According to this conjecture, the occurrence of a sudden stop increases the probability of a current account reversal. The reversal, in turn, will have a negative impact on GDP per capita growth. I formally investigate this hypothesis in the subsection that follows.

Joint Estimation

I use a treatment effects model to estimate jointly an equation on real GDP growth and a probit equation on the probability that a country expe-

riences a current account reversal. The base empirical treatment effects model is as follows:

$$(1') \qquad g_j^* = \alpha + \mathbf{X}_j\beta + \mathbf{R}_j\theta + \omega_j.$$

$$(2') \qquad \Delta g_{t,j} = \lambda(g_j^* - g_{t-1,j}) + \varphi v_{t,j} + \gamma u_{t,j} + \theta(u_{t,j} \times \text{Openness}_{t,j}) + \xi_{t,j}.$$

$$(3) \qquad u_{t,j} = \begin{cases} 1 & \text{if } u_{t,j}^* > 0 \\ 0 & \text{otherwise} \end{cases}$$

$$(4) \qquad u_{t,j}^* = \mathbf{W}_{j,t}\alpha + \varepsilon_{j,t}.$$

As before, equation (1′) is the long-term real growth equation, and equation (2′) is the growth dynamics equation, with $u_{j,t}$ a dummy variable (i.e., the treatment variable) that takes a value of one if country j in period t experienced a current account reversal, and zero if the country did not experience reversal. Accordingly, γ is the parameter of interest: the effect of the treatment on the outcome. Finally, the product $u_{t,j} \times \text{Openness}_{t,j}$ interacts $u_{t,j}$ with a measure of openness. The coefficient of this interactive variable θ will capture the effect of openness on the transmission of external shocks on growth. In the estimation I used two alternative measures of openness: the index of capital account openness presented in section 2.3 of this paper, and a measure of trade openness (defined as the ratio of exports plus imports over GDP).

According to equation (3), whether the country experiences a current account reversal is assumed to be the result of an unobserved latent variable $u_{j,t}^*$—which in turn is assumed to depend linearly on vector $\mathbf{W}_{j,t}$. In the estimation, one of the $\mathbf{W}_{j,t}$ variables is the degree of capital mobility, or financial openness. Some of the variables in $\mathbf{W}_{j,t}$ may be included in $\mathbf{X}_{j,t}$.[26] β and α are parameter vectors to be estimated; $\xi_{j,t}$ and $\varepsilon_{j,t}$ are error terms assumed to be bivariate normal, with a zero mean and a covariance matrix given by

$$(5) \qquad \begin{pmatrix} \sigma & \psi \\ \psi & 1 \end{pmatrix}$$

If equations (2′) and (3) are independent, the covariance term ψ in equation (5) will be zero. Under most plausible conditions, however, it is likely that this covariance term will be different from zero (see Wooldridge 2002 for details). The model in equations (1′)–(5) will satisfy the consistency and identifying conditions of mixed models with latent variables if the outcome variable $y_{j,t}$ is not a determinant of the treatment equation—that is, if y is

26. For details on the identification requirements for this type of models see, for example, Wooldridge (2002).

not one of the variables in **W** in equation (4).[27] As is clear in the discussion that follows, in the estimation of the model in equations (1′)–(5) we impose a number of exclusionary restrictions; that is, a number of variables in vector $\mathbf{W}_{j,t}$ are not included in vector $\mathbf{X}_{j,t}$.

The system in equations (1′)–(5) was estimated using a three-step procedure. The first step consists of estimating the long-run growth equation [1′]). The results from this estimation are used to compute the growth gap term ($g_j^* - g_{t-1,j}$). In the second step the treatment equation on the probability of having a current account reversal is estimated using a probit procedure. From this estimation a hazard is obtained for each *j*, *t* observation. In the third step, the outcome equation (2′) is estimated with the hazard added as an additional covariate; in this third step the outcome equation is estimated using fixed effects. From the residuals of this augmented outcome regression, it is possible to compute consistent estimates of the variance-covariance matrix, equation (4). (See Maddala 1983 and Wooldridge 2002 for details.)

