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Author

Ito, Hiro

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Is Financial Openness a Bad Thing?
An Analysis on the Correlation Between Financial Liberalization
and the Output Performance of Crisis-Hit Economies

by

Hiro Ito*
Portland State University

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* Hiro Ito, Department of Economics, Cramer Hall 241, 1721 SW Broadway, Portland State University, Portland, OR 97201. Tel/Fax: 503-725-3930/3945. Email: ito@pdx.edu.

Is Financial Openness a Bad Thing?
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Abstract

This paper investigates the link between capital account openness and the output cost associated with a currency crisis. Although the Malaysian experience during the Asian crisis of 1997-98 made many researchers and policy makers interested in the effectiveness of a policy restricting cross-border financial transactions to minimize the output cost, this association has not been exposed to a thorough empirical investigation. The probit analysis in this paper shows that the higher the level of financial openness is, the less likely countries are to experience a currency crisis among industrialized and less developed countries. It is found that a higher level of financial openness prior to a crisis helps to reduce output losses for industrialized countries, but not for less developed or emerging market countries. It is also shown that the duration of post-crisis output contraction can be shorter when an industrialized country has a high level of financial openness, but for the group of EMGs the duration of output contraction can be lengthened if a country has more open capital accounts. However, once the country encounters a currency crisis, the effect of capital account openness differs depending on the level of development. The post-crisis level of financial openness helps industrialized countries to reduce the magnitude of output losses while it increases post-crisis output losses for emerging market and less developed countries. A higher rate of financial liberalization is also found to be detrimental to less developed countries. When the dynamics of output gaps after a crisis are investigated, it is found that the negative effect of a higher level of capital account openness lasts for at least three years for emerging market countries. In general, I have found that institutional development such as corruption, law and order, and bureaucratic quality, rather than the level of openness in financial markets, is important in lowering the size of post-crisis output losses for the groups of less developed or emerging market countries. Only the group of IDCs appears to be able to reap the effect of capital account liberalization in terms of reducing the size of post-crisis output losses. Moreover, Mahathir's type of capital restriction policy immediately after the breakout of a crisis does not appear to be effective.

JEL Classification:

Keywords: Currency crisis, banking crisis, capital controls, financial liberalization

1. Introduction

Why do financial crises draw much attention from the public? Speculative attacks or turbulence in the foreign exchange markets make headlines in the news, but it is usually the consequence of the crises that interest people the most. More specifically, people tend to think that financial crises create negative impacts on the real economy, and that such economic turmoil can lead to political turmoil as witnessed in Indonesia during the Asian crisis of 1997-98. However, as Gupta, et al. (2000) and Angkinand and Ito (2004) show, it is not always the case that financial crises lead to output losses, but that financial crises can even lead an economy to experience an expansion. Regardless of what statistical analysis has found, the perception that financial crises lead to negative consequences on the real economy is quite prevalent.

While many researchers have attempted to theorize or empirically study what can contribute to the occurrence of a crisis, some have investigated the factors that can lead to crises with output losses (Bordo, et al. (2001), Glick and Hutchison (2001), Gupta, et al. (2000), Hutchison and Noy (2001, 2002a,b)). While macroeconomic or institutional factors have been investigated as possible contributors to the occurrence of a crisis or its output losses, capital controls have been also discussed as one of the main contributors (Glick and Hutchison (2001), Bordo, et al. (2001)). The discussion on the role of capital controls heightened especially during the Asian crisis. Krugman (1998) advocated implementing capital controls as an extraordinary policy for an extraordinary situation such as a financial crisis. In 1998, Malaysia's prime minister M. Mahathir tightened capital controls in an attempt to insulate his country from negative waves from the Asian crisis.

Although Mahathir's policy drew much attention from both academia and policy makers, the evaluations of his capital control policy are far from settled. Dornbusch (2001) argues that in retrospect, Malaysia's quick recovery from the crisis is not because of Mahathir's capital control policy, but because of relatively benign macroeconomic conditions prior to the crisis. Kaplan and Rodrik (2001), on the other hand, claim that Mahathir's capital controls policy was as effective as an IMF-supported stabilization program could be, and thus helped the country to recover quickly. Despite its controversy, interestingly, there is not much empirical literature investigating the link between capital account openness and the output performance of the crisis-afflicted economies. This link is the focus of this paper.

This paper will look into 141 currency crisis episodes for 62 countries (22 industrialized countries (IDC), 40 less developed countries (LDC), and 29 emerging market countries (EMG)) between 1975 and 2002, and examine the effect of capital account openness on the output losses of the crisis-afflicted countries.¹ The lack of empirical analysis on the link between financial openness and output losses associated with crises can be partly explained by the lack of measures on the extent and intensity of capital controls. To overcome this issue, I use the index on the openness regarding capital account transactions from Chinn and Ito (2002). The merit of this index is that it can refer to the intensity of capital controls, which has been always an issue when empirical analysis is conducted on the role of capital controls. As for the measures on the output losses associated with crises, I use the methodology from Angkinand and Ito (2004) and investigate the association of the post-crisis output loss with the level of capital account openness as well as its rate of change (i.e., financial liberalization).

I find that a higher level of financial openness reduces the likelihood of a currency crisis for industrialized countries and less developed countries, but not for emerging market countries. Also, having a higher level of financial openness prior to a currency crisis will help industrialized countries to experience smaller post-crisis output losses as well as a shorter duration of such losses. These positive effects of open capital accounts are not found in less developed countries. For emerging market countries, on the other hand, a higher level of financial openness prior to a crisis appears to make the duration of post-crisis output contraction longer.

The analysis on how the post-crisis level of financial openness, controlled for by post-crisis macroeconomic conditions, affects post-crisis output losses is interesting. That is, while a higher post-crisis level of financial openness helps to lower the magnitude of post-crisis output losses for industrialized countries, it appears to increase the size of output losses for developing and emerging market countries. For the group of emerging market countries, it is found that the negative effect of a higher level of financial openness lasts as long as three years after the crisis. Also, I find that Mahathir's method of restricting capital flows immediately after the breakout of a crisis does not have any effect on the post-crisis output performance. In short, the level of openness in capital accounts prior to a currency

¹ The LDC group also includes EMG countries. The definition of EMG is based on Glick and Hutchison (2001).

crisis only matters for industrialized countries, but once a crisis occurs, further financial liberalization may worsen the post-crisis output contraction for less developed and emerging market countries. Furthermore, the effect of the post-crisis level of financial openness on post-crisis output performance seems to be independent of institutional developments, such as corruption level, law and order, and bureaucratic quality.

The paper proceeds as follows. Section 2 reviews the theoretical links between capital account openness, currency crises, and output losses. Section 3 discusses the issues regarding the data and measurement of important variables. In Section 4, non-parametric analysis on the link is conducted, followed by empirical analysis in Section 5. The concluding remarks are given in Section 6.

2. Theoretical Links

To put the issue of the link between financial openness and the output losses of the crisis-hit countries in a broader context, let us look at the interactions of three phenomena: financial openness (or liberalization), currency crisis, and post-crisis output losses. Figure 1 may help in organizing the following discussion.

First of all, on the link between capital account openness (or liberalization) and currency crises (see link (a) in Figure 1), both theoretical prediction and empirical findings present a mixed picture. A higher level of capital account openness (or a lower level of capital controls) may lead to a lower likelihood of currency crises because it allows countries to correct microeconomic distortions (including the distortions in financial markets caused by financial repression) and reduce the cost of capital (i.e., improve productivity of investment).² Also, Bertolini and Drazen (1997a,b) argue that countries maintaining or imposing a high level of capital controls are inclined to implement risky or inconsistent macroeconomic policies, and therefore these countries can be exposed to currency attacks by the investors who downgrade their confidence level in the countries' policy management. In this view, financial liberalization may reduce the likelihood of currency crises. An alternative view is that financial liberalization will cause financial

² For empirical evidences for capital account openness reducing the likelihood of currency crises, see Glick and Hutchison (2004) and Glick, Guo, and Hutchison (2004). Also, for the link between the productivity of investment and financial openness, refer to Wurgler (2000).

instability through more volatile flows of capital across borders (Aizenman, 2002), thereby increasing the likelihood of currency crises.

It is widely believed that financial liberalization may lead to currency crises through disturbing financial markets. Demirgüç-Kunt and Detragiache (1998) find that countries with liberalized financial systems are more exposed to financial instability and therefore prone to experience banking crises (link (b)). This negative association can be worsened by moral hazard; if the government shows its readiness to rescue failing financial institutions or implement some macroeconomic policies to prevent a systematic crisis, financial institutions tend to make risky investments, which can eventually lead to banking crises. Given the findings of Kaminsky and Reinhart (1999) and Glick and Hutchison (2001) that banking crises can be a leading indicator of a currency crisis, a currency crisis may occur as a result of financial liberalization, but indirectly through a banking crisis (links (b) and (c)).

As noted above, even if a currency crisis occurs, it is not always the case that a currency crisis involves output losses in its aftermath. The theoretical link between currency crises and post-crisis output performance is ambiguous (link (d)). This ambiguity is related to the level of financial openness or financial liberalization efforts (link (e)).

One view about the link between currency crises and post-crisis output performance is that, given nominal rigidities, a sharp nominal depreciation caused by a currency crisis can produce a real depreciation, at least, in the short-run, thereby improving the terms of trade of the crisis-hit country and thus letting the country increase exports, employment, and output. In this view, a crisis-hit country may experience a short-run output expansion by “exporting unemployment” to other countries. An alternative view is that a currency crisis may reduce the real value of wealth (again with the help of nominal rigidities) as well as raise production costs, leading the economy to experience a post-crisis output contraction. In this view, a currency crisis can also negatively affect output through financial markets (e.g., reductions in collateral values and currency mismatches in the balance sheets). Currency crises can also cause a sudden cessation in capital flows or capital flight, which may lessen the rate of capital formation in the crisis-hit economy.

This ambiguous link between currency crises and post-crisis output performance can also be affected by the level of financial openness. On the positive side, financial openness may facilitate reallocation of capital within and across countries and help agents smooth

their consumption and production, thus dampening the distortion caused by the currency crisis. As a negative possibility, financial openness may amplify the disturbances caused by a crisis through freer cross-border capital movement and increased volatility in financial markets, eventually affecting the real side of the economy through constraining liquidity. Sometimes policy makers attempt to restrict capital movement to stop the volatility as we saw in Mahathir's efforts during the Asian crisis. However, as we have discussed, whether such a policy helps the country to avoid or minimize output losses incurred by the crisis is unknown.

Thus, financial openness can affect the likelihood of a currency crisis (link (a)), a banking crisis (link (b)), or the likelihood of a crisis leading to post-crisis output contraction (link (e)). But, as we have seen, the effect of financial openness is ambiguous in general. To summarize this issue, we can discuss the effect of financial openness by referring to the first-best, second-best policy argument. That is, if financial opening is analogous to trade opening, financial liberalization can help agents smooth intertemporal consumption and production. If restricted intertemporal or cross-national financial trade is the only distortion in the economy, removing restrictions on cross-border financial transactions may lead the economy closer to an optimal state (the first-best policy condition). In this scenario, more efficient allocation of capital and smoother paths of consumption and production are achieved by financial liberalization, helping to reduce the likelihood of a currency crisis (link (a)) or a banking crisis (link (b)), and the likelihood of a crisis leading to post-crisis output contraction (link (e)). Conversely, if other parts of an economy also involve some sort of market distortions, then removing capital controls *without* fixing the other distortions will bring about negative consequences on the economy (the second-best policy condition). In this case, the negative aspect of volatile capital movement outweighs the positive aspect of capital reallocation, seriously disturbing the financial markets. In this view, a lower level of financial openness, or even capital restriction policy such as the one in Malaysia, may stop the instability in the financial markets and give policy makers time to implement consistent macroeconomic policy (Krugman, 1998), both of which may help prevent the crisis country from experiencing output losses.³

³ Another argument about the effectiveness of financial liberalization is that restricting cross-border capital flows may allow an economy to have an independent monetary policy because the effect of interest rate

Given these theoretical ambiguities, it is worthwhile investigating the link between financial openness and output losses associated with a currency crisis. For the investigation, I will keep the following in mind. First, during the investigation, it is important to be aware the link by which financial openness (or liberalization) affects the post-crisis output performance. In Figure 1, we have seen that the level of financial openness or the efforts of financial liberalization can affect different stages of causality links among the three phenomena. Depending upon the link, the effect of financial openness or liberalization on post-crisis output losses may vary.

The other point I keep in mind is that the effect of financial openness (or liberalization) may not be detected unless “third factor” conditions of the economy are controlled for. In other words, the effect of financial openness may depend upon the kind and magnitude of distortions that exist in the economy. The effect of cross-border financial liberalization can interact with the level of development, efficiency, and/or freeness in the domestic financial markets. Besides the domestic financial market issues, the level of development in governance and/or political stability can also affect the effectiveness of financial openness.

Keeping these theoretical arguments in mind, I will examine the effect of financial openness and financial liberalization on the output performance of crises countries.

3. Data and Measurement Issues

This section describes the key variables that will be used in the empirical tests. They are the exchange rate market pressure (EMP) index, measures of post-crisis output losses, and capital controls.

3.1 Definition of the Currency Crisis – EMP index

In this paper, identification of currency crises relies on the exchange rate market pressure (EMP) index that is conventionally used in the crisis literature (i.e., Kaminsky and

policy does not get easily washed out by free mobility of capital across countries. However, this issue is not discussed in this paper.

