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Leonard K. Cheng

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ABSTRACT

This paper studies empirically the effects of financial crises on international trade. The major findings are that banking crises had a negative impact on imports but a positive impact on exports in the short term, whereas currency crises decreased imports in the short term and stimulated exports in the longer term.

Zihui Ma
Department of Economics
Hong Kong University of Science and Technology
Clear Water Bay
Hong Kong
mazihui@ust.hk

Leonard Cheng
Department of Economics
Hong Kong University of Science and Technology
Clear Water Bay
Hong Kong
leonard@ust.hk

The Effects of Financial Crises on International Trade*

Zihui Ma+ and Leonard K. Cheng#

Hong Kong University of Science and Technology

1 Introduction

The world suffered three major financial crises in the last ten years, namely, the European Monetary System (EMS) crisis in 1992-1993, the Mexican crisis in 1994-1995 (which spread to a number of South American countries) and the Asian crisis in 1997- 1998. Economists usually believe these crises were the results of weak economic fundamentals, e.g. declining foreign reserve, increasing foreign debt, capital account and current account deficits, government fiscal deficit and so on.

Obviously, a current account deficit can be a very important factor because, other things being equal, it increases foreign debt, decreases foreign reserves and weakens confidence in the exchange rate of the domestic currency. Almost all countries that suffered financial crises had faced rising current account deficits before the crises occurred. So such deficits are widely regarded as an important factor of financial crises.

International trade links play an important role in the so called "contagious effect", i.e., a crisis in one country causes a new crisis in another country with relatively good fundamentals. Glick and Rose (1999) provided some analysis of the relationship between trade and contagion; while Forbes (2001) went further to construct some statistics measuring the importance of trade linkages in transmitting crises.

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+ E-mail address: mazihui@ust.hk

E-mail address: leonard@ust.hk

Since most economists agree that international trade is one of the important factors in explaining financial crises, it seems natural and logical to ask the reverse question: what are the effects of financial crises on international trade? Surprisingly, little research on this subject has been done. Perhaps the reason is that the answer appears to be obvious. Conventional wisdom would predict that a financial crisis, by bringing about a recession in the macro economy, would lead to a drop in imports. Exports, however, may rise because of both a decline in domestic demand and devaluation of the domestic currency. A weakening or collapse of the financial system, in particular the banking system, however, might weaken the country's export capability. So the aggregate effects of a financial crisis on the macro economy are unclear. This paper tries to ascertain whether the ambiguity can be resolved empirically.

We divide all the past financial crises into two types: banking crisis and currency crisis. These two different types of crises had different attributes and different effects on international trade. This paper begins by analyzing theoretically the effects of banking and currency crises on international trade. Then it uses bilateral trade data, macroeconomic data and geographic data to test the theoretical predictions. Overall, the empirical results provide support for the theoretical predictions.

This paper contributes to the literature in two ways. First, it provides a theoretical framework for understanding the impact of financial crises on international trade and the channels of crises transmission through trade. Second, it estimates the effects of banking crises and currency crises on imports and exports. The estimated results can be used to predict the impact of financial crises on trade, thus providing useful information for risk management to policy makers.

The remainder of the paper is organized as follows. Section 2 reviews previous works on the relationship between international trade and financial crisis. Sections 3 and 4 analyze the effects of banking crises and of currency crises on trade respectively.

Section 5 describes the data and methods used to estimate the effects of these crises. Section 6 reports the results of empirical estimation and statistical testing. Section 7 concludes.

2 Literature Review: Trade and Financial Crises

Economists pay attention to the role played by trade in financial crises for two reasons. First, trade imbalance has been shown to be one of the important factors that trigger financial crises. Current deficits may decrease foreign reserves. As Krugman (1973) pointed out, a currency crisis is more likely to happen in an economy which does not have enough foreign reserves. Second, financial crises may be transmitted through trade linkages from an affected country to others despite the latter's relatively good fundamentals. In explaining such contagion effects, economists have tried to identify the channels through which contagion was spread. As trade is the most obvious economic linkage between countries, much research has been devoted to this connection. While the importance of trade imbalance in triggering crises is widely accepted, there is no agreement on the importance of trade in transmitting financial crises.

Eichengreen and Rose (1999) used a binary-probit model to test whether bilateral trade linkages transmitted crises between industrial countries between 1959 and 1993. They found that the probability of a financial crisis occurring in a country increased significantly if the country had high bilateral trade linkages with countries in crises. They concluded that trade was an important factor. Glick and Rose (1999) conducted a similar analysis with more countries between 1971 and 1997 and obtained a similar result. Forbes (2000) used company's stock market data to study the importance of trade in financial crises transmission and his result also showed that trade played an important role.

However, other papers have provided different answers to the problem. For instance, Goldfajn (1998) thought that trade was unimportant in the East Asian Crisis because the direct bilateral trade volumes between these economies were very small. Masson (1998), analyzing the Mexican crisis and the Asian crisis, obtained similar results.

All the papers that analyzed the relationship between trade and financial crises ignored the reverse question: how did financial crises affect international trade? We argue that the effects of financial crises on trade are a precondition for discussing whether trade transmits crises. If financial crises do not affect countries' imports and exports at all, how can financial crises be transmitted through the trade channel? So, before we analyze the importance of trade in transmitting financial crises, we need to clarify the effects of financial crises on international trade. As pointed out above, little work has been done on this topic to date. It seems there is a belief that financial crises only affect countries' imports and exports through changes in the exchange rates. Since the effects of exchange rates have already been thoroughly analyzed before, it may seem that there is no need to study the question. However, this view may not be correct.

A devaluation of a national currency will increase the volume of exports and reduce the volume of imports. Classic international trade theory shows that a devaluation improves the trade balance if the Marshall--Lerner condition is satisfied. Since in a financial crisis a country usually experienced a devaluation of its national currency, the same analysis would apply, i.e., the affected countries' imports will decrease but their exports will increase after the crises.

Furthermore, financial crises (including currency crises, banking crises or both) could also affect trade through channels besides the exchange rate. Reinhart (1999) pointed out that financial crises usually caused capital account reversal ("sudden stop") and triggered an economic recession. Mendoza (2001) showed that in an economy with imperfect credit markets these sudden stops could be an equilibrium outcome. The

economic recession reduces not only domestic demand, but also total output and export capability, whereas capital outflow forces the country to increase export. Thus, whether exports increase or decrease after financial crises is unclear without further analysis.

Before we analyze how financial crises affect the crisis countries' imports and exports, let us first define financial crises. Eichengreen and Bordo (2002) have provided definitions of currency crises and banking crises:

"For an episode to qualify as a currency crisis, we must observe a forced change in parity, abandonment of a pegged exchange rate, or an international rescue. For an episode to qualify as a banking crisis, we must observe either bank runs, widespread bank failures and suspension of convertibility of deposits into currency such that the latter circulates at a premium relative to deposits (a banking panic), or significant banking sector problems (including but not limited to bank failures) resulting in the erosion of most or all of banking system collateral that are resolved by a fiscally-underwritten bank restructuring."

The above definitions are adopted in this paper. In next two sections, we analyze the effects of banking crises and currency crises on the macro-economy and trade.

3 Impact of Banking Crises

A classical framework of bank runs was developed by Diamond and Dybvig (1983). Let us recapitulate the key elements of their model. Agents are endowed with goods which can be invested in a long term project or stored without costs. The long term project is profitable but illiquid, i.e., if investors do not liquidate the project before it matures, its return is greater than the initial investment; however, if the project is liquidated before it matures, the fire sale return is less than the initial investment. Each agent can be impatient or patient with fixed probabilities, but there is no aggregate uncertainty, i.e., the total number of impatient agents is fixed and known by all agents.

At the beginning, agents do not know their own types but must decide if they will invest in the project. After they have invested (or have decided not to invest) but before the project matures, each agent realizes his/her own type. Impatient agents must consume immediately whereas patient agents do not consume anything until the project matures. Agents' types are private information, so even if each agent knows his/her own type, other people do not know.

On the one hand, if an agent does not invest in the project but turns out to be patient, then he/she has missed a profitable investment opportunity. On the other hand, if he/she invests in the project but turns out to be impatient, he/she will have suffered a loss. In this case, he/she has to liquidate the long term investment before it matures.

Agents can improve their utilities by pooling risk through the creation of a bank. All agents deposit their goods in the bank. Depending to the number of impatient agents, the bank sets aside a part of deposits as reserves and invests the rest in the project. When agents realize their types, impatient agents withdraw their deposits from the bank's reserves and patient agents wait for the project to mature. After the project matures, the bank distributes the return of the project to patient agents. By way of pooling risk through the bank, impatient agents do not suffer fire sale losses and patient agents can enjoy the benefits of the project.