The Treatment Equation. Following work by Frankel and Rose (1996), Milesi-Ferretti and Razin (2000), and Edwards (2002), among others, in the estimation of the first treatment (probit) I included the following covariates:

- The index of capital mobility discussed in section 2.3. If, as critics of capital mobility have argued, greater mobility increases countries' vulnerability to crises, the estimated coefficient should be significantly positive.
- The ratio of the current account deficit to GDP lagged one and two periods. It is expected that, with other things given, countries with a larger current account deficit will have a higher probability of experiencing a reversal. The best results were obtained when the one-year lagged deficit was included.
- A sudden-stop dummy that takes the value of one if the country in question has experienced a sudden stop in that particular year. Its coefficient is expected to be positive.
- An index that measures the relative occurrence of sudden stops in the country's region (excluding the country itself) during that particular year. This variable captures the effect of "regional contagion"; its coefficient is expected to be positive.
- The one-year lagged external debt–GDP ratio. Its coefficient is expected to be positive.
- An index that measures whether the country in question has been subject to a banking crisis during the year in question. Its coefficient will

27. Details on identification and consistency of models with mixed structures can be found in Maddala (1983). See also Heckman (1978) and Angrist (2000).

measure the extent to which banking and external (i.e., current account) reversals have tended to occur jointly.
- The ratio of net international reserves to GDP, lagged one year. Its coefficient is expected to be negative, indicating that, with other things given, countries with a higher stock of reserves have a lower probability of experiencing a current account reversal.
- Short-term (less than one-year maturity) external debt as a proportion of external debt, lagged one period. Its coefficient is expected to be positive.
- The one-year lagged rate of growth of domestic credit. Its coefficient is expected to be positive.
- The lagged ratio of external debt service to exports. Again, its coefficient is expected to be positive.
- The country's initial GDP per capita (in logs).
- Country fixed effect dummies.

In some of the probit regressions I also included an index that measures the extent of dollarization in the country in question. Also, in some specifications I included the ratio of foreign direct investment (FDI) to GDP, and the public-sector deficit (both lagged). Their coefficients were not significant, however. Since these three variables were available for a smaller number of observations than the other variables, they were not included in the final specification of the probit equations reported in this section.

In table 2.13 I summarize the basic results obtained from the estimation of number of treatment models for GDP growth (the coefficients of the country-specific fixed effect variables are not reported due to space considerations). The table contains two panels. Panel A includes the results from the growth outcome equation (2′); panel B contains the estimates for the treatment equation, or probit equation on the probability of experiencing a current account reversal. As pointed out above, the *treatment observations* correspond to current account reversal episodes, and the untreated group is comprised of all country-year observations where there have been no reversals.[28] Table 2.13 also includes the estimated coefficient of the hazard variable in the third-step estimation, as well as the estimated elements of the variance-covariance matrix, equation (5).

Probability of Experiencing a Current Account Reversal. The probit estimates are presented in panel B of table 2.13. I discuss first the results in equations (1) and (2), since they were estimated over a larger sample. As may be seen, the results are similar across models and are quite satisfactory. Most of the coefficients have the expected signs, and many of them are sta-

28. Naturally, countries and time periods included in the analysis are determined by data availability. For many countries there are no data on the (potential) determinants of the probability of a current account reversal, including data on external debt and its characteristics.

Table 2.13 **Growth, current account reversals, and sudden stops: Treatment effects model (three-step estimates)**