Reinhart, (1999)). The EMP index is defined as a weighted average of monthly nominal exchange rate changes, monthly (percent) international reserve losses, and monthly change in the nominal interest rate. The weights are inversely related to the pooled variance of changes in each component over the sample countries, and adjustment is made for the countries that experienced hyperinflation following Kaminsky and Reinhart. When the EMP index exceeds a certain threshold level, a currency crisis is identified. This study includes nominal interest rate changes as a component of the index to account for countries such as Hong Kong which in 1997 dealt with speculative attacks through changes in the nominal interest rate (See Nitithanprapas, et al. for the importance of including nominal interest rate changes in the index calculation).⁴

As in Hutchison and Noy (2002a), the threshold point for a “standard” crisis is the mean plus two times the EMP index’s standard deviation, and the major crisis threshold point is three times the EMP’s standard deviation. As will be discussed in a later section, in this study’s sample of 62 countries in the period between 1975 and 2002, there are 141 standard crises and 77 major crises. Not all the currency crises entail output losses or recession in their aftermath. However, before turning to this issue, the definition of post-crisis output losses or recession must be discussed.

3.2 Magnitude of Post-Crisis Output Losses⁵

In the literature on the output losses in the aftermath of a crisis, it is both crucial and controversial to define how to measure output losses associated with crises. While many studies such as IMF (1998), Bordo, et al. (2001), Glick and Hutchison (2001), and Hutchison and Noy (2001, 2002a,b) measure output losses that accompany currency crises in terms of GDP growth rates, Mulder and Rocha (2000) use the absolute values lost in the recession that accompanies the crisis. While the former method aggregates the gaps between the trend rate of GDP growth and the actual rate, the latter computes the trend of GDP level and defines the output losses as the downward deviation of actual output from its trend level. In each method there is a wide variety in terms of how to compute the (growth or level) trend.

⁴ Angkinand and Ito (2004) discuss how different crisis identification can depend on whether or not the EMP index includes nominal interest rate changes in addition to the other index components; how the variances of each component are calculated as the weights; and how the threshold level is determined.

⁵ This section is based upon Angkinand and Ito (2004).

In the growth-based measuring method, the trend growth rate is calculated as the average growth rate for five or three years preceding the crisis. In the absolute value method, the Hodrick-Prescott filter (HP filter) is often used to compute the trend of GDP level. In both methods, recovery is defined to occur when the actual level or growth rate of GDP returns to the trend.

Mulder and Rocha (2000) argue that the growth rate approach in measuring output losses overstates the output losses because pre-crisis growth rates tend to be substantially high (especially if a country experiences a boom before the crisis), thus making output losses inevitably high. They also point out that the return of actual growth rates to the trend growth may not mean the actual level of GDP returns to the trend in level. This means that the growth rate method may inappropriately truncate a recession and make it seem that a depressed economy is experiencing a recovery while its actual GDP level is still lower than the trend.

Alternatively, Mulder and Rocha compute the trend in GDP level using the HP-filter up to the crisis year and project the trend after the crisis by using the average growth rate of a HP-filtered trend for three years preceding the crisis.^{6,7} With this method, they argue that the post-crisis recession will not be truncated. Post-crisis losses will appear realistically high unlike the output losses calculated using the growth rate method or a method that computes the trend by applying the HP-filter for the entire time series of GDP.

Angkinand and Ito (2004) argue that Mulder and Rocha's method inflates the post-crisis output losses, especially for the economies that experience a high growth in the GDP trend before a crisis.⁸ In fact, in the GDP trend data calculated using Mulder and Rocha's method, some economies appear to have an explosion in the trend, which overstates

⁶ They claim that applying the HP-filter for the entire sample to compute the trend is not appropriate because, especially when the HP-filter is applied to an economy that is experiencing a long recession (such as Japan in the 1990s), the GDP trend will entail a downward bias due to the long underperformance of the economy. Especially in a crisis study, the HP-filtered trend tends to make the economy look like it experienced an economic boom before a crisis. Kuttner and Posen (2003) present an interesting analysis on how different the Japanese potential output level can appear depending on the detrending technique.

⁷ Using this type of trend, they lump together the output gaps in the post-crisis period and apply a discount rate of four percent to calculate the present value of the output losses.

⁸ Especially when the HP-filter is applied only to the data up to a crisis, the growth rate of the trend can necessarily appear inflated because it does not incorporate a possible downturn of the actual GDP after the crisis. Ironically, their method involves the same problem of inflated GDP trend as in the growth rate method when the concerned economy is experiencing a boom before the crisis.

post-crisis output losses.⁹ Angkinand and Ito, instead, suggest a method in which the output trend is calculated by applying the HP-filter up to the crisis period (t) and updating the GDP trend by applying the HP-filter to newly available data in each period (quarter in their study) after the crisis period. This method prevents the trend earlier in the series from being affected by the actual GDP series in the future. As such, this updating method is akin to the idea of real time trend estimation. (Angkinand and Ito call this methodology the “rolling-HP method.”) Hence, with this method, the output gap before the crisis period (t) is not unnecessarily inflated (i.e., the “pre-crisis boom” appears to be smaller), and the post-crisis recession will not be deflated even if the concerned economy continues to be depressed for a longer time period after the crisis.¹⁰

The post-crisis output loss is computed by aggregating the output gaps based on the rolling-HP method for the period of the recession in the aftermath of a crisis. The “recession” associated with the crisis is defined as follows: In the original quarterly GDP data, if actual GDP is below the trend for *at least two consecutive quarters within four quarters after the quarter when the crisis occurs* (based on the EMP index), a post-crisis recession is assumed to have started. Recovery, the end of the post-crisis recession, is assumed to occur when the actual GDP level is above the trend for *at least two consecutive quarters*. Thus, the duration of the post-crisis recession refers to the number of quarters when the recession in this definition is in place, and the aggregate output loss is the sum of the output gaps during this post-crisis recession.¹¹ This method differs from other methods which merely aggregate both positive and negative output gaps without a specific definition of the post-crisis recession. As Angkinand and Ito show, this methodology yields more conservative output losses than Mulder and Rocha’s calculation, but the magnitude will still be greater than what can be estimated by using the simple HP filtering method.

One last note must be made about this calculation method. While this methodology refers to the output losses during a recession that may arise in the *aftermath* of the crisis, it is also true that countries fall into a currency crisis after some period of recession. In that sense, the magnitude of output losses based on this rolling-HP method may entail a

⁹ Mulder et al. try to alleviate this problem by truncating output losses if the economy experiences another crisis before the actual GDP returns to the trend. However, this adjustment still does not appear to correct the upward bias of post-crisis output losses.

¹⁰ That is because the GDP trend will not be pulled down by the future, unrealized economic slump.

¹¹ Following Mulder and Rocha, I also apply a discount rate of four percent to the post-crisis output gaps so as to calculate the present value of output losses.

downward bias because it does not account for the recession period prior to a crisis. However, because incorporating pre-crisis recession will make the computation unnecessarily intricate and also make the definition of a recession and its association with a crisis arbitrary, the output losses in this study refer only to those in a recession *after* a currency crisis. Hence, although I often use the phrase “post-crisis recession,” or the output losses *associated with* a crisis, these phrases do not have any implication about causality from currency crises to the post-crisis recession or its output losses.

3.3 Capital Account (Financial) Openness

As is documented in Chinn and Ito (2002), Eichengreen (2002), and Edison et al. (2002), it is extremely difficult to measure the extent of openness in capital account transactions. Although many measures exist to describe the extent and intensity of capital account controls, there is a general impression that most such measures fail to capture the complexity of real-world capital controls.¹² This view prevails because implementation of regulatory limitations on capital flows have multidimensional characteristics; capital restrictions can differ depending upon the intension of policy makers and the prevailing economic conditions.

Generally speaking, the complexity of measuring capital controls can be summarized in the following points. First, conventional ways of quantifying capital controls (or openness) fail to account for the intensity of capital controls. Many analyses of the effects of capital controls or their determinants rely upon binary variables based upon the IMF’s categorical enumeration reported in *Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER)*.¹³ However, these IMF-based variables can only address the existence of capital controls, but not their extensity or intensity.

¹² See Edison and Warnock (2001), Edwards (2001), and Edison et al. (2002) for discussions and comparisons of various measures on capital restrictions. Dooley (1996) provides an extensive literature review and Neely (1999) presents a descriptive overview on capital controls.

¹³ There are binary variables created based on a set of “on-off” clarification, which includes an indicator variable for the existence of multiple exchange rates (k_1); restrictions on current account (k_2); capital account transactions (k_3); and a variable indicating the requirement of the surrender of export proceeds (k_4). k_3 is the one often used for capital controls.

Second, IMF-based variables are too aggregated to depict the intricacy of actual capital controls. Capital controls can differ depending on the direction of capital flows (i.e., inflows or outflows) as well as the type of financial transactions targeted.¹⁴

Thirdly, it is almost impossible to distinguish between *de jure* and *de facto* controls on capital transactions. Capital control policies are often implemented without explicit policy goals to control the volume and/or type of capital flows. Conversely, as Edwards (1999) discusses, it is often the case that the private sector circumvents capital account restrictions, nullifying the expected effect of regulatory capital controls. Therefore, researchers often refer to financial integration among countries and interpret it as *de facto* restrictions on (or freeness of) capital transactions (See De Gregorio (1998) and Rajan (2003)).

Given the above issues involved with capital account openness measures, I use the capital account openness index, *KAOPEN*, from Chinn and Ito (2002). This Chinn-Ito index is the first principle component composed of the four IMF binary variables. One of the merits of the *KAOPEN* index is that it refers to the intensity of capital controls because it incorporates other types of restrictions such as current account restrictions, not just capital account controls. Also, this index covers many countries (more than 100 countries) for a long time period (1970 through 2000). For the sake of brevity, the index is normalized to have ten as its maximal value with a minimal value of zero. Appendix 1 explains how *KAOPEN* is constructed.

3.4 Macroeconomic and Other Data

All of the macroeconomic data are taken from either IMF's International Financial Statistics (IFS) CD-ROM or World Bank's World Development Indicator (WDI). The definition of each variable is discussed in later sections when necessary. Annual observations of GDP (both level and trend) and the EMP index are constructed from quarterly and monthly data, respectively.

¹⁴ Johnson and Tamirisa (1998) investigated the empirical determinants of capital controls and used the recently created disaggregate components of capital controls publicized in the *AREAER*. However, the time series of the variables are not sufficiently long.

4. Non-parametric Approach: Before and After Analysis

4.1 Output Losses Before and After the Crises

Table 1 reports the summary statistics for aggregate output losses of the countries that experienced currency crises between 1975 and 2002. The table shows that about 50 to 60% of standard crises involve output losses in both the entire and sub- samples, whereas a higher ratio (about upper 60 to 70%) of major crises involve output losses. This is consistent with the findings of Aziz et al. (2000) and Gupta, et al. (2000), both of whom document that about 40% of currency crises do not have a contractionary effect on output. Among 79 standard crisis episodes, the average magnitude of output losses in the entire sample is 6.2%, while that for the IDC group is significantly smaller (3.2%) than both LDC and EMG groups (8.3%). Interestingly, the magnitude of output losses does not significantly differ between standard and major crises. The table also shows that Latin American countries have a high likelihood of output contraction when they have a major currency crisis. Asian countries, on the other hand, have larger output losses (9%) when they experience a major crisis.¹⁵

Table 2 reports the duration of the post-crisis recession based on the definition discussed above. On average, a recession in the aftermath of a crisis seems to last for about two years, which is consistent with the findings in other studies (Hutchison and Noy, 2001, 2002a). LDCs tend to experience a longer output contraction than emerging market countries while IDCs tend to experience a short period of recession. The duration of the output losses also does not appear to differ between standard and major crises except for the IDC group which has a shorter period of output contraction in the case of major crises. Latin American countries appear to have a longer period of output contraction compared to other subgroups, while Asian countries tend to have a short period of post-crisis recession and their standard deviation is considerably smaller than other subgroups.

Figure 2 compares the average output gap among the subgroups before and after the crisis.¹⁶ The vertical line indicates the crisis period ($t = 0$). As is shown in Table 2, the

¹⁵ The subgroup “Asia” does not include Japan.

¹⁶ This graph illustrates the *average* of the output gaps of the countries that experienced currency crises including those which do not entail any output contraction.

relatively small size of output losses among IDCs can be explained by the tendency for IDCs to experience output *expansion* in the aftermath of the crises. The EMG group tends to experience slightly deeper output gaps compared to LDCs.

Table 3 reports the magnitude and duration of post-crisis output losses by decade. During the 1970s, the size of post-crisis output losses was small in both standard and major crises. In the 1980s, not only did the number of crises increase, but both the magnitude and duration of post-crisis output losses increased as well. Especially for LDC and EMG groups, the change is substantial and the post-crisis output losses are above 10% for both standard and major crises. Since the 1990s, the size and duration of output contraction decreased, but the likelihood of currency crises entailing output losses increased especially for major crises. For the last five years of the sample period, the size of output losses appears to have increased. Given both the likelihood of currency crises entailing output contraction and the size of output losses increased in recent years, the perception that currency crises “cause” output contraction is not surprising.

4.2 Financial Openness Before and After the Crises

The development of financial openness and financial liberalization is summarized in Table 4. Naturally, IDCs have achieved the highest level of financial openness and the most rapid financial liberalization among the subgroups. The regional subgroup of Asian countries appear to have a significantly higher level of financial openness compared to other EMG countries while Latin American countries’ financial openness is about the same as the average of EMG. Countries seem to have had a slow process of financial liberalization during the 1970s. During the 1980s, while IDCs rapidly liberalized their capital accounts, LDCs and EMG countries, on average, restricted their capital accounts (i.e., negative financial liberalization figures for both subsamples during the 1980s). Latin American countries appear to have restricted capital accounts considerably during this decade while Asian countries continued liberalizing, thus expanding the difference between the two groups. The 1990s appear to be the decade of financial liberalization. However, it is also shown that the rapid financial liberalization is concentrated in the first half of the decade. All subsamples appear to experience a slow down in financial liberalization efforts in the second half of the 1990s. This may be related to the outbreak of the crises in East

Asia and Latin America during this time period.