However, there is a problem because agents' types are private information. Patient can pretend to be impatient and withdraw their deposits before the project matures. Normally, they have no incentive to do so because withdrawing early decreases their utilities. However, patient agents may wish to withdraw their deposits if there is panic. When that happens, the bank's reserves will not be enough to meet the agents' demand. The bank has to liquidate the long term project before it matures, but it cannot meet the withdrawal if all patient agents try to withdraw because the fire sale return of the project is less than the initial investment. The result is a bank run and some agents get nothing

back.

The above is the classical framework of bank runs. It does not analyze the effect of bank runs on imports and exports. We extend this model to feature international trade by making four additional assumptions.

1. We assume that agents belong to two categories: local agents and foreign agents. Local agents are endowed with local goods and foreign agents are endowed with foreign goods. Both foreign and local agents may be patient or impatient with the same probability. Both local and foreign goods can be bought and sold in the international market.

2. The long term project needs both foreign and local goods as inputs, and it produces local goods. As the aggregate investment increases, the investment demand for local and foreign goods also increases. For simplicity, we assume that foreign agents' deposits are less than the investment demand for the foreign good. So the bank always has to export some local goods for the sake of importing foreign goods.

3. Foreign agents only consume foreign goods, and local agents consume both local and foreign goods. The returns that agents receive from the bank are local goods, so they need to exchange a part or all of the return for foreign goods in the international market.

4. There are overlapping generations. When the project matures, a new generation of agents appears. Like the previous generation, they deposit their goods in the bank and the bank invests deposits in a new long term project. We assume that the number of local agents is fixed but the number of foreign agents depends on the experience of the previous generation. If no bank run occurs in the previous generation, the number of new foreign agents will be the same. Otherwise, the number of new foreign agents will decrease, i.e., capital inflow decreases after a bank run.

We can analyze the impact of banking crises on imports and exports under the above

assumptions. If a bank run occurs before the project matures, all agents withdraw their deposits. Due to the illiquidity of the project, only some of them can get their deposits back. On the average, agents suffer losses. All foreign agents (with out a bank run, only impatient foreign agents) leave the economy bringing with them the withdrawal. After the banking crisis, capital inflow decreases. So banking crises affect international trade through three channels.

1. Income channel. If a bank run occurs, the bank has to liquidate the long term investment before it matures and all depositors suffer some losses. With a lower income, local agents' demand for foreign goods goes down. Through this channel, both imports and exports decrease during and after banking crises.

2. Foreign capital flow channel. In the absence of bank runs, patient foreign agents withdraw after the project matures, but the withdrawal would be offset by an inflow of new investment made by the next generation of foreign agents. However, a bank run causes them to withdraw early and also reduces new foreign investment in the future. So banking crises can stimulate exports during crises but reduces them after crises.

3. Investment demand channel. As aggregate investment decreases, the input demand for foreign goods drops. So banking crises have negative longer term effects on imports through this channel. On the other hand, as foreign investment decreases, the economy must export more local goods to import foreign goods as investment input. As a result, banking crises will simulate exports after crises.

The real world is more complicated than that highlighted in the above theoretical framework. For instance, developed countries usually may be able to save their banking systems when banking crises occurred, so net capital outflow might not happen. As a second example, some less-developed countries (e.g., some African countries) are unsuccessful in attracting a lot of foreign capital, so the impact of capital flow would be insignificant during banking crises. As a third example, several Latin American

countries (e.g., Mexico, Brazil and Venezuela) stopped repaying foreign debt during debt crises in 1980s, so the amount of net foreign capital outflow would be less than that suggested by the theoretical analysis.

4 Impact of Currency Crises

Currency crises often occur due to one of two reasons: run away fiscal deficits or external shocks. We analyze them in turn. As Krugman (1973) pointed out, if a government cannot control its budget deficit, it has to finance the deficit by printing money, thus triggering currency depreciation. The currency crises in Brazil, Mexico and Argentina would be a case in point.

An external shock (may be a currency crisis in another country) may cause the demand for local products to decrease in the international market. If the economy's exchange rate remains unchanged, it must experience a price deflation, which is often a painful process because cutting prices is difficult, and cutting the civil servants' salary may be particularly challenging. During a price deflation, firms usually suffer losses while unemployment rises. To minimize the social costs, the government may choose to give up the fixed exchange rate regime. A case in point would be the experience of Thailand, Malaysia, Taiwan and Singapore before and during the Asian financial crisis. These economies faced competition in their export market from China, and the devaluation of the Japanese Yen in 1996 worsened their trade position further. They discovered that their cost structures were too high to support their currencies, so they had to give up the fixed exchange rates despite their relatively good fundamentals. The Thai government gave up its fixed exchange rate in July 1997, triggering the Asian financial crisis. Even through Hong Kong's currency board was maintained, it paid a heavy price in the form of price deflation and fiscal deficit.

During a currency crisis, the exchange rate would be more uncertain. Importers and

exporters are exposed to greater exchange rate risk, and may choose to reduce their business to reduce their exposure. As a result, currency crises may have negative impacts on imports and exports in the short term.

In the longer term, the market equilibrium is gradually restored. However, imports and exports may not return to the original level because a currency crisis can produce persistent impact on imports and exports through three channels.

1. Income channel. This channel exists if a crisis is triggered by external shocks. As the demand for local products declines, the consumer's income falls. So both imports and exports decline.

2. Substitution effect channel. This channel exists if a crisis triggered by external shocks. As the relative price of local products decreases, consumers tend to increase their consumption of local product and decrease their demand for foreign goods, so both imports and exports decrease.

3. Wealth channel. Regardless of whether a currency devaluation is caused by a fiscal deficit or an external shock, consumers always suffer wealth losses due to money holdings, forcing consumers to decrease their consumption. As consumers' demand for foreign goods decreases, imports decrease; as their demand for local product decreases, other things being equal, the economy is able to export more.

If a devaluation is expected, consumers can reduce losses by reducing their money holdings. They can exchange domestic currency for foreign currency before the devaluation and then reverse the process after the devaluation. If the cash-in-advance constraint holds, their consumption would decrease during the devaluation as they reduce their money holding in anticipation of the devaluation. As a result, imports decrease and, if the price elasticity of demand for exports is larger than unity, the value of exports increases in the short term. After the devaluation, however, consumptions may return to the original level. So expected devaluations will have only short term

impact on imports and exports.

However, according to Eichengreen and Bordo (2002), currency crisis often occurred when governments abandoned their fixed exchange rates suddenly. The Mexico crisis was a good example. Before the abandonment of its fixed exchange rate, interest rate of Peso was relative low and the market did not predict the devaluation. In short, most currency crises were unexpected, and thus the impact on imports and exports through the wealth channel would be larger than if the crises were expected.

5 Data, Crises, and Estimation Model

Having analyzed in theory the effects of banking crises and currency crises on foreign trade, let us use real world data to test the above theoretical predictions.

The data include bilateral export value from 1981 to 1998 as contained in World Trade Database; GDP, population and exchange rate data between 1979 and 1998 as contained in the International Financial Statistics; distances, common land border, the number of the landlocked countries and the number of the island countries as contained in Frankel and Rose (2002)'s database. Eichengreen and Bordo (2002) have provided a list of financial crises found in the major economies (Table 1). We use the same list in our analysis because the included countries are sufficiently representative.

**** Table 1 here ****

We show the frequency of currency crises and banking crises in Figure 1 and 2, respectively. There were 128 currency crises between 1980 and 1998. As shown in Figure 1, the number of currency crisis peaked in 1982, 1986 and 1992, with more than 10 crises each year. In 1982, the debt crisis occurred in many Latin American countries, and five Latin American countries had currency crises. In addition, six other countries experienced currency crises due to high US interest rate. In 1986, there were 13 currency crises in both developed and developing countries, spreading over Asia,

Africa, Europe, North and South America. In 1992, many European countries quit EMS under speculative attacks. In 1997 and 1998, several Asian countries that had stable exchange rates for a long time, such as Malaysia and Korea, experienced currency crises, even though the frequency of currency crises was not significantly higher than the average level

**** Figure 1 here ****

**** Figure 2 here ****

According to Eichengreen and Bordo (2002)'s definition, currency crises do not always manifest themselves as currency devaluations. For instance, the Swedish Krona did not depreciate in 1992 but Sweden's central bank had to rely on an international rescue effort to defend its currency. Therefore, we regard that as a currency crisis. In contrast, while the Hong Kong dollar was attacked in 1997 and 1998, there was neither devaluation nor international rescue. Therefore, we do not classify that as a currency crisis. We classify currency crises that ended with devaluations as "successful" currency crises, and the others as "unsuccessful" currency crises. According to these definitions, 113 currency crises were successful and 15 were unsuccessful.

There were 53 banking crises between 1980 and 1998. From Figure 2 we can see that in 1981, 1987, 1994 and 1998, there were more than five crises each year. These peaks of banking crises were close to the peaks of currency crises.