Variable	Eq. (1)	Eq. (2)	Eq. (3)
A. Results from growth equation			
Growth gap	0.87	0.87	0.86
	(32.63)***	(32.66)***	(25.76)***
Terms of trade	0.07	0.07	0.07
	(8.48)***	(8.43)***	(6.47)***
Reversal	–5.35	–3.93	–6.72
	(4.83)***	(2.86)***	(3.69)***
Reversal · openness	0.02	0.02	0.01
	(2.22)**	(2.38)**	(0.97)
Reversal · capital mobility		–0.03*	–0.005
		(1.70)	(0.19)
B. Results from treatment equation			
Capital mobility (–1)	–0.007	–0.007	–0.008
	(1.47)	(1.48)	(1.56)
Current account deficit to GDP (–1)	0.10	0.10	0.11
	(8.16)***	(8.16)***	(5.93)**
Sudden stop	0.67	0.67	0.63
	(3.09)***	(3.08)***	(2.26)**
Sudden stops in region	1.34	1.34	1.09
	(2.08)**	(2.08)**	(1.43)
Reserves to GDP (–1)	–16.95	–16.85	–5.47
	(1.87)*	(1.86)*	(0.40)
Domestic credit growth (–1)	0.0002	0.0002	0.0002
	(1.33)	(1.33)	(1.12)
Banking crisis	0.19	0.18	0.16
	(0.79)	(0.76)	(0.63)
External debt to GDP (–1)	0.004	0.004	0.004
	(2.11)**	(2.11)**	(1.47)
Short-term debt (–1)	–0.007	–0.007	–0.0001
	(0.75)	(0.77)	(0.00)
Debt services (–1)	–0.002	–0.002	–0.001
	(0.37)	(0.36)	(0.18)
Initial GDP per capita	–0.01	–0.01	–0.81
	(0.05)	(0.05)	(2.97)***
Dollarization			0.24
			(5.14)***
Hazard lambda	1.18	1.23	1.85
	(2.45)**	(2.56)**	(2.85)***
Rho	0.29	0.30	0.45
Sigma	4.11	4.11	4.11
Wald χ^2 (215)	1,190.70	1,190.74	786.2
No. of observations	1,071	1,069	647

Notes: Absolute values of *z*-statistics are reported in parentheses; (–1) denotes a one-period lagged variable; country-specific dummies are included but not reported.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

tistically significant at conventional levels. A particularly interesting result is that in every equation the estimated coefficient of the capital mobility index was negative (although it was not significant at conventional levels). This was also the case when lagged values of this index were included in the estimation. These results suggest that, contrary to what has been argued by the critics of financial liberalization, a greater degree of capital account openness has not increased the degree of vulnerability in the world economy. If anything, these results provide some (preliminary and weak) evidence suggesting that countries with a higher degree of capital mobility have had a lower probability of experiencing a current account reversal. The results in panel B of table 2.13 also indicate that the probability of experiencing a reversal is higher for countries with a large (lagged) current account deficit and a high external debt ratio. Countries that have experienced a sudden stop also have a high probability of a current account reversal, as do countries that are in a region where many countries experience a sudden stop (i.e., there is evidence of regional contagion). The coefficient of net international reserves is negative, as expected, and it is significant at the 10 percent level in equations (1) and (2). The coefficients of the short-term debt and total debt service have the expected signs but tend not to be significant. The coefficients of initial GDP per capita are negative but not significant. Overall, when different lag structures of the regressors were considered, the nature of the results did not change.

An important policy issue has to do with the effects of dollarization and dollarized liabilities on macroeconomic vulnerability and on the costs of crises. If, as argued by Calvo, Izquierdo, and Talvi (2003), countries with dollarized financial systems are particularly vulnerable to external shocks, one would expect that dollarization would positively affect the probability of facing a reversal. Unfortunately, there are no extensive data sets on dollarization across countries and time. It is possible, however, to use a more limited data set—limited in terms of both year and country coverage—to further investigate this issue. I use the data set recently assembled by Reinhart, Rogoff, and Savastano (2003) that covers 117 countries for the period 1996–2001. This index goes from 1 to 30, with higher numbers indicating higher degrees of dollarization. The results obtained when this index is included in the treatment regression are reported in equation (3) of table 2.13. As may be seen, the estimated coefficient is positive and significant, indicating that a higher degree of dollarization increases the probability of a country experiencing a current account reversal.[29] This result supports findings by Edwards (2004b) and Calvo, Izquierdo, and Mejía (2004). Notice, however, that due to the limited nature of the dollarization data, the

29. The Reinhart, Rogoff, and Savastano (2003) dollarization index refers only to the period 1996–2002. I have assumed, however, that the extent of dollarization detected by Reinhart et al. applies to the 1976–2000 period. For this reason the results reported here should be taken with a grain of salt.

number of observations in regression (3) is significantly smaller than in the original regressions.