The relationship between the degree of capital account openness and aggregate output losses among crisis-afflicted countries is examined in Figure 3, which shows the development of the level of financial openness among subsample groups before and after the crisis period ($t = 0$). The figure shows that industrialized countries have a financial liberalization trend regardless of the crisis. Less developed countries and emerging market countries appear to have restricted financial openness during the crisis year and gradually liberalized in the aftermath of the crisis. With this figure, we are not sure whether financial restriction caused the crisis; policy makers tried to restrict capital flows in reaction to a rise in the EMP index to prevent a possible capital flight; or they immediately restricted capital flows at the outbreak of a currency crisis. However, given that the EMP index often rises and remains at a high level well before the crisis period, and that a policy making process for restricting capital flows usually involves a time lag before its implementation, it is more reasonable to think that policy makers tried to prevent capital flight and restricted capital flows, which eventually precipitated an occurrence of a crisis.

Figures 5-1 through 5-3 compare the development of financial openness before and after the crisis between the average of a subsample and that of those countries in the subsample that experienced post-crisis output contraction. According Figure 5-1, the IDCs that experienced post-crisis output contraction appear to have a lower level of financial openness throughout the window of periods than the average of the IDC subsample. The opposite is true for the LDC and EMG groups; for both groups, the level of financial openness is higher for the countries with post-crisis output contraction than the subsample average. These graphical findings suggest that the level of financial openness may affect the post-crisis output performance differently depending on the level of development. Also, in both LDC and EMG groups, it appears that the countries with post-crisis output contraction appear to have restricted financial openness radically before the crisis and rapidly liberalized after the crisis. This finding indicates that a rapid decline in financial openness, i.e., a rapid financial restriction policy, may be detrimental to output performance for developing and emerging market countries, where once a crisis occurs, the countries may try to deal with output contraction through financial liberalization.

5. Empirical Analyses

5.1 Probit Analysis: the Link Between the Occurrence of Currency Crises and Financial Openness/Liberalization

Before examining the link between post-crisis output losses and financial openness, let us investigate whether the level of or change in financial openness (financial liberalization) can lead to a currency crisis (link (a) in Figure 1). I do this by using a multivariate probit model. Kaminsky and Reinhart (1999), Kaminsky et al. (1998), Glick and Hutchison (2001), and Kaminsky (2003) have used probit models and investigated what are the factors that contribute to the occurrence of currency crises. Here, I would like to focus on how and if at all the level of financial openness or its change contributes to the likelihood of currency crises.

The binary dependent variable, y_t , takes a value of unity when a country at a particular time is experiencing an onset of a currency crisis, and zero, otherwise. The probability that a crisis will occur, $\Pr(y_t = 1)$, is hypothesized to be a function of financial openness, $KAOPEN$, or financial liberalization, $FINLIB (= KAOPEN_t - KAOPEN_{t-1})$, along with a vector of economic conditions and macroeconomic policies at time t , X_t , and the parameter vector, β . The model specification is given as:

$$\ln L = \sum_{i=1}^n [y_i \ln F(\alpha' Z_{t-1} + \beta' X_t) + (1 - y_i) \ln(1 - F(\alpha' Z_{t-1} + \beta' X_t))]$$

where n indicates the number of countries times the number of observations for each country, and Z refers to either financial openness ($KAOPEN$) or financial liberalization ($FINLIB$). The characteristics vector, X_t , contains the control variables that are often used in other studies, namely, real GDP per capita, current account as a ratio to GDP, government budget balance (as a ratio to GDP), real exchange rate overvaluation, real money growth, the banking crisis dummy, and regional dummies to account for possible contagion effects.^{17,18} In order to avoid the simultaneity problem, except for GDP per capita,

¹⁷ Real exchange rate overvaluation is defined as deviations from a fitted trend in the real trade-weighted exchange rate, which is the trade-weighted sum of the bilateral real exchange rates against the U.S. dollar, the

KAOPEN (FINLIB) is lagged one year, and the variables for economic conditions and macroeconomic policy are included as the average of the previous two years (specified as the “ $(t-2/t-1)$ ” in the regression results table). Following Glick and Hutchison (2001), the observations within two years following the onset of a currency crisis are eliminated from the dataset. The banking crisis dummy assigns a value of unity for the observations two years before and after the banking crises. The banking crises dates are obtained from Honohan and Klingebiel (2003) and updated using Caprio and Klingebiel (2003).

Regression results are given in Table 5. The first four columns contain results from the regression with financial openness ($Z=KAOPEN$). The significantly negative coefficient for *KAOPEN* in the full sample results indicates that, on average, the higher the level of financial openness is, the less likely it is for a country to fall into a currency crisis. This seems to be true for the subsamples of IDCs and LDCs, a finding consistent with the findings of Glick and Hutchison (2000) and Bordo, et al. (2001).¹⁹ Furthermore, the coefficient for the banking crisis dummy for the full sample and LDC and EMG subsamples is found to be significantly positive, which is also consistent with the finding of Glick and Hutchison (2001), and indicates twin crises can occur for LDC and EMG groups. While the coefficient for the real exchange rate overvaluation appears to be significant, those for current accounts and budget balance do not, contrary to theoretical predictions.

Bordo et al. (2001) argue that while a higher level of capital restrictions reduces the likelihood of currency crises, as in Table 5, it increases the likelihood of banking crises. Their argument is that capital controls may allow policy makers to implement risky or inconsistent macroeconomic policies which may eventually lead to speculative attacks, whereas open financial markets may allow private agents to be exposed to risky projects outside the countries, thus increasing the likelihood of banking crises. To test this

German mark, and the Japanese yen. The trade weights are based on the average bilateral trade with the United States, the European Union, and Japan in 1980, 1990, and 2000.

¹⁸ Other variables dropped from the regression specification due to the insignificance of the estimated coefficients include trade openness (total trade volume (= sum of imports and exports) divided by nominal GDP) as of the crisis year; the growth rates of G3 countries weighted by bilateral trade volumes; and real GDP growth, both of which are the average in two years preceding the crisis ($t-2/t-1$).

¹⁹ It is often pointed out that this sort of investigation on the link between capital account openness (liberalization) and the occurrence of a currency crisis involves “self-selection” bias, i.e., the data for financial openness are more available for the countries with developed institutions and regulatory systems which may make them less likely to experience a crisis. Glick, Guo, and Hutchison (2004) show that even if corrections are made for sample selection bias, countries with liberalized capital accounts experience a lower likelihood of currency crises.

hypothesis, the same exercise is repeated for the model with the banking crisis dummy as the dependent variable along with the same control variables, except for the currency crisis dummy being included to control for twin crises. However, it is found that the level of financial openness does not affect the likelihood of banking crises (results not reported).

The results in the last four columns show the results from the regression analysis with the financial liberalization variable, *FINLIB*, included as the main explanatory variable. Financial liberalization does not significantly affect the probability of a currency crisis for both full and sub- samples, though the estimated coefficients are negative for all groups, implying that the rate of financial liberalization does not affect the likelihood of currency crises.²⁰

In sum, we have found that having a higher level of capital account openness contributes to lowering the probability of an IDC or LDC country experiencing a currency crisis (link (a)) while such openness does not affect the likelihood of banking crisis (link (b)). Also, the rate of financial liberalization does not affect the likelihood of currency crises.

5.2 Does the Level of Financial Openness Affect the Size of Output Losses?

In this section, I examine whether and how the level of financial openness or financial liberalization affects the magnitude of post-crisis output losses. To see this association, the Tobit regression model will be employed. Because not all currency crises lead to output contraction as we saw, the data series for continuous output losses can be considered as a truncated distribution by assigning a value of zero for the crises whose occurrence is not accompanied with post-crisis output contraction. As such, the Tobit estimation method is appropriate because this specification has a flavor of the limited dependent model to account for whether or not a crisis involves post-crisis output losses while also maintaining (partially) continuous observations as the dependent variable.²¹

²⁰ The same exercise was repeated using the average rate of financial liberalization for the previous two years (*FINLIB*_{(t-1)t-2}) instead of *FINLIB*_(t-1), but the results (not reported here) do not change qualitatively.

²¹ As long as there is a possibility that a currency crisis does not entail post-crisis output losses, the estimates from an OLS model would not be consistent. Conversely, the higher the likelihood of currency crises entailing post-crisis output contraction is, the closer the estimates from an OLS model to those from the Tobit model.

The model can be specified as:

$$(1) \quad y^*_{i,t} = \gamma Z_{t-1} + \sigma X_{i,t} + \varepsilon_{i,t}.$$

The main explanatory variable, Z , again refers to either financial openness (*KAOPEN*) or financial liberalization (*FINLIB*) while X is the characteristic vector. The dependent variable, y^* , is the observed magnitude of output losses in the aftermath of crisis i in year t . Since y^* takes a value of zero when a crisis does not entail any post-crisis economic contraction, y^* is the latent dependent variable, and the regressand, y , can be specified as:

$$y = y^* \quad \text{if} \quad y^*_{i,t} > 0$$

$$y = 0 \quad \text{if} \quad y^*_{i,t} \leq 0.$$

With this model, I will examine the link between financial openness (or liberalization) and output losses using the following two approaches. First, I will look into how the level of financial openness prior to the crisis affects post-crisis output losses. Many studies use pre-crisis macroeconomic conditions to examine the likelihood of currency crises or the effect of crises on output losses. In this regard, this methodology presents an orthodox approach. Using these pre-crisis conditions including the level of financial openness, I will also examine how the duration of economic contraction can be affected by these variables.

The second approach looks into whether and how the *post*-crisis level of financial openness and economic conditions affect the size of output losses. Park and Lee (2002) investigate how policy efforts affect output losses in the aftermath of a crisis in the case of the Asian crisis. The second approach shares the same intent and puts the main focus on how the post-crisis level of financial openness or financial liberalization affects the output performance once a currency crisis occurs. In the past currency crises, we have seen that policy makers try to minimize the effect of a crisis on the real economy. Especially regarding financial openness or financial liberalization efforts, as we have discussed, the Malaysian experience at the wake of the Asian crisis in 1998 raised debates over whether a policy restricting capital flows, once a crisis occurs, can prevent the currency crisis from affecting other parts of the economy.

5.2.1. *The Effects of Pre-crisis Level of Financial Openness along with Pre-crisis Macroeconomic Conditions on the Output Losses*

The first Tobit regression focuses on how the pre-crisis policy conditions, including the level of financial openness or the rate of financial liberalization, affect post-crisis output losses. In the regression specification, a k -element vector of control variables, X , includes current account as a ratio to GDP, the budget balance as a ratio to GDP, real exchange rate overvaluation, and real money growth, all of which enter as the two-year average *prior to* the crisis year. Real GDP per capita at the time of the crisis (t) is included in X to account for the level of development as of the break out of a crisis, and a dummy variable for banking crises is used to see the effects of twin crises.^{22,23}

The regression results are reported in Table 6. In the full sample, while a pre-crisis environment with a lower level of current account surplus, a higher level of budget balance surplus, and a higher rate of real money growth seems to contribute to a larger magnitude of output losses, the pre-crisis level of capital account openness does not appear to have a significant effect.²⁴ However, among industrialized countries, the level of financial openness does seem to have a significantly negative effect on the size of post-crisis output contraction, while the sign of the estimates for $KAOPEN$ is positive for LDC and EMG countries, though not significant. Given these results, the insignificance of the estimated coefficient for $KAOPEN$ in the full sample may be due to the differences in the effect of $KAOPEN$ on output losses among different subgroups.

The estimated coefficient for the banking crisis dummy is not significant in any of the subgroups despite its significance in the full sample. This finding is consistent with Hutchison and Noy (2002b) who find no joint effect on output from twin crises.

Given the Tobit system of equation (1), the marginal effect of capital account openness

²² The regression model is also controlled for regional differences whose results, however, are not reported in the tables.

²³ Other variables that are dropped from the regression due to the insignificance of the estimated coefficients include the trade-weighted average growth rate of G3 countries and real GDP growth rates both of which are the two-year averages preceding the crises ($t-2/t-1$).

²⁴ The positive sign for the estimated coefficients for the pre-crisis level of budget balance and real money growth may be difficult to interpret. However, it can be considered that a high level of debt spending by the government (that can be captured as budget deficit) may lower the probability of a crisis-inflicted country experiencing post-crisis large output contraction while high real money growth may increase the likelihood of pre-crisis boom that may lead to larger post-crisis output losses.

on post-crisis output losses conditional on post-crisis output contraction occurring (i.e., $y^*_{i,t} > 0$) can be calculated as $\frac{\partial \hat{E}[y | y^*_{i,t} > 0]}{\partial KAOPEN}$.²⁵ For the subgroup of IDCs, the marginal effect is calculated as about a 0.35 percent point decline in the post-crisis output losses for a one unit increase in *KAOPEN*. As an actual example, France's *KAOPEN* changed from 5.81 to 9.38 in 1992. For this amount of change in *KAOPEN*, the post-crisis output losses would be smaller by 1.25 percent point.

The rate of financial liberalization, captured by *FINLIB*, is also tested to see whether it affects the size of post-crisis output contraction. In neither the full nor any of the subsamples, is the estimated coefficient for the *FINLIB* term found to be significant (results not reported), suggesting that the speed of financial liberalization does not influence the size of post-crisis output losses.