If a banking crisis and a currency crisis occur in a country in the same year, we regard that as a "twin crisis." There were five twin crises during 1980-1998. This definition is not perfect, because it ignores some cases in which that banking crisis and currency crisis occurred closely but in subsequent calendar years.

We use bilateral trade data to test the theoretical predictions because we would like to isolate external effects that vary across countries. For example, if a country and its main trading partner fall into financial crises at the same time, the country's exports and

imports are affected by both internal and external shocks. However, we would not be able to include the external shock as explanatory variable if we use their aggregated (across countries) trade data. The use of bilateral trade data allows us to include the importing and exporting countries' crisis dummies as explanatory variables, thus avoiding biases caused by inappropriate use of dummies in analyzing aggregate trade data.

The gravity model is widely used to estimate bilateral trade value. The basic idea is that trade between any pair of countries is positively related to their economic sizes, but inversely related to the distance between them. Some other factors, such as common land border, can also affect bilateral trade value. This methodology has proven to be successful in explaining variations in bilateral trade. We extend the gravity model by including crisis variables. The regression equation to be adopted is as follows.

$$\log(export_{t,i,e}) = \lambda \cdot \log(export_{t-1,i,e}) + \theta_1 X_{t,i,e} + \theta_2 Y_{t-1,i,e} + \theta_3 Y_{t-2,i,e} + \theta_4 C_t + \theta_5 C_{t-1} + \theta_6 C_{t-2} + C + \gamma \cdot t + \varepsilon_{t,i,e}$$

where $\exp ort_{t,i,e}$ is exports from country e to country i at time t. As trade relationships take time to build and to break, we allow for the underlying continuity of trade over time by including $\log(\exp ort_{t-1,i,e})$ as an explanatory variable. $X_{t,i,e}$ is a set of macroeconomic variables that affect trade between country i and e at time t. Based on the gravity equation framework, X is taken to include the following variables: *igdp*, the log of GDP of the importing country; *egdp*, the log of GDP of the exporting country; *ipop*, the log of the population of importing country; *epop*, the log of the population of exporting country; *dis*, the log of the distance between importing and exporting countries; *comland*, a common land border dummy equal to 1 if the trading countries have a common land border and 0 otherwise; *nland*, the number of trading

countries being landlocked (i.e., 0, 1 or 2); $nisland$, the number of trading countries being islands countries (i.e., 0, 1, or 2); C is constant term; $idev_t = \log iex_t - \log iex_{t-1}$, the rate of devaluation of the importing country's currency relative to US dollar, where iex_t is the exchange rate (measured in domestic currency/ US dollar) of the importing country's currency at time t; $edev_t = \log eex_t - \log eex_{t-1}$, the rate of devaluation of the exporting country's currency relative to US dollar.

Since a currency devaluation has both short term and longer term effects, the explanatory variables $Y_{t-1,i,e}$ and $Y_{t-2,i,e}$ include the first and second lag of the devaluation variables, namely, $lagidev$, $lagedev$, $lag2idev$ and $lag2edev$.

To capture the possibility of time trends, we also include time t as an explanatory variable.

C_t, C_{t-1} and C_{t-2} are crisis dummy variables and their first and second lags. C_t includes bi_t, be_t, ci_t and ce_t, the banking crisis dummies of the importing and exporting countries, and the currency crisis dummies of the importing and exporting countries, respectively.

$bi_t = 0$ if country i does not fall into a banking crisis at time t;

1 otherwise.

$ce_t = 0$ if country i does not fall into a currency crisis at time t;

1 otherwise.

We analyze how financial crises affected foreign trade over a period of three consecutive years. The effects on trade during the crisis years are regarded as "short term" and the effects on trade one and two years after crises are regarded as "longer term." We do not consider lags in excess of two years because the major crises were not more than three years apart. For example, the EMS crisis (1992-93), the Mexican crisis

(1994-95) and the Asian crisis (1997-98).

6 Estimation Results and Statistical Tests

We divide the data into two groups: 1982-1990 and 1991-1998, and estimate separately regressions for each period. This allows us to compare the effects of financial crises in different periods.

6.1 Gravity Model with Lagged Dependent Variables and Rates of Devaluation

Before we examine the impact of financial crises, let us check the behavior of the gravity model with a lagged dependent variable and rates of devaluation, i.e.,

$$\log(\exp ort_{t,i,e}) = \lambda \cdot \log(\exp ort_{t-1,i,e}) + \theta_1 X_{t,i,e} + \theta_2 Y_{t-1,i,e} + \theta_3 Y_{t-2,i,e} + C + \gamma \cdot t + \varepsilon_{t,i,e}$$

where $X_{t,i,e}$ includes *igdp*, *egdp*, *ipop*, *epop*, *dis*, *comland*, *nland* and *nisland*. The devaluation variables are either omitted or included.

The estimation results when the devaluation variables are omitted are reported in the first two columns of Table 2. The model's fit is relatively good. In both periods, R^2 is greater than 0.93. Most coefficients are significant and their signs are consistent with theoretical predictions of the gravity model. An unstable result is time trend: it was significantly positive during 1982-1990 but significantly negative during 1991-1998. Since the volume of trade for all countries are expressed in U.S. dollars, the changing value of U.S. dollar over time may provide some clues. The value of the U.S. consumers' price index (CPI) increased by 41.5% during 1982-1990, but by 22.6% 1991-1998. So even if the time trend of the real value of exports were the same, the time trend of exports measured in current US dollars could be different.

Other differences between the two periods include the coefficients of *ipop*, *epop*, *comland* and *nland*. Although the signs of the coefficients for these population variables in both periods are negative, the absolute values decreased significantly in

1990s. The absolute values of the coefficients of *comland* and *nland* in 1991-1998 were higher than those in 1982-1990.

**** Table 2 here ****

Next, we add the rates of devaluation and their lags *idev* , *exdev* , *lagidev* , *lagedev* , *lag*2*idev* and *lag*2*edev* as explanatory variables. The results are reported in last two columns of Table 2.

The signs of all the newly added explanatory variables are identical in both periods. To understand the effects of devaluation, we draw impulse response functions in Figure 3.1 and 3.2 by considering devaluations of 50%, or equivalently by setting *idev* and *edev* equal to 0.4055.

**** Figure 3.1 here ****

**** Figure 3.2 here ****

In Figure 3.1 and 3.2, either in 1980s or in 1990s, devaluations had negative impact on imports. However, the impact was short-term. Except for the effects on GDP, imports almost fully recovered in the second year after the devaluation. In contrast, the impact of devaluations on exports was somewhat more complicated. In the year of devaluation, exports decreased, but a year later, exports rebounded significantly, only to decrease again in the second year after the devaluation.

The results are consistent with the theoretical predictions. If a devaluation is expected to occur, then consumers reduce their cash holdings to avoid loss, decreasing consumption, decreasing imports and increasing exports in the short term. After the devaluation, consumption rebounds so imports and exports return to the original level. The decrease in exports in the devaluation year may be due to the low price elasticity of exports in the short term, but the result that the longer term exports are less than the original level is hard to explain because it would be questionable whether the price

elasticity of demand for exports would remain less than unity two years after devaluation.

6.2 Adding Crisis Dummies

Now let us add financial crisis dummies to the regression equation. First, we include banking crisis dummy and currency crisis dummy separately. The results are reported in Table 3.

**** Table 3 here ****

The first two columns of Table 3 show that the impact of banking crises was unclear between 1982-1990. The short term effects on imports and exports were insignificant, and the longer term effects were negative but not always significant. The results for 1991-1998 were more significant. Imports decreased significantly in all three years. Exports increased in the crisis years but fell back in the first year after banking crisis.

Impulse response functions induced by the banking crisis dummy are presented in Figure 4.1 and 4.2. We focus on the results for 1991-1998 in Figure 4.2. The impact on imports not only was negative but also tended to decrease further.

**** Figure 4.1 here ****

**** Figure 4.2 here ****

The last two columns of Table 3 show the effects of currency crises, and the impulse response functions induced by the currency crisis dummies are showed in Figure 5.1 and 5.2. From the table and figures, we find that the effects on imports in the two periods were very similar. In both periods, imports decreased in all three years. However, the effects on exports in the two periods were somewhat different. In 1982-1990, there was a significant negative impact of currency crises on exports in the short term (i.e., the coefficients of ce_t and $lagce_{t-1}$ were significantly negative), and the negative impact was mitigated but not reversed in the second year after crises. In

stark contrast, the effects of currency crises on exports in 1991-1998 were significantly positive in all three years.

**** Figure 5.1 here ****

**** Figure 5.2 here ****

When all crisis dummies are included as explanatory variables, the results are reported in Table 4. The results for banking crises are very similar to those obtained above when currency crisis dummies were omitted (Table 3). In 1982-1990, the effects of banking crises were insignificant except for the coefficient of $lagbi_t$. Figure 6.1 shows impulse response functions induced by the banking crisis dummies. In 1991-1998, imports decreased and exports increased significantly in the short term, and both imports and exports decreased in the longer term. Comparing the impulse response functions in Figure 6.2 with Figure 4.2, we find that after controlling for the effects of currency crises, the accumulated impact of banking crises in the second year after crises was negative.