GDP Growth Models. The results from the estimation of the growth equation are reported in panel A of table 2.13. I discuss first the results from the first two equations that exclude the dollarization variable. As may be seen, the coefficient for the growth gap variable is significantly positive and smaller than one, as expected. The point estimates are similar to those reported in table 2.12. Also, as in table 2.12 the coefficients of the terms-of-trade shocks are significantly positive. The coefficient of the current account reversal variable is significantly negative, indicating that a current account reversal has a negative effect on growth.

Interestingly, in both equations (1) and (2) of table 2.13 the coefficient of the variable that interacts the reversal dummy and an index of trade openness are significantly positive. This means that the less open the country is to trade, the *higher* will be the cost of a current account reversal, in terms of lower growth. These results are consistent with a number of open economy macroeconomic models, which postulate that the costs of foreign shocks—including the costs of current account reversals—are inversely proportional to the country's degree of openness. In the Mundell-Fleming type of models, for example, the *expenditure reducing* effort, for any given level of expenditure switching, is inversely proportional to the marginal propensity to import. Recently, Calvo, Izquierdo, and Talvi (2003) developed a model where sudden stops result in abrupt current account reversals and in major real exchange rate depreciations. Depreciations, in turn, are contractionary, with the extent of the contraction depending inversely on the degree of trade openness of the economy. They argue that sudden stops and current account reversals will have a greater impact in closed economies, such as Argentina, than in more open ones, such as Chile.

In order to investigate how the degree of capital mobility affects the cost of an external crisis characterized by a current account reversal, in equation (2) of table 2.13 I also included a variable that interacts the current account reversal with the capital mobility index. As may be seen, the estimated coefficient is negative and significant at the 10 percent level. According to these results the growth effects of a reversal are given by the following expression:

$$\text{Growth effect} = -3.93 + 0.02 \times \text{Trade openness} - 0.03 \times \text{Capital mobility.} \tag{6}$$

This means that, with other things given, the decline in GDP per capita growth will be more pronounced in a country with a higher degree of capital mobility that in one with a lower degree of capital mobility. Consider, for example, the case of two countries that have the same degree of trade

openness—say, 60 percent. Assume further that while one country has a low degree of capital mobility (an index of 25), the other country has a high degree of mobility (index of 90). According to equation (6) the country with low capital mobility will experience a decline in growth of 3.48 percent as a consequence of the reversal. The country with high mobility, on the other hand, will experience a decline in growth of 5.43 percent.

Finally, in equation (3) of table 2.13 I included a dollarization index in the treatment equation. As discussed earlier, the estimated coefficient is positive and significant, indicating that countries with a higher degree of dollarization have a higher probability of experiencing a reversal. Notice that in the outcome equation on GDP growth, equation (3), the reversal coefficient is still significantly negative. The coefficients of the two interactive variables (reversal and trade openness, and reversal and capital mobility) are not significant any longer. This, however, is likely to be the result of using a much smaller and restricted data set than in the two base equations.

To summarize, the results reported in this section indicate that current account reversals are costly, in the sense that they result in a (temporary) reduction in GDP per capita growth. Notice that this contrasts with results reported by Milesi-Ferretti and Razin (2000), who argued that "reversals . . . are not systematically associated with a growth slowdown" (p. 303). The results reported in this paper also indicate that it is the reversals that are costly; once reversals are introduced into the analysis, the coefficient of sudden stops is not significant in the growth dynamics equations. The regression results reported in table 2.13 also indicate that the degree of capital mobility does not have a significant effect on the probability of a country facing a crisis. However, these results indicate that once a reversal has taken place, countries with a higher degree of capital mobility will experience a deeper drop in growth.

Endogeneity and Robustness

The results presented in table 2.13 assume that capital mobility is exogenous to the current account. In particular, it is assumed that the restrictions on capital mobility don't change if the probability of a reversal becomes higher. This, however, need not be the case. Indeed, some authors have argued that as a country's external position worsens, policymakers will have the temptation to heighten restrictions on capital mobility, and in particular on capital outflows.[30] If this is indeed the case, estimates that ignore potential endogeneity will be biased.[31] In order to address this issue I estimated the equation on the probability of experiencing a current account reversal using an instrumental variables probit procedure based on Amemiya's GLS estimators with endogenous regressors. In the estimation