The duration of post-crisis recession is also tested with the pre-crisis conditions. Industrialized countries with more open capital accounts tend to experience a shorter period of post-crisis output contraction. However, EMG countries with more open capital accounts prior to the crisis tend to experience a longer period of post-crisis contraction, which is not observed in the LDC subsample. *FINLIB* is also tested in place of *KAOPEN*. However, in both full and sub- samples, the estimated coefficient for *FINLIB* is found to be insignificant (results not reported). Hence, the pre-crisis level of financial openness, but not the speed of its change, affects the duration of post-crisis output contraction among industrialized and emerging market countries while the more open the capital account is, the shorter the period of a post-crisis output contraction is for the former group, and the longer the period is for the latter.

As we discussed in the theoretical section, the effect of capital account openness may differ depending on the third factor conditions, that is, how efficient the other parts of the economy including economic management are. One of the factors we should consider is the conditions of domestic financial markets. Eichengreen and Leblang (2003) and Wyplosz (2001) argue that a country with more well-developed domestic financial markets should be able to reap positive returns from capital account liberalization because efficient domestic

²⁵ See Greene (1997) for further discussions of the Tobit estimation.

financial markets allow capital to be allocated more efficiently.²⁶ I test this hypothesis and examine the effect of development in domestic financial markets on the correlation between capital account openness and post-crisis output losses, using the variables for private credit creation (*PCGDP*) and for stock market capitalization (*SMKC*), both as a ratio to GDP, in equation (1) individually as well as interactively with the *KAOPEN* variable. Contrary to theoretical prediction, these financial development variables as well as their interactive terms do not appear to be significant while the estimated coefficient for *KAOPEN* in the IDC subsample remains significant (results not reported). This result suggests that the effect of a higher level of financial openness helping industrialized countries to lower the size of post-crisis output losses is robust and independent of the level of domestic financial development.

Other third factor variables are also tested. They include the indices that account for the level of institutional/regulatory development, namely, corruption, law and order, an bureaucratic quality.²⁷ It would be ideal to include these variables both individually and interactively with the *KAOPEN* variable, the latter of which is to check if there is any interaction between the openness in capital accounts and the level of institutional development. However, the interactive terms are found to be highly correlated with *KAOPEN*, so that multicollinearity is too dominant for one to interpret the results properly. Hence, the interactive terms are not included in the model specification.

Although the interaction between *KAOPEN* and the institutional variables will not be detected in the following exercise, we may still be able to observe if there is any omitted variable bias on *KAOPEN*'s estimated coefficient, depending on the significance of the estimated coefficients for the institutional variables. The results are reported in Table 7. Columns (1) through (4) show the results for the regressions with the corruption index, and columns (5) through (8) and columns (9) through (12) show those with law-and-order and bureaucratic quality, respectively. The last four columns are the regression results with the three institutional variables included collectively. The columns in the upper half of the table show the regression results with the dependent variable of post-crisis aggregate output

²⁶ In their view, in an economy without efficient domestic financial markets, financial liberalization could be detrimental to the output performance, in which case restricting capital flows would be the second-best policy in the case of a financial crisis.

²⁷ All of these data series are obtained from the ICRG database. In these indexes higher values indicate better conditions. For example, a higher corruption index means a lower level of corruption. The data series are available for the period of 1984 through 1997, but included as the average of this time period.

losses. Those in the lower half show the results with the dependent variable of the duration of post-crisis recession.²⁸ The results for the models with the dependent variable of post-crisis output losses show that for the full sample as well as LDC and EMG subsample groups, the coefficients for the institutional variables are significantly negative, indicating that having a higher level of the corruption index (i.e., a lower level of corruption), law and order, and bureaucratic quality reduces LDC and EMG countries' post-crisis output losses. For the IDC group, on the other hand, none of the estimated coefficients for the institutional variables are significant. Both the significance level and the magnitude of the coefficients for *KAOPEN* remain the same as in the models without any institutional variables shown in Table 6. These results signify that a higher level of capital account openness, not the level of institutional development, lowers the size of post-crisis output losses for industrialized countries, while for LDC or EMG countries, it is institutional development, not the level of financial openness, that helps to make post-crisis output losses smaller. This generalization is also mostly applicable with respect to the duration of post-crisis recession.

5.2.2. The Effects of Post-crisis Level of Financial Openness along with Post-crisis Macroeconomic Conditions on the Output Losses

Policy makers of the countries that experience a currency crisis try to implement policies to prevent or minimize the damage from the crisis. However, it is also true that there is no perfect prescription to the economies in financial crisis. The difficulty of delivering prescriptive policies at the outbreak of a crisis and the danger of implementing uniform policies across different countries and different times is best exemplified by the debates about the effectiveness of the rescue plans led by the IMF and the World Bank (e.g., articles by Joseph Stiglitz). While many empirical studies focus on the contributing factors to a currency crisis using macroeconomic conditions prior to the crisis, few studies investigate the economic performance of crisis-inflicted economies with reference to the economic conditions and policy implementations in the aftermath of a crisis. Park and Lee (2001) discuss how the post-crisis conditions affect the performance of crisis-hit economies in the Asia crisis, concluding that countries with strong recovery in exports and private investment tend to recover strongly and quickly from a crisis. Hutchison (2001) examines how participating in an IMF-supported program affects the output cost of crisis-hit

²⁸ For the sake of brevity, the estimated coefficients for the control variables are not shown.

countries. However, few studies have investigated the effect of capital account openness on the output performance in the aftermath of a crisis (except for Kaplan and Rodrik (2001) and Edison and Reinhart (2000)).

In this subsection, the Tobit estimation exercise is repeated. The model includes the level of financial openness and economic conditions as of the aftermath of a crisis in order to examine how policy efforts, including financial liberalization, affect the output performance. In this estimation, a vector of the post-crisis macroeconomic conditions includes real GDP per capita as of the crisis year (t) to account for the difference in development; the output gap – the difference between actual real GDP and its trend – at the time of the outbreak of a crisis (t) to control for the initial conditions; government budget balance as a ratio to GDP; growth rates of G3 countries weighted by bilateral trade with the United States, the European Union, and Japan; real exchange rate overvaluation; and real money growth. All of these variables, except for GDP per capita and the initial output gap, are included as the average in two years *after* the crisis (dubbed as “ $(t+1/t+2)$ ” in the table). The banking crisis dummy is also included, as is an IMF dummy variable which assigns a value of unity if a country resorts to an IMF-supported stabilization program.²⁹

Table 8 displays regression results from the post-crisis Tobit analysis. Interestingly, the estimated coefficient for *KAOPEN* is significant for all subsamples (columns (2) through (4)), but the sign differs between IDC and LDC or EMG. For IDCs, a higher post-crisis level of *KAOPEN* helps the crisis-afflicted country to have a lower level of output losses. However, for the groups of less developed or emerging market countries, more open capital accounts appear to exacerbate post-crisis output losses. As was shown previously, when the marginal effect of a one-unit change in *KAOPEN* is calculated, it is found that among IDCs, this increase in *KAOPEN* would lead to a 0.17 percent point decrease in post-crisis output losses. For LDCs, the same figure would be a 0.29 increase in the post-crisis output losses while it would be a 0.36 increase for EMGs.

Among the economic control variables, while a higher government budget surplus and a more rapid real money growth help EMG countries to experience a smaller size of post-crisis output losses, interestingly, resorting to an IMF-supposed stabilization program would exacerbate the output losses.

²⁹ This dummy is created based on the information from the IMF’s web site.

As in the previous subsection, I also investigate the effect of institutional variables. The results are reported in Table 9. The significantly negative coefficient for IDC's *KAOPEN* remains robust as in the previous analysis. However, the coefficient for *KAOPEN* also seems to be relatively robust for EMG countries even when institutional variables are included, suggesting that a higher post-crisis level of capital account openness, independent of the level of institutional development, contributes to enlarging post-crisis output losses.

When *FINLIB* is used (last four columns in Table 8), a higher rate of post-crisis financial liberalization is found to enlarge the output losses for less developed countries while the effect does not appear to be significant for IDC and EMG subsamples. Another variable that assigns a value of unity if a country restricts capital account within one year after the occurrence of a currency crisis is also tested. This exercise is to examine whether Mahathir's type of policy, an immediate capital account restriction at the wake of a currency crisis, can reduce the output cost from a currency crisis.³⁰ When this dummy variable is included instead of *FINLIB*, the coefficient is not significant (results not reported), suggesting that an effort to restrict capital flows immediately after the onset of a crisis does not lower post-crisis output losses. Also, no significant results are found when a dummy for any capital account restriction implemented within two years after the onset of a crisis is included. Conversely, when a dummy variable for an immediate liberalization policy (unity if capital account is liberalized within one year after the crisis) is included, the regression yielded a qualitatively similar results to those in Table 8. Thus, immediately restricting capital flows after the wake of a currency crisis does not contribute to lowering the magnitude of output losses while immediately liberalizing capital flows can be detrimental to emerging market countries.

5.2.3. *Dynamics*

I now assess the dynamics of the output performance in the aftermath of a crisis. Above, we have seen that a higher level of financial openness increases the output loss for emerging market countries in a currency crisis. Here, I will examine the dynamics of output gaps in each year after the crisis. As in the previous subsection, both financial openness and

³⁰ Unfortunately, the *KAOPEN* series for Malaysia does not reflect Mahathir's capital restriction policy after the breakout of the Asian crisis in 1997. Instead of falling around 1998, the *KAOPEN* series falls a few years before the crisis. This capital flow restriction is argued in Dornbusch (2001).

(most of) the control variables are from the post-crisis period. The dependent variable in the regression is the average output gap of real GDP during the post-crisis period over p years.

$$y_{i,t+p} = \frac{1}{p} \sum_{j=1}^p (\ln GDP_{i,t+j} - \ln GDP^*_{i,t+j}), \quad i = 1, \dots, N,$$

where $\ln GDP^*_{i,t+j}$ is the (natural log of) of the real GDP trend for the country i in j years after the crisis year (t), and N is the number of crisis episodes in the sample. Hence, $y_{i,t+p}$ represents the real output gap averaged over the post-crisis period of p years. Because the analysis above finds that the average length of the post-crisis output contraction is less than three years, I choose p from one to five. Thus, the analysis here can allow us to observe the dynamics of the effects of explanatory variables on the output gap in each year of the five year period after a crisis.

The regression model is specified as:

$$(2) \quad y_{i,t+p} = \lambda KAOPEN_{i,t+p} + \phi X_{i,t+p} + u_{i,t+p}, \quad i = 1, \dots, N, \quad p = 1, \dots, 5$$

where $KAOPEN$ is the financial openness variable averaged over p years and X is a k -element vector of the control variables. We will treat this regression model as a system of five equations ($p = 5$). In the vector X , real GDP per capita, the initial level of the output gap, and trade openness are taken from the crisis year to account for the difference in the initial conditions among the countries. In addition to these variables, the banking crisis dummy, an IMF program dummy, and regional dummies are included in all five equations. Budget balance, real exchange rate overvaluation, and external growth rates are averaged over the period from the next year of the crisis $t+1$ to the post-crisis year $t+p$, while the real money variable is averaged over the period from the crisis year t to the post-crisis year $t+p-1$. This system of five equations is estimated using the Seemingly Unrelated Regression (SUR) technique which allows for different error variances in each equation and for correlation of these errors across equations.³¹

The estimation is conducted using the data from only the crisis countries that

³¹ The variables that indicate the level of development in domestic financial markets are not included in the regression because that would considerably reduce the number of observations.

experienced post-crisis output contraction. Removing the data of the countries without post-crisis output contraction reduces the number of observations, especially for subsamples. However, I consider it is still possible to observe how the level of capital openness affects the output gap year by year.

The regression results are given in Tables 10-1 and 10-2. We can see that for industrialized countries, real depreciation and a higher rate of real money growth contributes positively to output gaps in the entire five year post-crisis period. However, there is no significant effect of financial openness detected. The joint effect of banking crises is not detected, either. In the LDC subsample, the level of capital account openness may contribute negatively to the output gap in the first three years after the crisis and positively from the fourth year on, but none of the estimated coefficients for *KAOPEN* are significant. Among macroeconomic variables, a higher level of government budget surplus and a higher rate of real money growth appear to contribute positively to output gaps, though unlike in industrialized countries, real depreciation does not seem to matter as much. Neither the banking crisis dummy nor the IMF-program dummy is found to affect output gaps.

The results for the EMG sample are interesting. The level of capital account openness affects the output gaps negatively and significantly for the first three years after the crisis. In the fourth year, the negative effect of capital account openness disappears, and in the fifth year, the sign for the coefficient becomes positive, though not statistically significant. As with the LDC group, improving budget balance and having a higher rate of real money growth seems to be important for positive output gaps. What is also striking here is that the estimated coefficient for the IMF dummy are significantly negative from the second year through the fifth year after the crisis, an interesting contrast with the finding in Hutchison (2001) where participation in an IMF-supported program following a currency crisis does not appear to affect the output losses.

5.2.4. Further Considerations on the Dynamics

Given the above findings, the next concern would be to explore how capital account openness affects the post-crisis output losses? Considering what theory predicts, the above finding that a higher level of financial openness affects output negatively could be explained by a decline in the net inflows of foreign direct investment, portfolio investment,

and/or stock market capitalization. In order to examine the validity of these channels, I have repeated the above SUR estimation, replacing the dependent variable with the above three variables³². However, these regression exercises have produced contradictive results. That is, when foreign direct investment and portfolio investment are tested as dependent variables, especially in the EMG subsample, the level of capital account openness is found to have a *positive* effect on these variables for the first few years after the crisis year. If the level of financial openness negatively affects output gaps and if foreign direct investment and/or overseas portfolio investment are the channels for the link, the effect of capital account openness on foreign direct investment net inflows or portfolio investment net inflows should be negative, not positive.