**** Table 4 here ****

**** Figure 6.1 here ****

**** Figure 6.2 here ****

The results for currency crises are similar to those obtained above when banking crisis dummies were omitted. In both periods, imports decreased in all three years. The impact of currency crises on exports was significant except that during the crisis year in 1982-1990. The impulse response functions for the currency crisis dummy during the two periods are given in Figure 7.1 and 7.2, respectively. In 1982-1990, exports decreased in the short term and remained below the original level despite a subsequent recovery. In 1991-1998, the short term effect on exports was insignificant and exports exceeded the original level beginning in the first year after currency crises. After

controlling the effects of banking crises, the impact of currency crises on exports was insignificant during the crisis years. So the significantly positive coefficient of ce_t in Table 3 seems to be the result of omitting the banking crisis dummies.

**** Figure 7.1 here ****

**** Figure 7.2 here ****

We summarize the theoretical predictions and empirical results about the impact of banking crises and currency crises in Table 5.1 and 5.2, respectively. Because the model includes GDP and devaluation as explanatory variables, the effects of the crisis dummies capture the effects of crises through channels other than economic recession or currency devaluation. Theoretical analysis predicts that exports increase during banking crises due to foreign outflow, and in the longer term changes in exports depend on the aggregate effect through the foreign capital flow channel and the investment demand channel; imports would decrease due to reduction in investment demand.

**** Table 5.1 here ****

**** Table 5.2 here ****

In 1982-90, the empirical results for banking crises do not support the theoretical predictions. In particular, there was no increase in exports during banking crises. Perhaps the theoretical predictions were inappropriate for this period because many developing countries stopped repaying foreign debts when they struggled with the financial crises. Furthermore, the amount foreign capital flow into less developed economies was relatively modest.

The empirical results for 1991-1998 were broadly consistent with theoretical predictions. The negative longer term effect of banking crises on imports is as predicted. Although the theories predict the short term effect on imports to be insignificant, the empirical negative impact on imports during crisis years may be due to the use of

annual data (as opposed to quarterly or monthly data), which might have been influenced by the longer term effects. The positive impact on exports in the short term is consistent with the theoretical prediction about the effect of capital outflow. The results that exports decreased in the longer term (the second year after crisis) implies that the negative effect via capital flow channel overwhelmed the positive effect through investment demand channel.

Theoretical analysis predicts that currency crises had negative impact on imports both in the short term (due to market chaos) and the longer term (due to wealth loss plus substitution effect if crisis was triggered by external shocks). The short term effect on exports are negative, but the longer term effect was ambiguous because the positive effect via the wealth channel ran counter to the negative effect via the substitution effect if the crisis was triggered by external shocks.

Comparing the empirical results of currency crises with the theoretical predictions, we discover three phenomena. First, consistent with theoretical predictions, the impact of currency crises on imports were negative in both the short term and the longer term. Second, the short term effect via market chaos channel in 1991-1998 was weaker than that in 1982-1990, so exports decreased significantly in crisis years in 1982-1990 but did not change significantly in 1991-1998. Third, in 1982-1990, exports after the crisis recovered but still remained below the original level. We are not certain whether it was due to a weakening of the short term effect or if the longer term effect had kicked in. In contrast, in 1991-1998, exports increased significantly after currency crises, implying that the impact via the wealth channel overwhelmed the impact through the substitution effect channel. Generally, the empirical results in both periods are broadly consistent with theoretical predictions.

6.3 Twin Crises, Successful and Unsuccessful Crises

Let us check for the effects of twin crises by adding a twin crisis dummy

$tc_t = bi_t \times ci_t$ and its first and second lags. Clearly $tci_t = 1$ if and only if both bi_t and ci_t are equal to 1.

The estimation results are listed in Table 6. Most coefficients of the twin crisis dummy variables are insignificant even though the values of the coefficients are not small in relative terms.

**** Table 6 here ****

As we pointed out above, currency crises may be "successful" or "unsuccessful". Since currency devaluations did not occur in unsuccessful currency crises, their impact could be different from that of successful crises. We separate the currency crisis dummies into two more refined groups of variables: sc stands for a successful currency crisis (i.e., both currency crisis and devaluation happen); fc stands for an unsuccessful currency crisis (i.e., a currency crisis without devaluation). The results are reported in Table 7. Since most currency crises were successful, it is not surprising that the coefficients of *sc* are close of those of c in Table 4. We find that the longer term effects of unsuccessful currency crises were unclear: almost all coefficients of *lagfc* and $lag2\,fc$ are insignificant. However, the short term effects of unsuccessful crises in the two periods were different. In 1982-1990, imports did not change significantly but exports decreased significantly after an unsuccessful currency crisis. However, in 1991-1998, an unsuccessful currency had negative effects on imports but positive effects on exports. Most of the other coefficients were not affected by the separation into two different currency crisis variables.

**** Table 7 here ****

6.4 How large are the effects on trade

Since the variables are expressed in logarithmic terms, we can compute the size of the effects from the regression results contained in Table 5 and using the impulse

response functions in Figure 6 and 7. In 1991-1998, a country's imports on average would decline by about 9.7% during the year in which a banking crisis occurred, by 13% in the first year after crises, by 14.5% in the subsequent year; exports would increase by about 8.8% during the crisis year, by 5% in the first year after crisis, but decrease by 2% in the second year after crisis. The country's imports would drop by about 4.3% during the year in which a successful currency crisis occurred, by 9.7% and 12.4% in the subsequent two years, respectively; exports would increase by about 0.5% (insignificant) during the crisis year, by about 5% and 9% in the two subsequent years after crises, respectively. The results show that the impact of financial crises on international trade was very strong.

7 Conclusions and Directions for Further Research

We have analyzed how financial crises affected international trade in the last two decades, an important question largely ignored by the literature. Our theoretical analysis predicts that imports will decrease during and after a banking crisis, whereas exports will rise during but fall after the crisis. Theoretical analysis predicts imports and exports will fall during currency crises but the effect after the crisis depends on the source of external shocks. By estimating a model of bilateral trade between 50 countries over a period of 19 years with real world data, we have found that the empirical results are generally consistent the theoretical predictions, especially in 1991-1998. The empirical results also show that after currency crises exports increased more significantly in 1991-1998 than that in 1982-1990. That may be a clue of "contagious crisis" in the last decade.

This paper has focused on the value of trade, but an alternative measure would be the volume of trade. In addition, the impact of financial crises on different tradable goods may be different. It would be interesting to explore whether the relationships between

trade and financial crisis varied systematically across different products. For instance, products that enjoyed a comparative advantage versus those that suffered a comparative disadvantage.

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Table 1 Country List and Crisis Frequency (1980-1998)

	Banking crisis frequency	Currency crisis frequency		Banking crisis frequency	Currency crisis frequency
Argentina	4	6	Japan	1	0
Australia	1	2	Korea Rp	2	3
Austria	0	0	Malaysia	2	2
Bangladesh	1	2	Mexico	2	6
Belgium-Lux	0	1	Netherlands	0	1
Brazil	2	3	New Zealand	1	3
Canada	0	2	Nigeria	1	6
Chile	1	2	Norway	1	1
China	0	4	Pakistan	0	5
Colombia	1	0	Paraguay	1	3
Costa Rica	1	1	Peru	1	4
Denmark	1	2	Philippines	2	5
Ecuador	1	5	Portugal	0	1
Egypt	2	1	Singapore	1	1
Finland	1	3	South Africa	1	7
France	1	1	Spain	0	3
Germany	0	0	Sri Lanka	1	0
Greece	0	2	Sweden	1	1
Hong Kong	2	0	Switzerland	0	0
Iceland	0	2	Thailand	3	2
India	1	2	Turkey	3	4
Indonesia	3	4	UK	0	2
Ireland	0	2	Uruguay	1	3
Israel	0	0	USA	1	1
Italy	1	2	Venezuela	2	4
Jamaica	0	4	Zimbabwe	1	7

Table 2: gravity equation without crisis dummies.