30. See, for example, Edwards (1989).

31. Notice, however, that the results in table 2.13 use the lagged value of the capital mobility index.

Table 2.14 **Determinants of current account reversals: Instrumental variables probit model**

Variable	Set one	Set two
Capital mobility (–1)	–0.004	–0.002
	(0.42)	(0.19)
Current account deficit to GDP (–1)	0.064	0.065
	(8.06)***	(8.33)***
Sudden stop	0.868	0.861
	(4.74)***	(4.79)***
Sudden stops in region	1.761	1.771
	(3.13)***	(3.25)***
Reserves to GDP (–1)	–2.935	–4.437
	(0.56)	(0.84)
Domestic credit growth (–1)	0.0001	0.0001
	(0.66)	(0.60)
External debt to GDP (–1)	0.001	0.001
	(1.10)	(0.93)
Short-term debt (–1)	0.002	0.004
	(0.39)	(0.84)
Debt services (–1)	–0.008	–0.007
	(1.46)	(1.29)
Initial GDP per capita	0.094	0.065
	(0.86)	(0.58)
No. of observations	1,071	1,071

Notes: Absolute values of *z*-statistics are reported in parentheses; (–1) denotes a one-period lagged variable; country-specific dummies are included but not reported. For a list of the instruments used, see the text.

***Significant at the 1 percent level.

I used two alternative sets of instruments. The first set includes change in the terms of trade (as a measure of external real shocks), the world rate of interest (as a measure of external financial shocks), and a measure of trade openness obtained as the fitted value from a gravity model of bilateral trade.[32] In the second set of instruments, I added the three-year lagged current account balance to the first set of instruments. The results obtained under both sets of instruments are very similar; they are presented in table 2.14. As may be seen, by and large, these instrumental variables probit estimates confirm the results presented in panel B of table 2.13 for the treatment regressions. The signs of all coefficients have been preserved. It is important to notice, however, that the coefficients of international reserves and external debt, which were significant in table 2.13, are not statistically significant at conventional levels in table 2.14. More important for the subject of this paper, the coefficient of the capital mobility index continues to

32. As Aizenman and Noy (2004) have shown, there is a strong empirical connection between trade openness and the degree of capital mobility. The use of gravity trade equations to generate instruments in panel estimation has been pioneered by Jeff Frankel. See, for example, Frankel and Cavallo (2004).

be negative and insignificant, indicating that the probability of a current account reversal is not different for countries with a high degree of capital mobility than for countries with a low degree of capital mobility.

In order to investigate further the robustness of the results reported in tables 2.12 and 2.13 I analyzed the potential role of outliers, and I considered somewhat different samples, as well as different specifications. These robustness checks indicate that, from a qualitative point of view, the results discussed above are not affected by the choice of sample, specification, or outliers. Further research, however, should focus on generating more detailed and comprehensive indexes of capital mobility.

2.6 Concluding Remarks

In this paper I have used a broad multicountry data set to analyze the relationship between restrictions to capital mobility and external crises. The analysis focuses on two manifestations of external crises that have received considerable attention during the last few years: sudden stops of capital inflows, and current account reversals. I have tried to deal with two important policy-related issues: first, does the extent of capital mobility affect countries' degree of vulnerability to external crises, and second, does the extent of capital mobility determine the depth of external crises—as measured by the decline in growth—once the crises occur?

In analyzing these issues I relied on two complementary approaches. First, I used a methodology based on the computation of nonparametric tests and frequency tables to analyze the incidence and main characteristics of both sudden stops and current account reversals in countries with different degrees of capital controls. Second, I used a regression-based analysis that estimates jointly the probability of having a crisis, and the cost of such a crisis, in terms of short-term declines in output growth. Overall, my results cast some doubts on the assertion that increased capital mobility has caused heightened macroeconomic vulnerabilities. I have found no systematic evidence suggesting that countries with higher capital mobility tend to have a higher incidence of crises, or tend to face a higher probability of having a crisis, than countries with lower mobility. My results do suggest, however, that once a crisis occurs, countries with higher capital mobility tend to face a higher cost in terms of growth decline.