Stock market capitalization is also tested as dependent variable, with insignificant results. Given these results, I have repeated the SUR exercise using fixed capital formation as the dependent variable. In this estimation, the level of capital account openness was found to have a significantly negative impact on private capital formation in the EMG subsample in all five years after the crisis, consistent with the results in the previous subsection. However, while these results do mean that capital account openness negatively affects fixed capital formation in the case of a currency crisis, the question of through which channel(s) capital account openness operates is not answered fully. Investigating this channel issue is an important endeavor for the literature. However, given the extent of aggregation of the KAOPEN variable – no distinction on the type and/or directions of capital flows to which KAOPEN is referring, further investigation require research possibly using different measures of capital controls.

6. Concluding Remarks

This paper investigated the link between capital account openness and the output cost associated with a currency crisis. Although the Malaysian experience during the Asian crisis of 1997-98 create significant interest in the effectiveness of a policy restricting cross-border financial transactions to minimize the output cost, interestingly, this

³² Naturally, some of the initial condition variables are also changed to maintain the consistency with the dependent variable.

association has not been exposed to a thorough empirical investigation. The list of the reasons for the lack of the literature on this issue must include the lack of appropriate measures for capital controls and appropriate methodologies to measure post-crisis output losses. In an effort to overcome these issues, I utilized the Chinn-Ito index for capital account openness and a specific calculation method for output losses.

We have seen that less developed countries and emerging market countries, on average, restricted capital accounts before the crisis year while industrialized countries appear to maintain the trend of financial liberalization regardless of the occurrence of a crisis. It was also shown that industrialized countries with a lower level of financial openness tend to experience output contraction in the aftermath of a crisis while less developed and emerging market countries with a higher level of financial openness tend to experience post-crisis output losses.

The probit analysis showed that the higher the level of financial openness is, the less likely the countries, both industrialized and less developed, are to experience a currency crisis, a link not found in the subsample of emerging market countries. Moreover, among LDCs and EMGs, it was shown that a higher rate of financial liberalization reduces the likelihood of a currency crisis.

The link between the pre-crisis level of capital account openness and the magnitude and duration of post-crisis output contraction was also tested. It was shown that a higher pre-crisis level of financial openness helps to reduce output losses for industrialized countries, but not for less developed and emerging market countries. Also, it was shown that the duration of post-crisis output contraction can be shorter when an industrialized country has a high level of financial openness, but for the group of EMGs, the duration of output contraction can be lengthened for a country with more open capital accounts.

The effects of the post-crisis level of financial openness and economic conditions on output losses were also examined. The post-crisis level of financial openness appeared to help industrialized countries reduce the magnitude of output losses, but to increase post-crisis output losses for emerging market and less developed countries. A higher rate of financial liberalization is found to be detrimental to less developed countries in terms of the output performance. When the dynamics of output gaps in the period after a crisis are explored, it was found that the negative effect of a higher level of capital account openness

lasts for at least three years for emerging market countries.

In this paper we have found that more open financial markets lower the likelihood of a country, whether industrialized or less developed, experiencing a currency crisis. However, once the country encounters a currency crisis, the effect of capital account openness seems to differ depending on the level of development. We have found that institutional development, rather than the level of openness in financial markets, is important in lowering the size of post-crisis output losses for the groups of less developed or emerging market countries. It seems to be only the group of IDCs that can reap the effect of capital account liberalization in terms of reducing the size of post-crisis output losses. We have also observed that the post-crisis level of financial openness is very important for the countries. While a higher level of post-crisis level of financial openness helps industrialized countries to have smaller post-crisis output losses, such openness can lead to larger post-crisis output losses for both less developed and emerging market countries. Especially for industrialized and emerging market countries, the effect of financial openness is independent of institutional development. In short, once a currency crisis occurs, financial liberalization policy can be detrimental to less developed and emerging market countries. However, restricting capital accounts is not helpful as Mahathir hoped, either. Contrary to Mahathir's wish, the empirical exercises in this paper showed that capital restriction policy immediately after the breakout of a crisis is not effective. Conversely, only industrialized countries benefit from an immediate financial liberalization policy after the breakout of a crisis while for less developed countries, such a policy would contribute to increasing the size of post-crisis output performance.

Country List

IDCs (22)	cn	LDCs (40)	cn	EMGs (29)	cn
Australia	193	Argentina	213	Argentina	213
Austria	122	Bolivia	218	Botswana	616
Belgium	124	Botswana	616	Brazil	223
Canada	156	Brazil	223	Chile	228
Denmark	128	Chile	228	Colombia	233
Finland	172	China	924	Ecuador	248
France	132	Colombia	233	Egypt	469
Germany	134	Costa Rica	238	Ghana	652
Greece	174	Ecuador	248	Hong Kong	532
Iceland	176	Egypt	469	India	534
Ireland	178	Ghana	652	Indonesia	536
Israel	436	Hong Kong	532	Jordan	439
Italy	136	Hungary	944	Kenya	664
Japan	158	India	534	Korea	542
Netherlands	138	Indonesia	536	Malaysia	548
New Zealand	196	Jamaica	343	Mauritius	684
Norway	142	Jordan	439	Mexico	273
Portugal	182	Kenya	664	Morocco	686
Spain	184	Korea	542	Peru	293
Sweden	144	Malaysia	548	Philippines	566
Switzerland	146	Mauritius	684	Singapore	576
UK	112	Mexico	273	South Africa	199
		Morocco	686	Sri Lanka	524
		Nigeria	694	Thailand	578
		Paraguay	288	Tunisia	744
		Peru	293	Turkey	186
		Philippines	566	Uruguay	298
		Poland	964	Venezuela	299
		Russia	922	Zimbabwe	698
		Senegal	722		
		Singapore	576		
		South Africa	199		
		Sri Lanka	524		
		Thailand	578		
		Tunisia	744		
		Turkey	186		
		Uruguay	298		
		Venezuela	299		
		Zambia	754		
		Zimbabwe	698		

NOTE: The LDC group also includes EMG countries. The definition of EMG is based on Glick and Hutchison (2001).

Appendix 1: Construction of *KAOPEN*

The index on capital account openness (*KAOPEN*) is based on the four binary dummy variables reported in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER)*. These variables are to provide information on the extent and nature of the restrictions on external accounts for a wide cross-section of countries. These variables are:

- k_1 : variable indicating the presence of multiple exchange rates;
- k_2 : variable indicating restrictions on current account transactions;
- k_3 : variable indicating restrictions on capital account transactions; and
- k_4 : variable indicating the requirement of the surrender of export proceeds.

In order to focus on the effect of *financial openness* – rather than *controls* – we reverse the values of these binary variables, such that the variables are equal to one when the capital account restrictions are non-existent. Moreover, for controls on capital transitions (k_3), we use the share of a five-year window that capital controls were not in effect ($SHAREk_3$). More specifically, the capital account openness variable for year t is proportion of five years encompassing year t and the preceding four years that the capital account was open:

$$SHAREk_{3,t} = \left(\frac{k_{3,t} + k_{3,t-1} + k_{3,t-2} + k_{3,t-3} + k_{3,t-4}}{5} \right)$$

Then we construct an index for capital “openness” ($KAOPEN_t$), which is the first standardized principal component of $k_{1,t}$, $k_{2,t}$, $SHAREk_3$, $k_{4,t}$. This index takes on higher values the more open the country is to cross-border capital transactions. By construction, the series has a mean of zero. The average value of *KAOPEN* in the full sample of countries in Chinn and Ito is growing at 3.8% annually. The first eigenvector for *KAOPEN* was found to be $(SHAREk_3, k_1, k_2, k_4)' = (0.563, 0.280, 0.516, 0.582)'$, indicating that the variability of *KAOPEN* is not merely driven by the $SHAREk_3$ series.

We incorporate the $k_{1,t}$, $k_{2,t}$, and $k_{4,t}$ variables in our *KAOPEN* variable instead of focusing on k_3 which refers to restrictions on capital account transactions. We believe the

incorporation of $k_{1,t}$, $k_{2,t}$, and $k_{4,t}$ in this index allows us to more accurately capture the intensity of the capital controls.³³ This point can be made more concrete by considering a country with an open capital account. It may still restrict the flow of capital by limiting transactions on the current account restrictions or other systems such as multiple exchange rates and requirements to surrender export proceeds. Alternatively, countries that already have closed capital accounts might try to increase the stringency of those controls by imposing k_1 , k_2 , and k_4 types of restrictions so that the private sector cannot circumvent the capital account restrictions.

Clearly, the measurement of the extent of capital account controls is a difficult enterprise. Many researchers have tried to capture the complexity of real-world capital controls, with varying degrees of success, and varying degrees of coverage.³⁴ For reviews and comparisons of various measures on capital controls, refer to Edwards (2001), Edison *et al.* (2002) and Eichengreen (2002).

³³ Quinn (1997) imputes the level of intensity by making qualitative judgments based on *AREAER*.

³⁴ Specifically, some indices are sector-specific. Edison and Warnock (2001) present an index of equity market openness. Kaminsky and Schmukler (2001) calculate indices for domestic financial system, equity market, and capital account liberalization, for a select number of developed and emerging market countries.

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Table 1: Summary Statistics of Output Losses

	N. of Crises	Crises w/ Output Loss (likelihood, %)	Mean	Std. Dev.	Min	Max
<i>“Standard” crises</i>						
Total	141	79 (56)	0.062	0.061	0.001	0.239
IDC	55	32 (58)	0.032	0.026	0.001	0.108
LDC	86	47 (55)	0.083	0.070	0.001	0.239
EMG	65	38 (58)	0.083	0.068	0.001	0.231
Latin A.	37	21 (57)	0.077	0.068	0.009	0.231
Asia	27	14 (52)	0.079	0.067	0.001	0.204
<i>Major crises</i>						
Total	77	52 (68)	0.070	0.066	0.001	0.225
IDC	22	14 (64)	0.026	0.026	0.001	0.096
LDC	55	38 (69)	0.086	0.070	0.004	0.225
EMG	39	30 (77)	0.086	0.068	0.004	0.225
Latin A.	21	17 (81)	0.069	0.057	0.011	0.192
Asia	19	12 (63)	0.090	0.067	0.024	0.204

Note: For the definition of the crises as well as the magnitude of output losses, see the text. The figures in parentheses in the second column indicates the ratio of the crises entailing recession (i.e., output losses) to the total number of crises.

Table 2: Summary Statistics on the Duration (Number of Quarters) of “Post-Crisis Recession”

	Mean	Std. Dev.	Min	Max
<i>“Standard” crises</i>				
Total	7.91	4.82	2	32
IDC	7.31	4.53	2	21
LDC	8.32	5.02	2	32
EMG	7.61	3.57	2	21
Latin A.	8.95	6.55	4	32
Asia	7.14	2.35	2	11
<i>Major crises</i>				
Total	7.87	5.34	2	32
IDC	6.36	4.20	2	15
LDC	8.42	5.65	2	32
EMG	7.53	4.23	2	21
Latin A.	8.65	7.47	2	32
Asia	7.75	2.01	5	11

Note: For the definition of the crises as well as output losses, see the text.

Table 3: Summary Statistics on the Magnitude and Duration of Post-Crisis Recession

“Standard” Crises					Major Crises			
	# of Crises	Crises w/ Output Loss (likelihood, %)	Mean of Output Losses	Mean of Duration of Recession	# of Crises	Crises w/ Output Loss (likelihood, %)	Mean of Output Losses	Mean of Duration of Recession
<i>1975 – 1979</i>								
Full	17	9 (53)	0.015	6.33	8	4 (50)	0.013	7.00
IDC	14	8 (57)	0.016	6.75	6	3 (50)	0.016	8.33
LDC	3	1 (33)	0.004	3.00	2	1(50)	0.004	3.00
EMG	2	1 (50)	0.004	3.00	1	1(100)	0.004	3.00
<i>1980s</i>								
Full	66	35 (53)	0.081	8.63	34	20 (59)	0.082	8.35
IDC	27	15 (56)	0.041	7.93	12	7 (59)	0.028	6.57
LDC	39	20 (51)	0.111	9.15	22	13 (59)	0.111	9.31
EMG	28	15 (54)	0.110	9.33	14	9 (64)	0.125	10.22
<i>1990 – 2002</i>								
Full	58	35 (60)	0.056	7.60	35	28 (80)	0.070	7.64
IDC	14	9 (64)	0.031	6.78	4	4 (100)	0.031	4.50
LDC	44	26 (59)	0.064	7.88	31	24 (77)	0.077	8.17
EMG	35	22 (63)	0.068	6.34	24	20 (83)	0.073	6.55
<i>1997 – 2002</i>								
Full	20	12 (60)	0.088	7.00	16	12 (75)	0.095	7.38
IDC	2	0 (–)	–	–	0	0 (–)	–	–
LDC	18	12 (67)	0.088	7.00	16	12 (75)	0.095	7.38
EMG	15	12 (80)	0.088	7.00	14	12 (86)	0.095	7.38

Table 4: Summary Statistics on KAOPEN (Financial Openness) and FINLIB (Financial Liberalization)