	1982-1990	1991-1998	1982-1990	1991-1998
Lag export	0.87089 (0.00323)***	0.86802 (0.00318)***	0.86957 (0.00323)***	0.86896 (0.00319)***
igdp	0.13928 (0.00532)***	0.11356 (0.00478)***	0.13255 (0.00532)***	0.11274 (0.00481)***
egdp	0.14958 (0.00576)***	0.13325 (0.00518)***	0.15153 (0.00584)***	0.13073 (0.00523)***
ipop	-0.02198(0.00432)***	-0.00774 (0.00365)**	-0.01444 (0.00434)***	-0.00794 (0.00371)**
epop	-0.03737 (0.00443)***	-0.00831 (0.00368)**	-0.03899 (0.00446)***	-0.00613 (0.00374)***
idev			-0.18552 (0.01417)***	-0.07608 (0.02107)***
edev			-0.04551 (0.01411)***	-0.05185 (0.02113)***
lagidev			-0.06591 (0.01708)***	-0.03792 (0.01838)**
lagedev			0.06308 (0.01700)***	0.06076 (0.01840)***
lag2idev			0.19746 (0.02029)***	0.09049 (0.01316)***
lag2edev			-0.02290 (0.02011)	-0.04737 (0.01311)***
dis	-0.13329 (0.00764)***	-0.11617 (0.00703)***	-0.12433 (0.00765)***	-0.11599 (0.00703)***
comland	0.04533 (0.03067)	0.11118 (0.02800)***	0.08437 (0.03081)***	0.10838 (0.02813)***
nland	-0.00637 (0.01469)	-0.09191 (0.01320)***	-0.01318 (0.01469)	-0.09007 (0.01320)***
nisland	0.05365 (0.00959)***	0.03890 (0.00870)***	0.04458 (0.00968)***	0.03878 (0.00874)***
year	0.01406 (0.00202)***	-0.01277 (0.00201)***	0.01496 (0.00202)***	-0.01265 (0.00206)***
Observations	21500	20084	21500	20084
R^2	0.9317	0.9468	0.9326	0.947

***, ** and * indicate significance at 1, 5 and 10 percent levels respectively.

Table 3 Estimation results with separate crisis dummies

	1982-1990	1991-1998	1982-1990	1991-1998
Lag export	0.86976 (0.00323)***	0.86851 (0.00318)***	0.86849 (0.00323)***	0.86890 (0.00319)***
igdp	0.13149 (0.00533)***	0.11327 (0.00480)***	0.12863 (0.00538)***	0.10831 (0.00484)***
egdp	0.15080 (0.00585)***	0.13190 (0.00522)***	0.15098 (0.00586)***	0.13325 (0.00526)***
ipop	-0.01478 (0.00434)***	-0.00371 (0.00376)	-0.01154 (0.00436)***	-0.00109 (0.00383)
epop	-0.03950 (0.00446)***	--0.00734 (0.00378)*	-0.03819 (0.00447)***	-0.01016 (0.00386)***
idev	-0.18671 (0.01426)***	-0.06225 (0.02115)***	-0.16387 (0.01501)***	-0.07087 (0.02141)***
edev	-0.04301 (0.01421)***	-0.06271 (0.02124)***	-0.03050 (0.01494)**	-0.05268 (0.02147)***
lagidev	-0.05899 (0.01718)***	-0.01953 (0.01871)	-0.05678 (0.01830)***	-0.02099 (0.01927)
lagedev	0.06588 (0.01711)***	0.05136 (0.01877)***	0.07026 (0.01825)***	0.05198 (0.01928)***
lag2idev	0.19066 (0.02039)***	0.08434 (0.01346)***	0.19057 (0.02114)***	0.09188 (0.01374)***
lag2edev	-0.02843 (0.02021)	-0.03143 (0.01344)**	-0.03533 (0.02099)*	-0.05060 (0.01367)***
bi	0.01191 (0.02405)	-0.12165 (0.02079)***		
be	-0.02214 (0.02382)	0.10471 (0.02077)***		
lagbi	-0.07878 (0.02238)***	-0.08646 (0.02183)***		
lagbe	-0.02052 (0.02231)	-0.01553 (0.02208)		
lag2bi	-0.02929 (0.02294)	-0.04187 (0.02201)*		
lag2be	-0.04835 (0.02293)**	-0.06378 (0.02227)***		
ci			-0.09436 (0.01609)***	-0.07649 (0.01446)***
ce			-0.07407 (0.01617)***	0.03537 (0.01441)**
lagci			-0.07638 (0.01583)***	-0.08108 (0.01498)***
lagce			-0.04656 (0.01595)***	0.04742 (0.01496)***
lag2ci			-0.00918 (0.01551)	-0.03020 (0.01512)**
lag2ce			0.03137 (0.01558)**	0.02885 (0.01521)*
dis	-0.12227 (0.00512)***	-0.11668 (0.00702)***	-0.12028 (0.00766)***	-0.11711 (0.00704)***
comland	0.08925 (0.03083)***	0.10719 (0.02808)***	0.08780 (0.03076)***	0.10574 (0.02811)***
nland	-0.01821 (0.01477)	-0.08939 (0.01317)***	-0.00716 (0.01468)	-0.09212 (0.01318)***
nisland	0.04177 (0.00971)***	0.04011 (0.00874)***	0.04648 (0.00967)***	0.03844 (0.00874)***
year	0.01378 (0.00204)***	-0.01328 (0.00206)***	0.01224 (0.00204)***	-0.01330 (0.00207)***
Observations	21500	20084	21500	20084
R^2	0.9327	0.9473	0.9329	0.9472

***, ** and * indicate significance at 1, 5 and 10 percent levels respectively.

Table 4 Estimation results with both kinds of crisis

	1982-1990	1991-1998
Lag export	0.86863 (0.00323)***	0.86844 (0.00318)***
igdp	0.12788 (0.00538)***	0.10963 (0.00485)***
egdp	0.15057 (0.00587)***	0.13468 (0.00527)***
ipop	-0.01186 (0.00436)***	0.00060652 (0.00384)
epop	-0.03861 (0.00447)***	-0.01081 (0.00387)***
idev	-0.16730 (0.01516)***	-0.06468 (0.02145)***
edev	-0.02874 (0.01509)*	-0.05658 (0.02153)***
lagidev	-0.04889 (0.01846)***	-0.01034 (0.01951)
lagedev	0.07141 (0.01842)***	0.04303 (0.01955)**
lag2idev	0.18519 (0.02121)***	0.08749 (0.01396)***
lag2edev	-0.03832 (0.02106)*	-0.03564 (0.01392)***
bi	0.00727 (0.02414)	-0.09415 (0.02212)***
be	-0.02139 (0.02391)	0.09248 (0.02210)***
lagbi	-0.07255 (0.02267)***	-0.05597 (0.02255)**
lagbe	-0.01203 (0.02259)	-0.03449 (0.02286)
lag2bi	-0.00815 (0.02318)	-0.02217 (0.02234)
lag2be	-0.03053 (0.02319)	-0.07947 (0.02261)***
ci	-0.08686 (0.01632)***	-0.04932 (0.01553)***
ce	-0.07142 (0.01641)***	0.01902 (0.01548)
lagci	-0.07985 (0.01599)***	-0.06788 (0.01535)***
lagce	-0.04558 (0.01611)***	0.05128 (0.01535)***
lag2ci	-0.01080 (0.01560)	-0.03417 (0.01528)**
lag2ce	0.02943 (0.01568)*	0.04003 (0.01538)***
dis	-0.11827 (0.00770)***	-0.11733 (0.00704)***
comland	0.09122 (0.03078)***	0.10606 (0.02808)***
nland	-0.01102 (0.01477)	-0.09101 (0.01317)***
nisland	0.04454 (0.00971)***	0.03987 (0.00875)***
year	0.01150 (0.00205)***	-0.01366 (0.00207)***
Observations	21500	20084
R^2	0.9329	0.9474

***, ** and * indicate significance at 1, 5 and 10 percent levels respectively.

Table 5.1 The effects of banking crisis on trade

	Theoretical prediction				Empirical results	
	Income channel	Foreign capital flow channel	Investment demand channel	Aggregate effects (except income channel)	1982-90	1991-98
Imports (short)	-			?	?	-
Imports (longer)	-		-	-	?	-
Exports (short)	-	+		+	?	+
Exports (longer)	-	-	+	?	?	-
? means unclear or insignificant.						

Table 5.2 The effects of currency crisis on trade

	Theoretical prediction					Empirical results	
	Market chaos channel	Income channel	Substitution effect channel	Wealth channel	Aggregate effects (except income channel)	1982-90	1991-98
Imports (short)	-				-	-	-
Imports (longer)		-	-	-	-	-	-
Exports (short)	-				-	-	?
Exports (longer)		-	-	+	?	-*	+

? means unclear or insignificant.
* Accumulated effect was negative but tended to increase.