Appendix

Description of the Data

Variable	Definition	Source
Index of capital mobility	Index: 0 (low mobility) to 100 (high mobility)	Author's construction based on indexes of capital restrictions computed by Quinn (2003) and Mody and Murshid (2002), and on country-specific data
Current account reversal	Reduction in the current account deficit of at least 4% of GDP in one year, when initial balance is indeed a deficit	Author's construction based on data of current account deficit (World Development Indicators)
Sudden stop	Reduction of net capital inflows of at least 5% of GDP in one year, when the country in question received an inflow of capital larger than its region's third quartile during the previous two years prior to the sudden stop.	Author's construction based on data of financial account (World Development Indicators)
Banking crisis	Dummy variable for occurrence of a banking crisis	Glick and Hutchinson (1999)
Dollarization	Index: 0 (low dollarization) to 30 (high dollarization)	Reinhart, Rogoff, and Savastano (2003)
Terms of trade	Change in terms of trade as capacity to import (constant local currency units)	World Development Indicators
Openness	Trade openness: exports plus imports over GDP	World Development Indicators
Reserves to GDP	Net international reserves over GDP	World Development Indicators
Domestic credit growth	Annual growth rate of domestic credit	World Development Indicators
External debt to GDP	Total external debt over GDP	World Development Indicators
Short-term debt	Short-term debt as percentage of total external debt	World Development Indicators
Debt services	Total debt services as percentage of exports of goods and services	World Development Indicators
GDP per capita	GDP per capita in US$ (1995)	World Development Indicators

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Comment

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This paper by Sebastian Edwards sheds light on one of the most heated policy questions in international macroeconomics: can capital controls help governments prevent crises? Although theory and introspection might provide an unambiguous positive answer to that question under laboratory

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conditions, the real world does not always conform to the tidy assumptions of our toy models. Thus, the question is ultimately an empirical one, and the author is to be congratulated for bringing a formidable range of applied tools and new data to construct an answer. And the answer, subject to various qualifications, would seem to be negative. Across countries and across time there appears to be very little correlation between the intensity of capital controls and crisis events. The only qualification offered is that, once a crisis is underway, there is a risk of a greater output loss during the crisis when capital is more internationally mobile, a result that seems quite plausible.

There is not much to quibble with here. This is a clearly written and well-executed paper. Its results fall in line with, and lend additional weight to, an emerging empirical literature that challenges the standard prescriptions. In these comments I will review the approach of the paper, offer a few constructive criticisms, and try to suggest directions for future research.

The paper starts with a nice motivation: a brief history of the (so-called) Washington Consensus, or at least of how it has been interpreted on the issue of capital mobility.[1] It is a familiar tale, and need not be recounted at great length. In the early 1990s, several emerging-market countries elected to liberalize their capital markets in line with the then conventional wisdom. Starting in 1997 in Asia, some of these countries experienced crises. Soon alternative views started to be heard. Some suggested that the liberalization had been premature and inappropriate, and even that it had been done under pressure from identifiable external sources, conspiratorially termed the "[IMF–] Wall Street–Treasury complex" (Bhagwati 1998; Wade and Veneroso 1998). In this drama, the villains are top IMF officials, Treasury brass, and major investment banks. These critics, plus other noted economists like Krugman (1998), Rodrik (1998), and Stiglitz (2002), questioned the wisdom of a policy of international capital mobility in emerging markets. The media perceived that the IMF was "chastened" (Blustein 2001). The seemingly inevitable post–Cold War advance toward an ever more economically integrated new world order suddenly faltered as antiglobalization sentiment pushed back. In defense of the still-prevailing consensus within the profession, other leading economists and financiers such as Fischer (2004), Rogoff (2003), Rubin (2003), and Summers (2000) have stepped up to give their accounts of events. Still, no agreement between the two sides seems near.

Edwards steers us away from the heat in this debate and urges that we look systematically for some light. To that end, some well-defined and testable propositions must be teased out from the rhetoric of policy briefs,

1. I say "so-called" because, in fairness to John Williamson (1990), the originator of that buzzword, his original policy recommendations were a broad and coherent package and their references to capital mobility very carefully nuanced.

op-eds, and "airport economics." The antiglobalization position, insofar as it pertains to capital mobility, is summed up by Edwards in two propositions: capital controls can (1) reduce the risk of crisis and (2) reduce the impact of a crisis by enabling countercyclical monetary policy.