KAOPEN (Financial Openness)					FINLIB (Financial Liberalization, 1 st diff. of KAOPEN)						
	obs.	mean	std. dev.	min	max		obs.	mean	std. dev.	min	max
<i>1970 – 2001</i>					<i>1970 - 2001</i>						
FULL	1767	4.57	3.56	0	10	FULL	1699	0.13	1.01	-7.50	7.50
IDC	647	6.48	3.28	0	10	IDC	623	0.18	0.82	-4.47	5.34
LDC	1120	3.46	3.23	0	10	LDC	1076	0.11	1.10	-7.50	7.50
EMG	873	3.66	3.40	0	10	EMG	841	0.11	1.11	-7.50	7.50
Latin A.	396	3.57	3.30	0	10	Latin A.	380	0.10	1.27	-7.50	5.97
Asia	305	5.10	3.48	0	10	Asia	294	0.09	0.87	-3.03	5.97
<i>1970s</i>					<i>1970s</i>						
FULL	549	3.42	2.89	0	10	FULL	543	0.07	0.82	-4.47	5.09
IDC	202	4.48	2.77	0	10	IDC	200	0.09	0.90	-4.47	5.09
LDC	347	2.81	2.79	0	10	LDC	343	0.06	0.77	-3.94	3.94
EMG	273	2.85	2.94	0	10	EMG	271	0.07	0.81	-3.94	3.94
Latin A.	124	3.29	3.35	0	10	Latin A.	122	0.07	0.95	-3.94	3.94
Asia	99	3.83	2.82	0	10	Asia	98	0.14	0.77	-2.41	3.56
<i>1980s</i>					<i>1980s</i>						
FULL	572	3.80	3.39	0	10	FULL	572	0.05	0.87	-7.50	4.57
IDC	209	5.67	3.08	0	10	IDC	209	0.17	0.70	-2.41	4.47
LDC	363	2.72	3.08	0	10	LDC	363	-0.03	0.94	-7.50	4.57
EMG	282	3.00	3.35	0	10	EMG	282	-0.02	0.92	-7.50	3.56
Latin A.	130	2.33	2.55	0	10	Latin A.	130	-0.22	1.25	-7.50	3.56
Asia	96	5.25	3.90	0	10	Asia	96	0.07	0.68	-2.41	2.94

NOTE: Financial openness variable, KAOPEN, is the first standardized principal component of SHAREk3, k1, k2, and k4, each of which is the share of the last five years (including the observed year) when the capital account was open, the non-existence of multiple exchange rates, the openness of the current account, and no obligation of surrender of export proceeds. See Chinn and ITO (2002) for more details on KAOPEN. FINLIB is the first difference of KAOPEN. The subgroup “Asia” does not include Japan.

Table 4 (con't): Summary Statistics on KAOPEN (Financial Openness) and FINLIB (Financial Liberalization)

KAOPEN (Financial Openness)						FINLIB (Financial Liberalization, 1 st diff. of KAOPEN)					
	obs.	mean	std. dev.	min	max	obs.	mean	std. dev.	min	max	obs.
<i>1990-2001</i>						<i>1990-2001</i>					
FULL	646	6.22	3.61	0	10	FULL	584	0.28	1.24	-5.34	7.50
IDC	236	8.90	2.19	1.53	10	IDC	214	0.28	0.84	-2.41	5.34
LDC	410	4.68	3.36	0	10	LDC	370	0.29	1.43	-5.34	7.50
EMG	318	4.95	3.45	0	10	EMG	288	0.28	1.46	-5.34	7.50
Latin A.	142	4.95	3.36	0	10	Latin A.	128	0.46	1.46	-5.34	5.97
Asia	110	6.12	3.31	0	10	Asia	100	0.06	1.11	-3.03	5.97
<i>1990-1996</i>						<i>1990-1996</i>					
FULL	410	5.70	3.66	0	10	FULL	407	0.39	1.39	-5.34	7.50
IDC	148	8.48	2.45	1.53	10	IDC	148	0.38	0.89	-2.41	3.56
LDC	262	4.12	3.27	0	10	LDC	259	0.39	1.60	-5.34	7.50
EMG	202	4.43	3.42	0	10	EMG	201	0.38	1.64	-5.34	7.50
Latin A.	90	4.02	3.04	0	10	Latin A.	89	0.61	1.70	-5.34	5.97
Asia	70	6.31	3.49	0	10	Asia	70	0.08	1.20	-3.03	5.97
<i>1997-2001</i>						<i>1997-2001</i>					
FULL	236	7.13	3.33	0	10	FULL	177	0.04	0.78	-2.94	5.34
IDC	88	9.59	1.42	2.78	10	IDC	66	0.04	0.68	-0.62	5.34
LDC	148	5.66	3.28	0	10	LDC	111	0.04	0.84	-2.94	3.56
EMG	116	5.85	3.33	0	10	EMG	87	0.05	0.85	-2.94	3.56
Latin A.	52	6.55	3.33	0	10	Latin A.	39	0.12	0.56	-0.62	1.53
Asia	40	5.81	2.97	1.53	10	Asia	30	0.01	0.89	-1.53	3.03

NOTE: Financial openness variable, KAOPEN, is the first standardized principal component of SHAREk3, k1, k2, and k4, each of which is the share of the last five years (including the observed year) when the capital account was open, the non-existence of multiple exchange rates, the openness of the current account, and no obligation of surrender of export proceeds. See Chinn and ITO (2002) for more details on KAOPEN. FINLIB is the first difference of KAOPEN. The subgroup "Asia" does not include Japan.

Table 5: Probit Analysis on the Link between Financial Openness/Liberalization and Output Losses Caused by Currency Crises

	Dependent Variable Occurrence of Currency Crises					Dependent Variable Occurrence of Currency Crises			
	(1) Full Sample	(2) IDC	(3) LDC	(4) EMG		(5) Full Sample	(6) IDC	(7) LDC	(8) EMG
Fin. Openness_(t-1)	-0.0475 [0.0204]**	-0.0773 [0.0369]**	-0.04560 [0.0277]*	-0.0155 [0.0305]	Fin. Liberalization_(t-1)	-0.0324 [0.0581]	-0.0012 [0.1224]	-0.0442 [0.0684]	-0.0509 [0.0732]
GDP pc. _(t)	0.0195 [0.1032]	0.284 [0.5358]	0.0247 [0.1510]	-0.0839 [0.1720]	GDP pc. _(t)	-0.0849 [0.0922]	-0.0417 [0.5072]	-0.0441 [0.1444]	-0.1149 [0.1634]
Ca _(t-2/t-1)	-0.0213 [0.0152]	-0.0165 [0.0328]	-0.0188 [0.0186]	-0.0412 [0.0223]*	CA _(t-2/t-1)	-0.0232 [0.0152]	-0.0307 [0.0315]	-0.0173 [0.0185]	-0.0405 [0.0222]**
Budget Balance _(t-2/t-1)	-0.0044 [0.0148]	-0.0292 [0.0264]	-0.0006 [0.0203]	-0.0122 [0.0234]	Budget Balance _(t-2/t-1)	-0.0102 [0.0145]	-0.0348 [0.0263]	-0.0066 [0.0198]	-0.0136 [0.0227]
Real Exchange Rate Overvaluation _(t-2/t-1)	-0.4101 [0.1859]**	-4.7354 [1.3505]***	-0.3696 [0.1973]*	-0.3385 [0.2089]	Real Exchange Rate Overvaluation _(t-2/t-1)	-0.4161 [0.1902]**	-4.7219 [1.3385]***	-0.3699 [0.2017]*	-0.3408 [0.2105]
Real Money Growth _(t-2/t-1)	-0.8686 [0.5594]	1.2162 [1.0941]	-1.6906 [0.6773]**	-1.6947 [0.7542]**	Real Money Growth _(t-2/t-1)	-1.0184 [0.5598]*	0.8442 [1.0662]	-1.8139 [0.6786]***	-1.7466 [0.7553]**
Banking Crisis (dummy)	0.3682 [0.1223]***	0.0273 [0.2335]	0.4938 [0.1547]***	0.5431 [0.1717]***	Banking Crisis (dummy)	0.3778 [0.1222]***	0.0869 [0.2299]	0.4753 [0.1543]***	0.5357 [0.1717]***
Observations	959	388	571	454	Observations	951	385	569	453

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

The estimates for the constant term and regional dummies are not reported. An increase in real exchange rate overvaluation indicates a real overdepreciation.

Table 6: Aggregate Output Loss, Duration of Output Loss, and Pre-Crisis Conditions

	Dependent Variable: Aggregate Output Loss					Dependent Variable: Duration of Post-Crisis Recession			
	(1) Full Sample	(2) IDC	(3) LDC	(4) EMG		(5) Full Sample	(6) IDC	(7) LDC	(8) EMG
Fin. Openness ($t-1$)	-0.0021 [0.0028]	-0.0077 [0.0021]***	0.0043 [0.0044]	0.0055 [0.0047]	Fin. Openness ($t-1$)	-0.4150 [0.2970]	-1.5072 [0.4263]***	0.3800 [0.4076]	0.5571 [0.3234]*
GDP pc.(t)	0.02000 [0.0155]	0.0503 [0.0292]*	0.0540 [0.0272]**	0.0433 [0.0280]	GDP pc.(t)	3.2422 [1.6431]*	6.6185 [5.9492]	4.5272 [2.5413]*	3.648 [1.9303]*
Ca ($t-2/t-1$)	-0.0069 [0.0022]***	-0.0018 [0.0017]	-0.0094 [0.0034]***	-0.0102 [0.0039]***	Ca ($t-2/t-1$)	-0.479 [0.2277]**	0.0651 [0.3491]	-0.6714 [0.3181]**	-0.402 [0.2667] ^{14%}
Budget Balance ($t-2/t-1$)	0.0047 [0.0021]**	0.0029 [0.0017]*	0.0039 [0.0031]	0.0035 [0.0033]	Budget Balance ($t-2/t-1$)	0.3148 [0.2180]	0.6389 [0.3349]*	0.0069 [0.2920]	-0.183 [0.2269]
Real Exchange Rate Overval. ($t-2/t-1$)	0.0176 [0.0314]	-0.0673 [0.0716]	0.0227 [0.0428]	0.0200 [0.0429]	Real Exchange Rate Overval. ($t-2/t-1$)	0.7027 [3.3509]	-0.9646 [14.5607]	2.1782 [4.0184]	1.507 [2.9072]
Real Money Growth ($t-2/t-1$)	0.1655 [0.0735]**	0.2027 [0.0880]**	0.2631 [0.1304]**	0.2994 [0.1338]**	Real Money Growth ($t-2/t-1$)	19.0964 [7.7999]**	47.0636 [17.7803]**	26.3094 [12.0909]**	24.2786 [9.4066]**
Banking Crisis (dummy)	0.0437 [0.0165]***	0.0157 [0.0107]	0.0136 [0.0301]	0.0052 [0.0328]	Banking Crisis (dummy)	2.6174 [1.7484]	2.7106 [2.1985]	-0.3576 [2.8085]	0.8135 [2.2379]
Observations (uncensored)	112 (67)	45 (29)	67 (38)	58 (34)	Observations (uncensored)	112 (67)	45 (29)	67 (38)	58 (34)

Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

The estimates for the constant term and regional dummies are not reported. The figures shown in parentheses below the number of observations are the number of observations that are not censored in the Tobit regression estimation. An increase in real exchange rate overvaluation indicates a real overdepreciation.

Table 7: Pre-Crisis Financial Openness and Institutional Factors

		Dependent Variable: Post-Crisis Aggregate Output Losses															
<i>with</i>		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
		Corruption				Law and Order				Bureaucratic Quality				All Three Institutional Variables			
		Full	IDC	LDC	EMG	Full	IDC	LDC	EMG	Full	IDC	LDC	EMG	Full	IDC	LDC	EMG
Fin. Openness	(<i>t-1</i>)	-0.0033 [0.0027]	-0.0077*** [0.0022]	0.0017 [0.0042]	0.0040 [0.0043]	-0.0024 [0.0027]	-0.0075*** [0.0022]	0.0035 [0.0042]	0.0053 [0.0045]	-0.0030 [0.0027]	-0.0079*** [0.0022]	0.0010 [0.0043]	0.0020 [0.0045]	-0.0032 [0.0026]	-0.0080*** [0.0024]	0.0008 [0.0042]	0.0032 [0.0044]
Corruption		-0.0021*** [0.0006]	0.0000 [0.0005]	-0.0032*** [0.0011]	-0.0048*** [0.0017]									-0.0011 [0.0008]	-0.0004 [0.0008]	-0.0023 [0.0012]	-0.0032 [0.0020]
Law and Order						-0.0019*** [0.0006]	0.0003 [0.0008]	-0.0021** [0.0009]	-0.002** [0.0010]					-0.0008 [0.0007]	0.0005 [0.0010]	-0.0008 [0.0010]	-0.0009 [0.0011]
Bureaucratic Quality										-0.0020*** [0.0006]	0.0002 [0.0006]	-0.0023** [0.0011]	-0.0025** [0.0011]	-0.001 [0.0007]	0.0004 [0.0008]	-0.0010 [0.0011]	-0.0010 [0.0012]
Observations		111	45	66	57	111	45	66	57	111	45	66	57	111	45	66	57
		Dependent Variable: Duration of Post-Crisis Recession															
<i>with</i>		Corruption				Law and Order				Bureaucratic Quality				All Three Institutional Variables			
		Full	IDC	LDC	EMG	Full	IDC	LDC	EMG	Full	IDC	LDC	EMG	Full	IDC	LDC	EMG
Fin. Openness	(<i>t-1</i>)	-1.1763* [0.6713]	-3.6781*** [0.9780]	0.2926 [0.8879]	1.0518 [0.6862]	-1.0027 [0.6663]	-3.4928*** [0.9992]	0.6875 [0.8969]	1.2405* [0.7142]	-1.09 [0.6801]	-3.431*** [0.9969]	0.4921 [0.9781]	0.8218 [0.7365]	-1.1343* [0.6656]	-3.9329*** [1.0789]	0.4272 [0.9081]	1.0159 [0.7162]
Corruption		-0.1938*** [0.0673]	-0.1591 [0.1081]	-0.3086*** [0.1024]	-0.3146** [0.1202]									-0.1463* [0.0862]	-0.3031* [0.1587]	-0.2685** [0.1172]	-0.2532* [0.1433]
Law and Order						-0.1635** [0.0645]	-0.032 [0.1668]	-0.1994** [0.0871]	-0.1184* [0.0693]					-0.0906 [0.0779]	0.1567 [0.1948]	-0.1019 [0.0965]	-0.0527 [0.0737]
Bureaucratic Quality										-0.1261* [0.0663]	-0.0119 [0.1205]	-0.1076 [0.1027]	-0.1326* [0.0747]	0.0048 [0.0820]	0.1551 [0.1514]	0.0431 [0.1042]	-0.0272 [0.0860]
Observations		111	45	66	57	111	45	66	57	111	45	66	57	111	45	66	57