Table 6 Estimation results with twin crisis dummies

	1982-1990	1991-1998
Lag export	0.86877 (0.00323)***	0.86833 (0.00319)***
igdp	0.12765 (0.00539)***	0.10960 (0.00486)***
egdp	0.15061 (0.00588)***	0.13460 (0.00528)***
ipop	-0.01171 (0.00436)**	0.00089734 (0.00386)
epop	-0.03865 (0.00447)***	-0.01044 (0.00389)***
idev	-0.15667 (0.01608)***	-0.06641 (0.02161)***
edev	-0.02151 (0.01599)	-0.05560 (0.02235)**
lagidev	-0.06552 (0.02035)***	-0.01134 (0.01960)
lagedev	0.06187 (0.02025)***	0.04110 (0.01991)**
lag2idev	0.19037 (0.02133)***	0.08756 (0.01407)***
lag2edev	-0.03601 (0.02118)*	-0.03680 (0.01405)***
bi	0.01752 (0.02575)	-0.08838 (0.03191)***
be	-0.00993 (0.02551)	0.10311 (0.02815)***
lagbi	-0.08615 (0.02356)***	-0.06949 (0.03000)**
lagbe	-0.02074 (0.02350)	-0.03919 (0.03070)
lag2bi	0.00052686 (0.02373)	-0.02985 (0.02743)
lag2be	-0.03660 (0.02376)	-0.09457 (0.02784)***
ci	-0.08610 (0.01643)***	-0.04906 (0.01673)***
ce	-0.06722 (0.01653)***	0.02059 (0.01613)
lagci	-0.08321 (0.01607)***	-0.07232 (0.01629)***
lagce	-0.04637 (0.01620)***	0.04860 (0.01631)***
lag2ci	-0.00878 (0.01570)	-0.03609 (0.01617)**
lag2ce	0.02657 (0.01578)*	0.03514 (0.01628)**
tci	-0.07250 (0.07379)	-0.01222 (0.04424)
tce	-0.08419 (0.07263)	-0.02618 (0.04281)
lagtci	0.17891 (0.09067)**	0.03273 (0.04514)
lagtce	0.10041 (0.08874)	0.01055 (0.04540)
lag2tci	-0.13564 (0.11350)	0.02193 (0.04579)
lag2tce	0.16103 (0.11235)	0.04215 (0.04627)
dis	-0.11825 (0.00770)***	-0.11755 (0.00705)***
comland	0.09047 (0.03078)***	0.10623 (0.02808)***
nland	-0.01042 (0.01478)	-0.09064 (0.01321)***
nisland	0.04481 (0.00971)***	0.04019 (0.00878)***
year	0.01148 (0.00207)***	-0.01389 (0.00210)***
Observations	21500	20084
R^2	0.933	0.9474

***, ** and * indicate significance at 1, 5 and 10 percent levels respectively.

Table 7 Estimation results with both "successful" and "unsuccessful" currency crisis dummies

	1982-1990	1991-1998
Lag export	0.86855 (0.00324)***	0.86796 (0.00320)***
igdp	0.12621 (0.00547)***	0.11027 (0.00488)***
egdp	0.15203 (0.00598)***	0.13519 (0.00530)***
ipop	-0.01021 (0.00443)**	0.00029741 (0.00385)
epop	-0.03987 (0.00456)***	-0.01036 (0.00388)***
idev	-0.16159 (0.01536)***	-0.06904 (0.02209)***
edev	-0.02700 (0.01528)*	-0.04247 (0.02218)*
lagidev	-0.04797 (0.01872)**	-0.00798 (0.01975)
lagedev	0.07718 (0.01865)***	0.03514 (0.01978)*
lag2idev	0.18412 (0.02152)***	0.08705 (0.01400)***
lag2edev	-0.05234 (0.02136)**	-0.03529 (0.01395)**
bi	0.00495 (0.02417)	-0.09108 (0.02233)***
be	-0.02285 (0.02395)	0.08417 (0.02231)***
lagbi	-0.07791 (0.02281)***	-0.05444 (0.02268)**
lagbe	-0.00509 (0.02274)	-0.04039 (0.02298)*
lag2bi	-0.00653 (0.02327)	-0.02153 (0.02238)
lag2be	-0.03390 (0.02329)	-0.08059 (0.02265)***
sci	-0.10246 (0.01748)***	-0.04392 (0.01641)***
sce	-0.06925 (0.01757)***	0.00505 (0.01636)
lagsci	-0.08581 (0.01741)***	-0.06681 (0.01585)***
lagsce	-0.05739 (0.01751)***	0.05068 (0.01586)***
lag2sci	-0.01370 (0.01704)	-0.03521 (0.01570)**
lag2sce	0.05255 (0.01709)***	0.04344 (0.01580)***
fci	0.01289 (0.04149)	-0.08822 (0.04050)**
fce	-0.10889 (0.04199)***	0.11401 (0.04028)***
lagfci	-0.05894 (0.03678)	-0.06386 (0.06416)
lagfce	0.01192 (0.03759)	-0.00087749 (0.06417)
lag2fci	0.01488 (0.03678)	-0.00998 (0.06430)
lag2fce	-0.08725 (0.03752)**	-0.00735 (0.06431)
dis	-0.11826 (0.00770)***	-0.11804 (0.00705)***
comland	0.09110 (0.03077)***	0.10594 (0.02808)***
nland	-0.01006 (0.01485)	-0.09101 (0.01318)***
nisland	0.04415 (0.00971)***	0.04004 (0.00876)***
year	0.01141 (0.00206)***	-0.01402 (0.00214)***
Observations	21500	20084
R^2	0.933	0.9474