In theory, the first claim follows because if controls were literally impermeable, then they would forcibly prevent capital flight. A crisis, as conventionally defined, would then be impossible. Again in theory, the second claim follows since capital controls undo the forces of interest arbitrage and allow domestic interest rates to be set independently of world conditions. By resolving the classic trilemma in favor of autonomy, countries with "fear of floating" can both manage their exchange rates (to limit price volatility and to prevent damaging balance-sheet effects in the financial system) and yet still pull the levers of monetary policy in an attempt to revive their economy.

In reality, of course, controls are leaky and require adept implementation. Leakage would obviously compromise the two claims. As for implementation, policymakers may incline toward making hay while the sun shines. Hence, controls tend to be lifted when incipient flows are inward, as this flow helps the economy to grow. But controls may not be implemented in time to prevent a crisis event when the tide starts to ebb. If they are imposed too late, they will fail to stop the crisis and are likely to end up generating the reverse correlation in the data (i.e., crises would end up being associated with the *presence* of controls, not their absence). Less naively, if the risk of capital controls being implemented is anticipated, this could induce a crisis too (or, alternatively, discourage the capital inflow in the first place).

These numerous qualifications suggest an empirical investigation is needed, and Edwards assembles a formidable data set to address the questions. Data requirements are a binary variable that indicates the occurrence of a crisis; a measure of the cost of the crisis, such as an output loss; and a measure of capital controls.

The crisis indicator takes two forms: "sudden stop" or "current account reversal." These are fine choices, but not the only ones available in the literature. The emphasis here is on the balance of payments in the aggregate, not on official reserves. So we have to be aware that the object of study is balance-of-payments crises, not currency crises or financial crises. In essence we are looking at a quantity measure of the worsening of the country's external financing position, and the trigger is some threshold for size or change in the current account. The reversal measure seems quite robust to different thresholds; I worry a little more about the way sudden stops are defined, particularly with respect to the size of flows in the country's region. It is not clear to me why a country cannot be said to suffer a sudden stop if its flows fall off rapidly from a maximum level *for that country,* even if that country's flows never get large enough to be above the third quartile

for the region. Perhaps the country has structural reasons (size? capital abundance? institutions?) that make it less of a target for flows on average, but it still might have a hard time if its inflows drop by 5 percentage points. That should also count as a sudden stop, I think. The one other sensitivity check worth investigating might be to allow for size-dependent heteroskedasticity in the current account, and apply some rescaling based on GDP. Simply put, a 5 percentage point change is far out in the tails of the current account/GDP distribution for a large country (e.g., the United States) but not quite as much for a tiny country with a more volatile ratio of trade balance to GDP.

Overall, these definitions seem adequate for the task at hand, and my only anxiety is that the two variables are inherently highly—but not perfectly—correlated with one another. This is not a problem if the analysis is just using two different measures for the same purpose as a robustness check. It might be a problem when we regress one variable on the other, as happens occasionally (table 2.12). If x is (almost) being regressed on x, the fit is likely to flatter, and we will have problems estimating the effects of other independent variables. I'd be happier if neither variable were used as an independent variable in this way, and both were just kept as variables to be explained.

The independent variable of most interest (as a cause of crises and their costs) is capital mobility, which is the most challenging variable to measure. As is well known, there are few sources for these measures, and researchers have tended to rely on one of a few sources. The IMF's own database is widely used, but it suffers from a simple binary definition of capital mobility. This has been joined of late by the pioneering work of Quinn (2003), who has constructed a more refined annual index of current and capital account restrictions, a project that has now reached back a century or more. Authors such as Chinn and Ito (2002), Klein and Olivei (1999), Mody and Murshid (2002), and Miniane (2004) have also added their own measures to the literature. As Edwards notes, this is a rapidly evolving area of research, and we will doubtless see even more indexes soon. Not to be outdone, Edwards constructs his own index of capital mobility using Quinn plus Mody and Murshid, plus other country-specific sources. Like other measures it has weaknesses, but with the benefit of an algorithm to impute missing data, it offers very wide coverage by year and by country. For analytical purposes, the index is used to classify the country-year observations into three subsets of equal size, referring to high, medium, and low capital mobility, respectively.