Table 8: Aggregate Output Losses, Duration of Output Losses, and Post-Crisis Conditions

	Financial Openness					Financial Liberalization			
	Dependent Variable: Aggregate Output Loss					Dependent Variable: Aggregate Output Loss			
	(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)
	Full Sample	IDC	LDC	EMG		Full Sample	IDC	LDC	EMG
Fin. Openness					Fin. Liberalization				
<i>(t/t+2)</i>	0.0015	-0.0035	0.0066	0.0085	<i>(t/t+2)</i>	0.0188	-0.0024	0.0412	0.0239
	[0.0021]	[0.0016]**	[0.0038]*	[0.0039]**		[0.0103]*	[0.0081]	[0.0170]**	[0.0216]
GDP pc.(t)	0.0180	0.0414	0.0123	0.0265	GDP pc.(t)	0.0238	0.0244	0.0315	0.0448
	[0.0141]	[0.0228]*	[0.0204]	[0.0221]		[0.0132]*	[0.0227]	[0.0186]*	[0.0216]**
Y-gap (t)	-1.4966	-0.7580	-1.6139	-1.5836	Y-gap (t)	-1.496	-0.8580	-1.6302	-1.5344
	[0.2040]***	[0.2157]***	[0.2781]***	[0.2724]***		[0.2003]***	[0.2257]***	[0.2726]***	[0.2778]***
Budget balance	0.0006	-0.0011	-0.0008	-0.0081	Budget balance	0.0001	-0.0007	-0.0019	-0.0074
<i>(t+1/t+2)</i>	[0.0016]	[0.0012]	[0.0028]	[0.0035]**	<i>(t+1/t+2)</i>	[0.0016]	[0.0012]	[0.0028]	[0.0035]**
Real exchange rate	0.0162	-0.1596	0.0361	0.0099	Real exchange rate	-0.0055	-0.1832	0.0144	-0.0063
Overval. (t+1/t+2)	[0.0334]	[0.0646]***	[0.0423]	[0.0453]	Overval. (t+1/t+2)	[0.0346]	[0.0667]***	[0.0434]	[0.0465]
External growth rates	0.1276	-0.6573	0.6413	0.1858	External growth rates	-0.0570	-0.4714	-0.1073	-0.3383
<i>(t+1/t+2)</i>	[0.3936]	[0.3087]**	[0.7417]	[0.8794]	<i>(t+1/t+2)</i>	[0.3895]	[0.3158]	[0.7003]	[0.8729]
Real Money Growth	-0.1560	-0.0566	-0.1459	-0.2157	Real Money Growth	-0.1258	-0.0822	-0.1571	-0.2118
<i>(t+1/t+2)</i>	[0.0486]***	[0.0901]	[0.0645]**	[0.0769]***	<i>(t+1/t+2)</i>	[0.0534]**	[0.0912]	[0.0742]**	[0.0803]***
Banking Crisis	0.0077	0.0102	0.0086	0.0191	Banking Crisis	0.0101	0.0081	0.0122	0.0195
(dummy)	[0.0121]	[0.0091]	[0.0194]	[0.0204]	(dummy)	[0.0118]	[0.0095]	[0.0197]	[0.0212]
IMF (dummy)	0.0494		0.0370	0.0752	IMF (dummy)	0.0477		0.0247	0.0546
	[0.0219]**		[0.0322]	[0.0382]*		[0.0215]**		[0.0316]	[0.0395]
Observations	111	45	66	54	Observations	110	45	65	54
(uncensored)	(68)	(30)	(38)	(31)	(uncensored)	(67)	(30)	(37)	(31)

Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%.

The estimates for the constant term and regional dummies are not reported. The figures shown in parentheses below the number of observations are the number of observations that are not censored in the Tobit regression estimation. An increase in real exchange rate overvaluation indicates a real overdepreciation.

Table 9: Post-Crisis Financial Openness and Institutional Factors

		Dependent Variable: Post-Crisis Aggregate Output Losses															
<i>with</i>		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
		Corruption				Law and Order				Bureaucratic Quality				All Three Institutional Variables			
		Full	IDC	LDC	EMG	Full	IDC	LDC	EMG	Full	IDC	LDC	EMG	Full	IDC	LDC	EMG
Fin. Openness		0.0007	-0.0037**	0.0048	0.0056 ^{11%}	0.0013	-0.0035**	0.0071*	0.0096**	0.0003	-0.0038**	0.0045	0.0060 ^{13%}	0.0002	-0.0035**	0.005	0.0076*
(<i>t/t+2</i>)		[0.0021]	[0.0016]	[0.0038]	[0.0035]	[0.0021]	[0.0017]	[0.0038]	[0.0039]	[0.0021]	[0.0016]	[0.0039]	[0.0038]	[0.0021]	[0.0017]	[0.0041]	[0.0039]
Corruption		-0.0008	-0.0002	-0.0014*	-0.0041***									-0.0003	0.0002	-0.0008	-0.0046**
		[0.0005]	[0.0004]	[0.0008]	[0.0013]									[0.0006]	[0.0006]	[0.0010]	[0.0018]
Law and Order						-0.0006	0.0000	-0.0012*	-0.0012					0.0000	0.0003	-0.0007	-0.0008
						[0.0005]	[0.0008]	[0.0007]	[0.0008]					[0.0006]	[0.0009]	[0.0008]	[0.0008]
Bureaucratic Quality										-0.0009**	-0.0005	-0.0012	-0.0013*	-0.0008	-0.0007	-0.0005	0.0007
										[0.0004]	[0.0004]	[0.0007]	[0.0007]	[0.0006]	[0.0006]	[0.0009]	[0.0010]
Observations		110	45	65	53	110	45	65	53	110	45	65	53	110	45	65	53

Table 10-1: Development in the Output Gap of the Economies with Post-Crisis Output Losses

	Full Sample					Industrialized Countries (IDC)				
	Dependent Variable: Average Output Gap from $t + 1$ to $t + k$					Dependent Variable: Average Output Gap from $t + 1$ to $t + k$				
	$t + 1$	$t + 2$	$t + 3$	$t + 4$	$t + 5$	$t + 1$	$t + 2$	$t + 3$	$t + 4$	$t + 5$
Fin. Openness (Avg. $t+1$ to $t+k$)	-0.0028 [0.0032]	0.001 [0.0026]	0.002 [0.0024]	0.0023 [0.0019]	0.0026 [0.0015]*	-0.0041 [0.0025]	-0.0016 [0.0022]	0.0012 [0.0018]	0.0001 [0.0015]	0.0006 [0.0013]
GDP per capita (t)	-0.0027 [0.0097]	-0.0022 [0.0085]	-0.0031 [0.0075]	-0.0026 [0.0058]	-0.0028 [0.0044]	-0.0029 [0.0160]	-0.0101 [0.0157]	-0.0097 [0.0124]	-0.011 [0.0104]	-0.0119 [0.0089]
Output gap (t)	0.4354 [0.1466]***	0.1264 [0.1245]	0.0032 [0.1092]	-0.0972 [0.0844]	-0.1243 [0.0637]*	0.4004 [0.1667]**	0.151 [0.1658]	-0.0843 [0.1304]	-0.2454 [0.1061]**	-0.2626 [0.0887]***
Trade openness (t)	0.0001 [0.0002]	0 [0.0001]	0 [0.0001]	-0.0001 [0.0001]	-0.0001 [0.0001]	0.0001 [0.0001]	0.0001 [0.0001]	0.0002 [0.0001]**	0.0003 [0.0001]***	0.0003 [0.0001]***
Budget Balance (Avg. $t+1$ to $t+k$)	0.0001 [0.0009]	0.0014 [0.0008]*	0.0017 [0.0008]**	0.0019 [0.0006]***	0.0013 [0.0005]***	-0.0008 [0.0007]	0.0001 [0.0007]	0.0006 [0.0006]	0.0009 [0.0005]	0.0011 [0.0005]**
Real Exchange Rate Overval. (Avg. $t+1$ to $t+k$)	0.0171 [0.0238]	0.0068 [0.0133]	0.0122 [0.0061]**	0.0089 [0.0075]	0.0074 [0.0081]	0.1545 [0.0370]***	0.1782 [0.0404]***	0.1499 [0.0275]***	0.1179 [0.0198]***	0.1343 [0.0239]***
External growth rates (Avg. $t+1$ to $t+k$)	-0.0912 [0.1557]	-0.0368 [0.1321]	0.1241 [0.1215]	0.0861 [0.1265]	0.1291 [0.1354]	0.0836 [0.1251]	-0.1256 [0.1596]	0.2087 [0.0799]***	-0.0221 [0.0872]	0.0351 [0.0989]
Real Money Growth (Avg. t to $t+k-1$)	0.0046 [0.0199]	0.0271 [0.0106]**	0.0166 [0.0140]	0.0265 [0.0143]*	0.0512 [0.0164]***	-0.0089 [0.0339]	0.0343 [0.0290]	0.0137 [0.0255]	0.0214 [0.0190]	0.0043 [0.0231]
Banking Crisis (dummy)	0.0019 [0.0084]	-0.0011 [0.0073]	-0.0024 [0.0066]	-0.0034 [0.0052]	-0.0041 [0.0040]	-0.0015 [0.0072]	-0.0007 [0.0070]	0.0008 [0.0055]	0.0031 [0.0046]	0.0021 [0.0041]
IMF (dummy)	-0.0195 [0.0161]	-0.0136 [0.0136]	-0.0127 [0.0121]	-0.0073 [0.0094]	-0.0055 [0.0071]	-	-	-	-	-
Observations	59	59	59	59	59	29	29	29	29	29

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

The estimates for the constant term and regional dummies are not reported. An increase in real exchange rate overvaluation indicates a real overdepreciation. There is no IDC observation which received an IMF-support and experienced a post-crisis output contraction.

Table 10-2: Development in the Output Gap of the Economies with Post-Crisis Output Losses

	Less Developed Countries (LDC)					Emerging Market Countries (EMG)				
	Dependent Variable: Average Output Gap from $t+1$ to $t+k$					Dependent Variable: Average Output Gap from $t+1$ to $t+k$				
	$t+1$	$t+2$	$t+3$	$t+4$	$t+5$	$t+1$	$t+2$	$t+3$	$t+4$	$t+5$
Fin. Openness (Avg. $t+1$ to $t+k$)	-0.0089 [0.0062]	-0.0039 [0.0050]	-0.0023 [0.0044]	0.0016 [0.0032]	0.0033 [0.0024]	-0.02 [0.0079]**	-0.013 [0.0057]**	-0.0134 [0.0050]***	-0.003 [0.0037]	0.003 [0.0030]
GDP per capita	-0.0003 [0.0148]	0.0009 [0.0127]	-0.0033 [0.0109]	-0.0038 [0.0076]	-0.0039 [0.0053]	-0.0234 [0.0196]	-0.0169 [0.0155]	-0.0259 [0.0121]**	-0.0167 [0.0090]*	-0.0071 [0.0068]
Output gap (t)	0.4838 [0.1998]**	0.1626 [0.1629]	0.1018 [0.1406]	0.0071 [0.0988]	-0.0599 [0.0692]	0.7435 [0.2639]***	0.374 [0.1935]*	0.4269 [0.1574]***	0.1803 [0.1169]	-0.0244 [0.0907]
Trade openness (t)	0.0003 [0.0003]	0.0001 [0.0002]	-0.0001 [0.0002]	-0.0002 [0.0002]	-0.0003 [0.0001]**	0.0012 [0.0005]**	0.0006 [0.0003]*	0.0004 [0.0003]	0 [0.0002]	-0.0003 [0.0002]*
Budget Balance (Avg. $t+1$ to $t+k$)	0.0026 [0.0019]	0.0035 [0.0016]**	0.0039 [0.0015]***	0.0041 [0.0010]***	0.0027 [0.0007]***	0.0049 [0.0023]**	0.0059 [0.0017]***	0.0079 [0.0017]***	0.0061 [0.0011]***	0.0035 [0.0008]***
Real Exchange Rate Overval. (Avg. $t+1$ to $t+k$)	0.0292 [0.0330]	0.0093 [0.0178]	0.0126 [0.0077]	0.003 [0.0083]	0.0001 [0.0086]	0.081 [0.0398]**	0.0259 [0.0199]	0.0235 [0.0080]***	0.0123 [0.0086]	0.0027 [0.0088]
External growth rates (Avg. $t+1$ to $t+k$)	-0.3007 [0.4022]	-0.0016 [0.2693]	0.2273 [0.2812]	0.4106 [0.2639]	0.6959 [0.2944]**	-0.4665 [0.4402]	0.0144 [0.3224]	-0.087 [0.2711]	0.0605 [0.2723]	0.5761 [0.3253]*
Real Money Growth (Avg. t to $t+k-1$)	-0.0055 [0.0303]	0.027 [0.0149]*	0.016 [0.0181]	0.0295 [0.0174]*	0.0648 [0.0193]***	0.0414 [0.0425]	0.0541 [0.0166]***	0.0563 [0.0244]**	0.0246 [0.0200]	0.0523 [0.0213]**
Banking Crisis (dummy)	0.0008 [0.0147]	-0.0005 [0.0123]	-0.0014 [0.0109]	-0.0047 [0.0078]	-0.0062 [0.0054]	-0.0165 [0.0172]	-0.0091 [0.0124]	-0.0036 [0.0100]	-0.0047 [0.0074]	-0.0057 [0.0055]
IMF (dummy)	-0.0225 [0.0222]	-0.0188 [0.0187]	-0.0197 [0.0165]	-0.0081 [0.0117]	-0.0029 [0.0081]	-0.0491 [0.0302]	-0.0578 [0.0226]**	-0.0725 [0.0193]***	-0.0435 [0.0140]***	-0.0206 [0.0105]**
Observations	30	30	30	30	30	25	25	25	25	25

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

The estimates for the constant term and regional dummies are not reported. An increase in real exchange rate overvaluation indicates a real overdepreciation.