***, ** and * indicate significance at 1, 5 and 10 percent levels respectively.

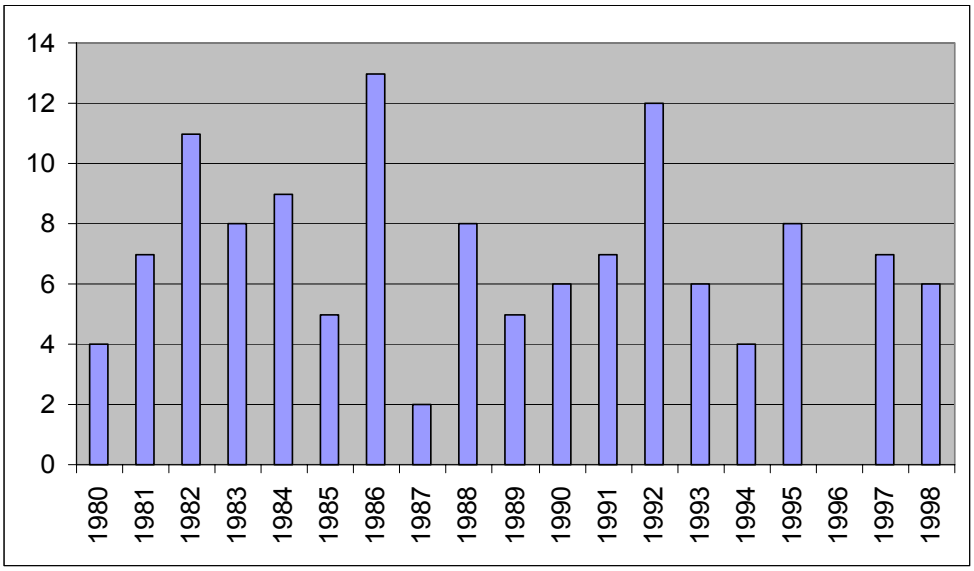

Figure 1: Histogram of Currency Crises: 1980-1998

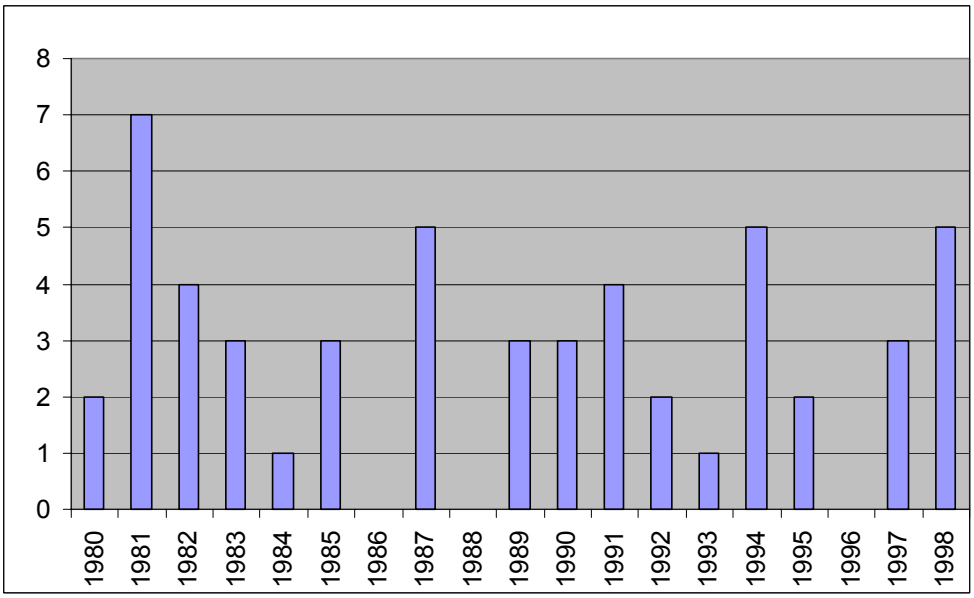

Figure 2: Histogram of Banking Crises: 1980-1998

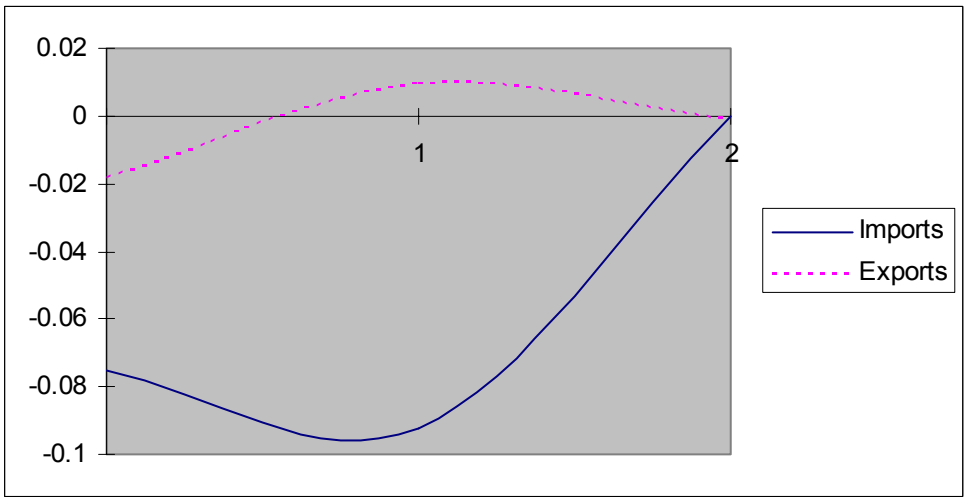

Figure 3.1: Impulse response functions induced by devaluation: 1982-1990

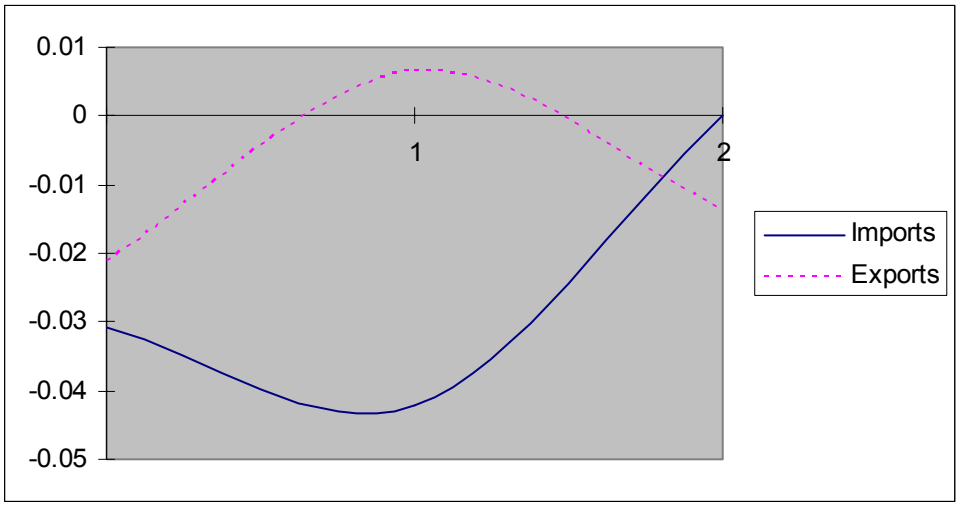

Figure 3.2: Impulse response functions induced by devaluation: 1991-1998

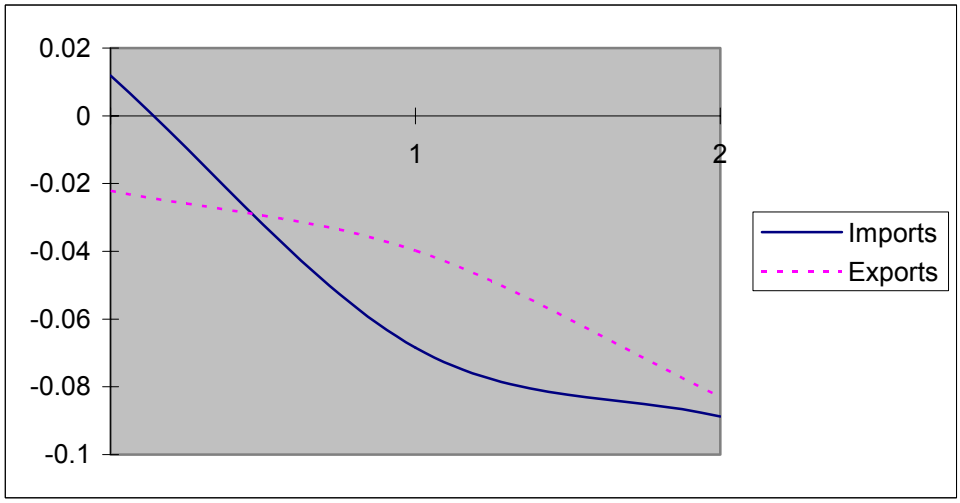

Figure 4.1 Impulse response functions induced by banking crisis (without currency crisis dummies): 1982-1990

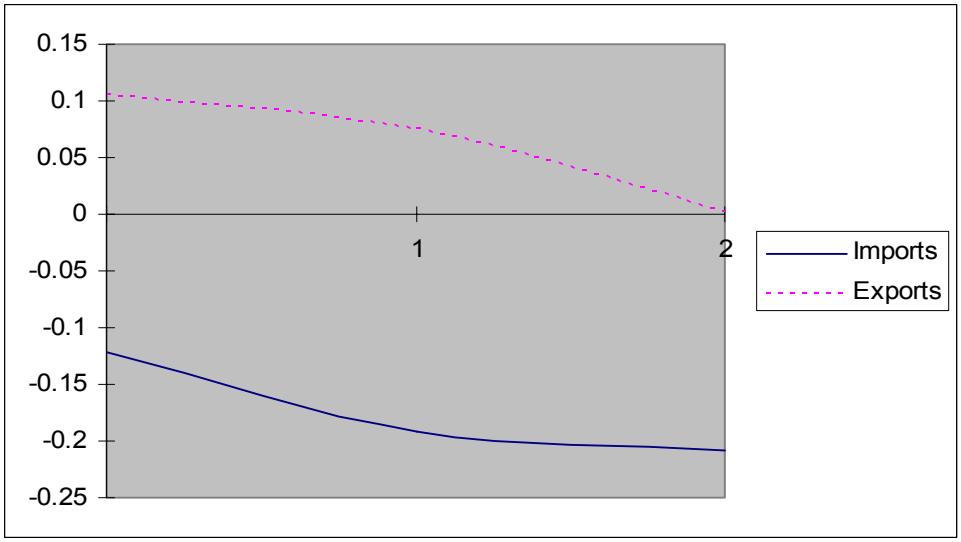

Figure 4.2 Impulse response functions induced by banking crisis (without currency crisis dummies): 1991-1998

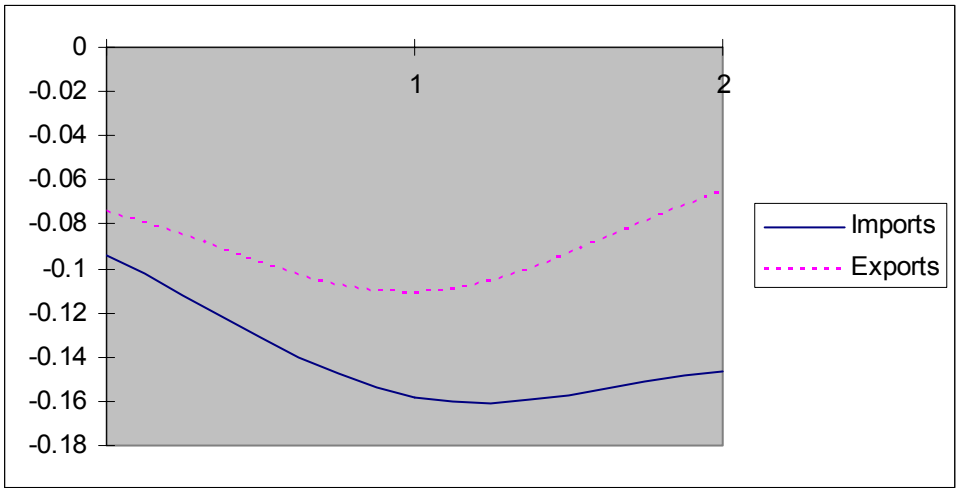

Figure 5.1 Impulse response functions induced by currency crisis (without banking crisis dummies): 1982-1990