Estimating a crisis model is then a matter of using probit or other models to figure out the determinants of crisis events. Estimating the cost of a crisis is a more routine matter in terms of variable definitions—we just look at the growth rate of GDP—but the way to actually extract the postcrisis effects on growth benefits from the use of a treatment effects model to sort

out short-run and long-run growth effects and allow for a first-stage (probit) equation where the binary crisis event is predicted. This part of the paper should be a model for future researchers seeking to estimate these kinds of impacts.

The results presented (e.g., table 2.13) show that it is hard to find any evidence that restrictions on capital mobility lower the likelihood of a crisis event. However, conditional on a crisis event having occurred, restrictions on capital mobility do seem to limit the damage. As far as they go, the results are convincing. They are also consistent with other contemporary analyses showing an inverse correlation of various crises with capital controls (Glick and Hutchison 2005; Glick, Guo, and Hutchison 2004). I am particularly impressed by the rigor of the econometric analysis and the clarity with which it is presented. Let me simply offer a plea for more research, by Edwards or by others, to address some unresolved questions.

First, what about the type of controls? Can we obtain more indicators telling us what form controls actually take for each observation? We would like to know if these results hold up for controls on inflows versus controls on outflows. In light of the current fad for all things Chilean—wine, sea bass, capital controls, pension systems—it would be helpful to know if there is any sort of robust advantage to one type of control versus another. The same could be said for controls aimed at "hot" versus "cold" flows more generally; one might want to think about freeing FDI and long-term flows while limiting short-term bank flows (exactly the sorts of flows Fischer and others have highlighted as problematic in the Thai case, among others).

Second, what about temporary versus permanent controls? We might imagine that a regime committed to permanent controls would fare differently compared to a regime where policymakers are trying (succeeding? failing?) to time the application of controls to just stave off a crisis.

Third, what about contagion? Does the state of the global economy matter? Eichengreen and Leblang (2003) have found evidence of spillovers from international crises to the local economy. If you have controls, they can help insulate you from this type of event. Should some control for this type of channel be included in the regressions?

Finally, what about institutional quality? Recent work by Klein (2005) emphasizes that in an average period (including crisis and noncrisis) the effect of capital mobility is to raise the growth rate, but not in every developing country—only in emerging markets: countries that are poor enough to be considered capital scarce but that also maintain some minimum level of institutional quality (e.g., measured by corruption or rule of law). Could not a case be made that the incidence and impact of crises may also be affected by institutional quality?

It would be interesting to see institutional variables placed in the probit and growth regression models and interacted with capital mobility, be-

cause there are big questions to be answered. Do institutions matter? Do better institutions tame crises? Do they make capital mobility a safer bet? If so, this would be one more element in a newly forming consensus, a sort of Washington Consensus II.

In this view, policy reform without institutional reform is a dead end. This view is not universally embraced in the operational sphere—indeed, it would require the international financial institutions (IFIs) to try to make more objective, and more politically charged, distinctions between good and bad borrowers, something their governmental masters are probably loath to do. Yet these ideas might be seen as gaining some limited traction—for example, in the efforts by the World Bank under Wolfensohn to crack down on corrupt borrowers and better prioritize loans, or efforts by the IMF to increase transparency and exert (some) pressure on severe offenders like Zimbabwe.

We are beginning to recognize that opening up to the global capital market may have the potential to do either good or harm, depending on the circumstances. Recommending capital mobility for institutional basket cases is pointless, the argument goes: with their low productivity levels there isn't much to finance, and essentially there is no positive future growth path (Easterly 2001; Gourinchas and Jeanne 2003; Obstfeld and Taylor 2004). Moreover, countries with weak institutions may be more susceptible to crises (Acemoglu et al. 2003). According to this logic, when it comes to capital market liberalization, it is the emerging markets we need to focus on, countries that have taken the first step on the escalator of modern economic growth and now have improved growth prospects (and lower crisis risk) that justify the inflow of capital. If these arguments hold up, and we continue to find strong effects of institutions on growth and crises, the case for a more nuanced approach to capital mobility would be bolstered.

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