Figure 1: Linkage of Financial Openness (or Liberalization), Currency Crises, and Post-crisis Output Losses

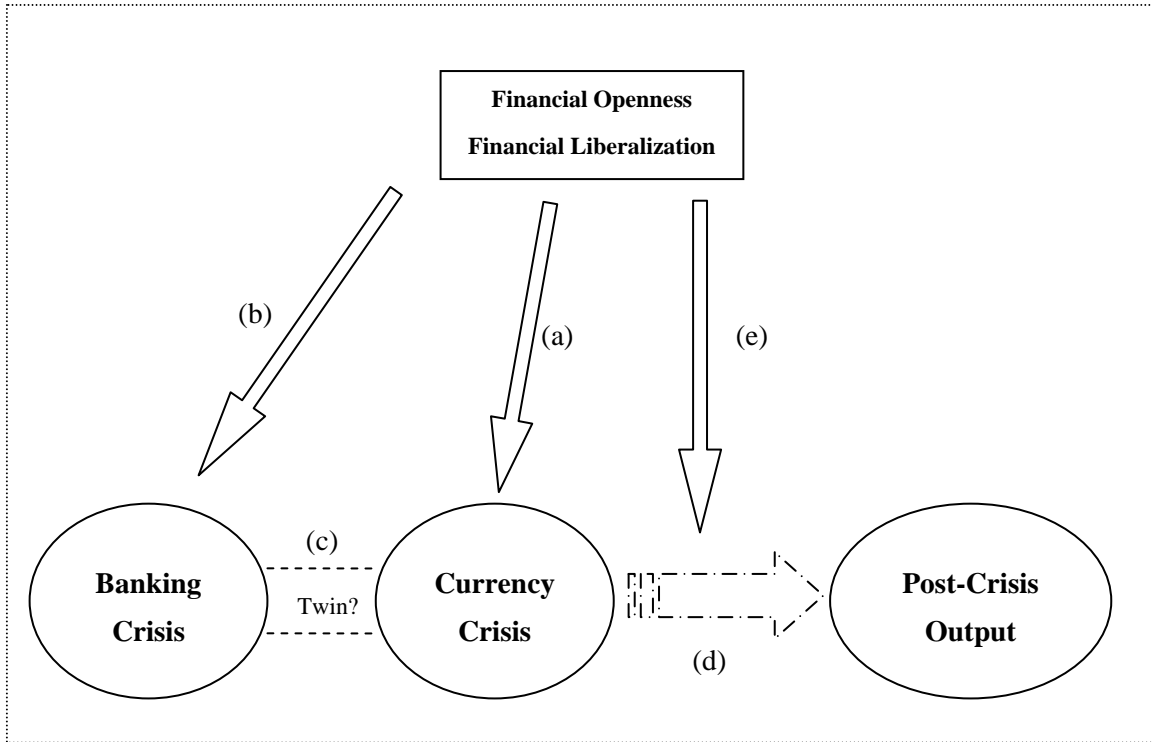


Figure 2: Output Gap Before and After the Crisis

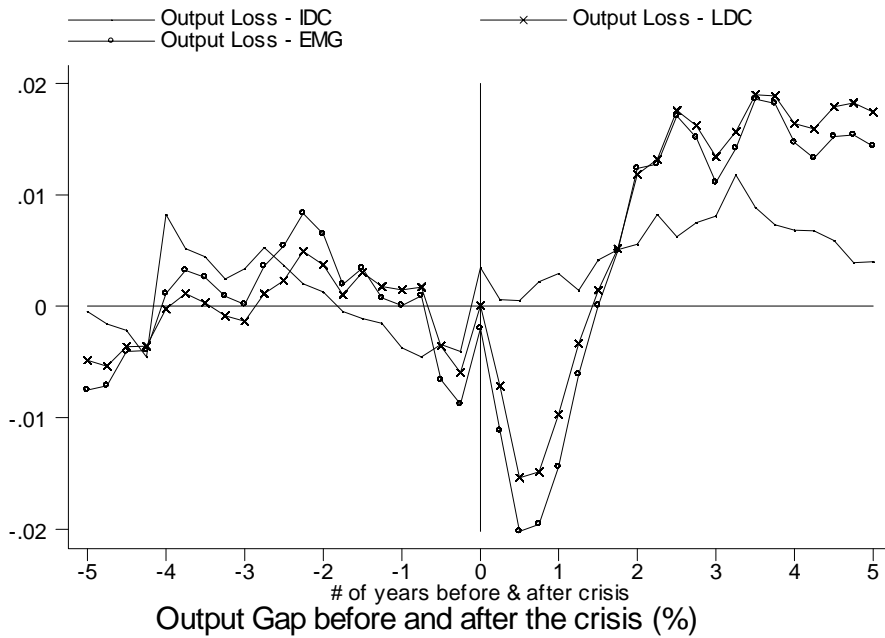


Figure3: Evolution of Financial Openness Among LDCs and EMGs

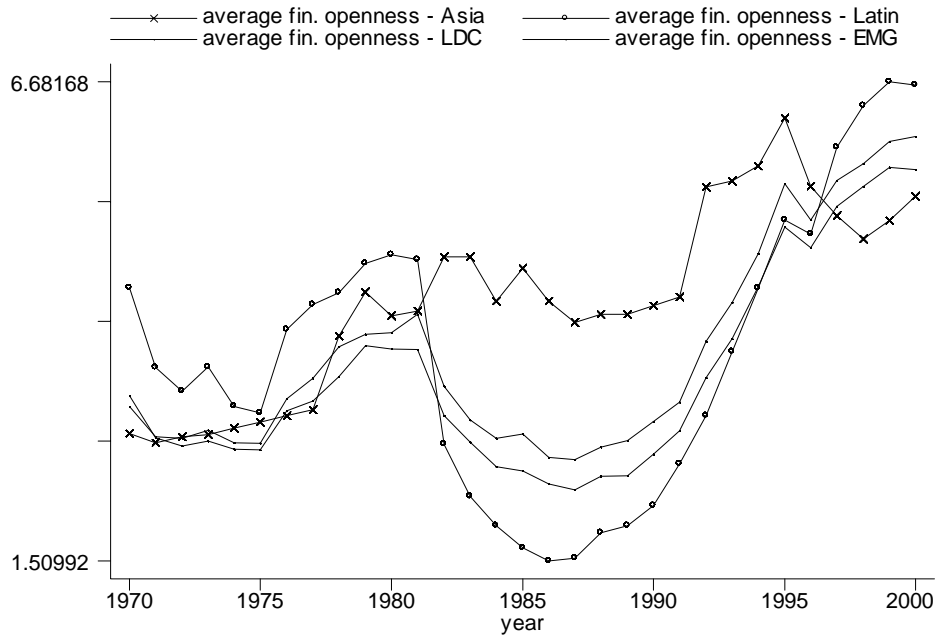


Figure 4: Change in Financial Openness Before and After the Crisis

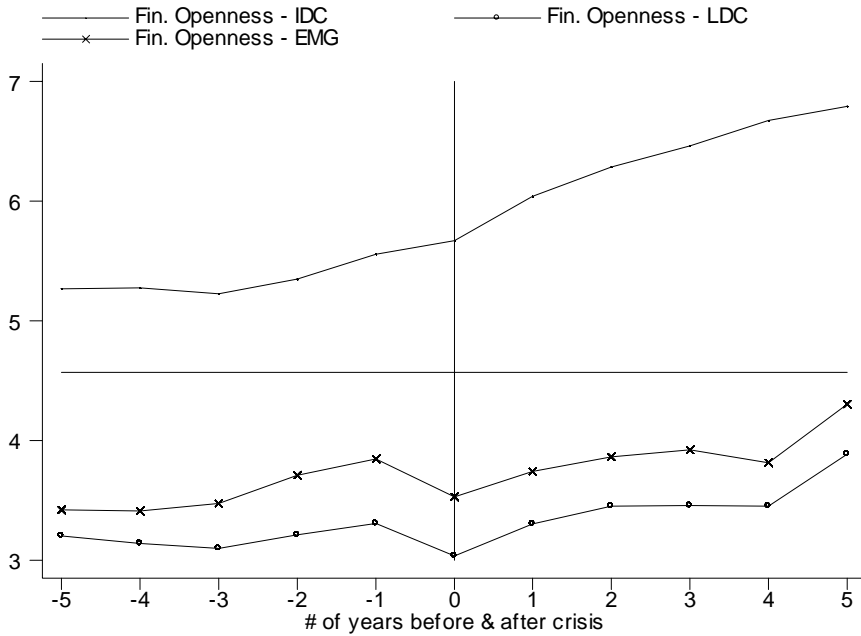


Figure 5-1: Comparison of Change in Financial Openness between Countries with and without Output Loss: Industrialized Countries (IDCs)

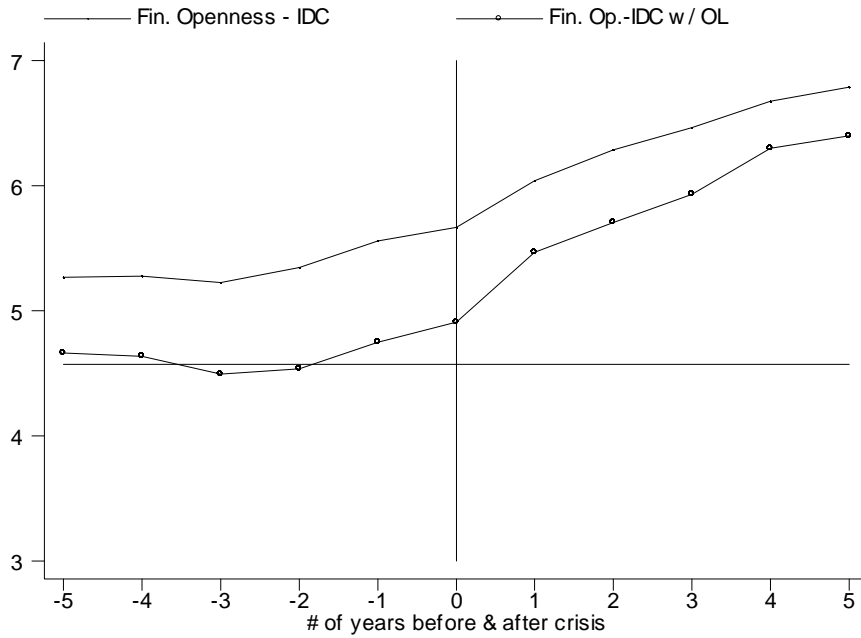


Figure 5-2: Comparison of Change in Financial Openness between Countries with and without Output Loss: Less Developed Countries (LDCs)

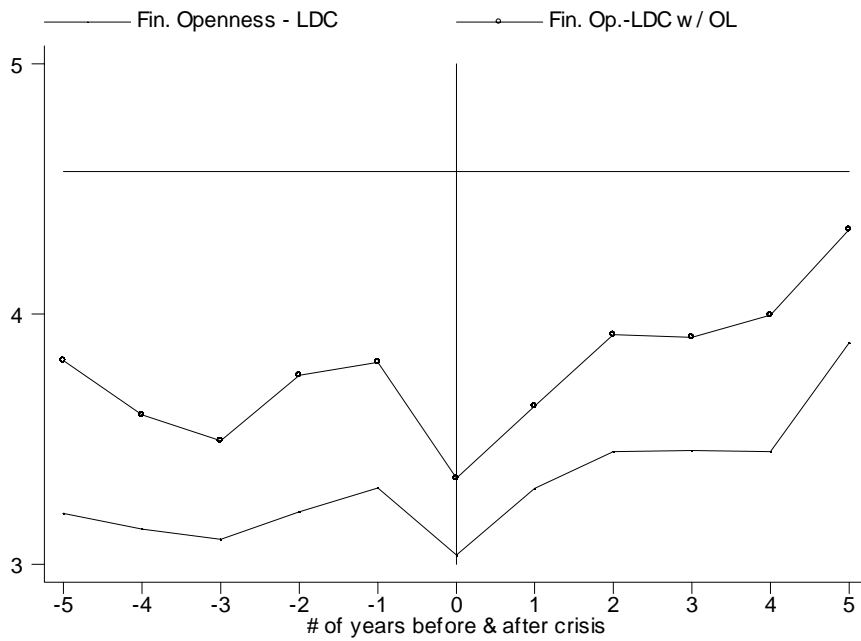


Figure 5-3: Comparison of Change in Financial Openness between Countries with and without Output Loss: Emerging Market Countries (EMGs)