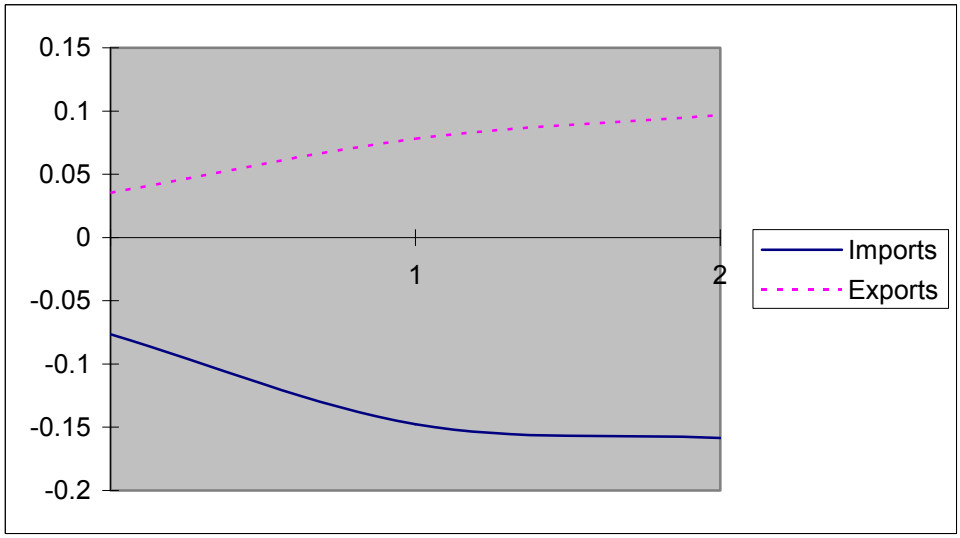

Figure 5.2 Impulse response functions induced by currency crisis (without banking crisis dummies): 1991-1998

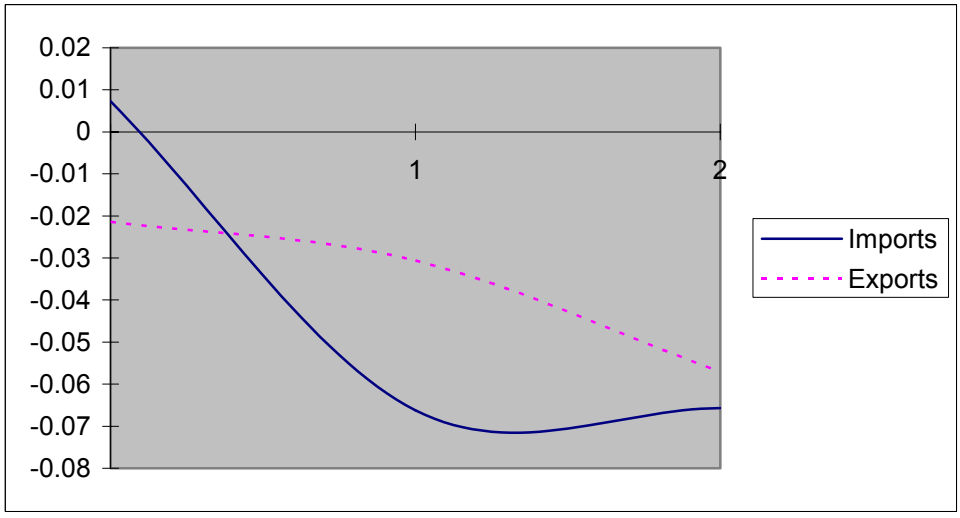

Figure 6.1 Impulse response functions induced by banking crisis (with currency crisis dummies): 1982-1990

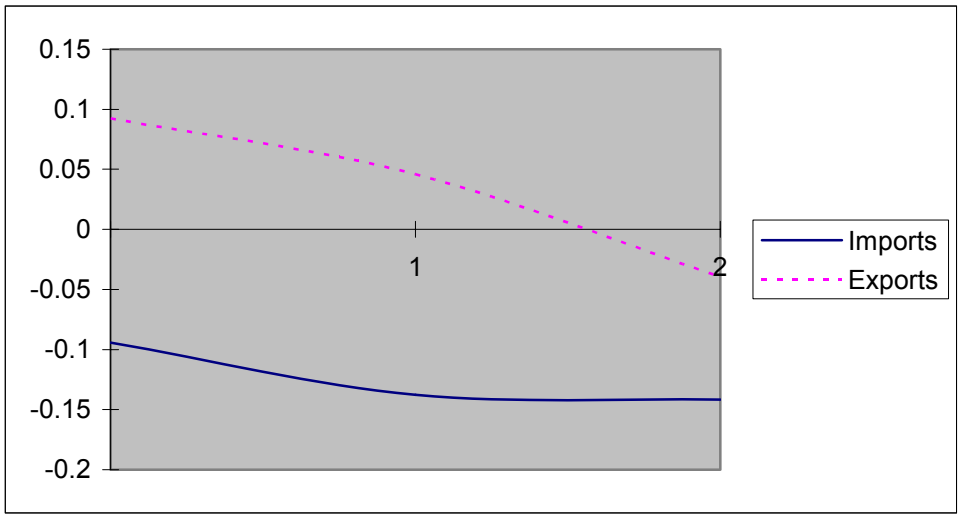

Figure 6.2 Impulse response functions induced by banking crisis (with currency crisis dummies): 1991-1998

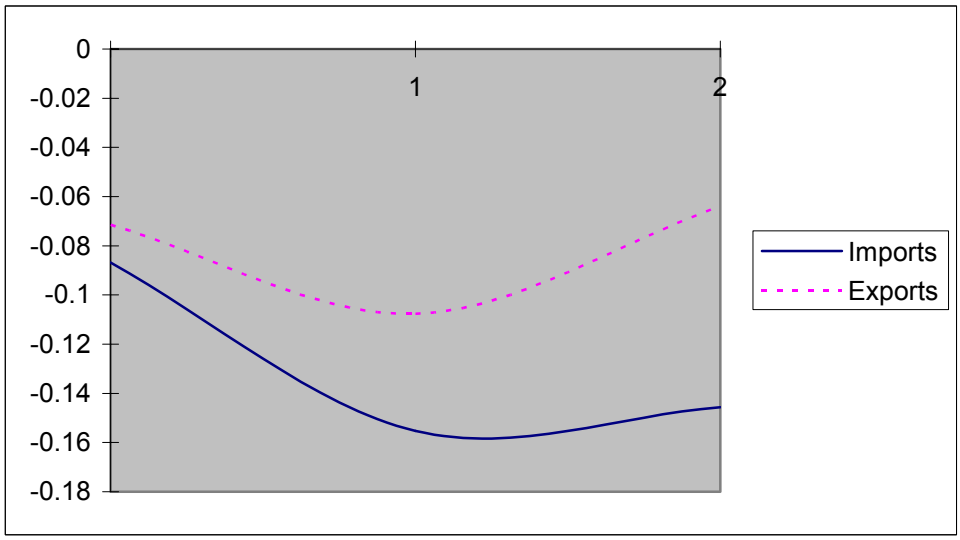

Figure 7.1 Impulse response functions induced by currency crisis (with banking crisis dummies): 1982-1990

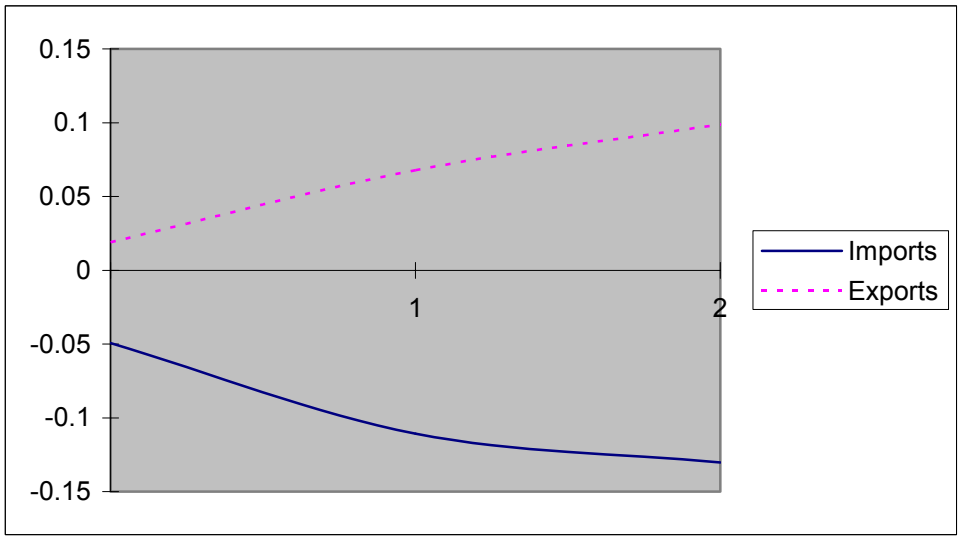

Figure 7.2 Impulse response functions induced by currency crisis (with banking crisis dummies): 1991-1998