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The Asian Financial Crisis: Effects on U.S. Agriculture

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The Asian Financial Crisis: Effects on U.S. Agriculture. By William T. Coyle, W.J. McKibbin, and Zhi Wang. Market and Trade Economics Division, Economic Research Service, U.S. Department of Agriculture. Staff Paper No. 9805.

Abstract

This paper analyzes the likely effects of the recent Asian financial crisis on the U.S. economy and agriculture. It uses a multi-country, multi-sector dynamic intertemporal general equilibrium model, with endogenously modeled financial markets (G-cubed agriculture). Two simulations are done: one in which the crisis is confined to Korea and Southeast Asia, where the problem was most acute as of the fall of 1998, and another in which the crisis is assumed to deepen in Japan, China, and Taiwan to the same extent as it already has in Korea and Southeast Asia. The results show that the Asian financial crisis has a number of offsetting effects on U.S. agriculture. U.S. exports of agricultural and food products fall in response to declining demand in the affected countries in Asia and the appreciation of the U.S. dollar. U.S. agricultural and food exports are estimated to decline three times as much when Japan, China, and Taiwan become embroiled in the crisis than when it is confined to Korea and Southeast Asia. On the other hand, adjustments in global capital and energy markets in both scenarios reduce capital costs and input prices faced by U.S. farmers and, more broadly, stimulate domestic U.S. economic activity in the short run, particularly in interest-sensitive and energy-intensive sectors. Thus the shortrun effects of the Asian crisis on U.S. agriculture are ambiguous. Sectors relying more on domestic demand, such as livestock products and processed food, expand output, while export-oriented sectors such as food grains are negatively affected.

Keywords: financial crisis, Asian crisis, agricultural trade, United States

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This paper is part of a cooperative agreement (43-3AEK-6-80082) between ERS and McKibbin Software Group, Inc. The agreement called for: 1) an extension of the G-cubed model, developed by McKibbin and Wilcoxon, to include a relatively detailed agriculture sector and country/regional disaggregations relevant to U.S. agricultural trade; 2) the documentation of the model, which appears in Brookings Discussion Paper in International Economics, No. 139; and 3) an application of the model, which is the substance of this report.

The Asian Financial Crisis: Effects on U.S. Agriculture

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Introduction

At the U.S. Department of Agriculture Outlook Forum in February 1998, the Asian financial crisis was cited as an important uncertainty confronting American agriculture (Collins, 1998). At that time, the Department estimated that the crisis would reduce U.S. agricultural exports by 3 to 6 percent below expected levels in fiscal years 1998 and 1999 (Gajewski and Langley, 1998). This outlook contrasted sharply with a more bullish U.S. export outlook only the year before, also hinging heavily on Asia--which was then forecast to continue growing rapidly.

Asia has been a booming market for U.S. agricultural exports for some time. Japan alone replaced the EU in the 1980's as the number one market for U.S. food and agricultural products. Other parts of Asia have been growing in relative importance. South Korea and Taiwan are second and third in Asia, behind the Japanese market. Southeast Asia was a rising market, in the aggregate about the size of South Korea, until the Asian financial crisis broke out in 1997.

Most attention in the U.S. farm community has focused on the merchandise trade implications of the Asian financial crisis--declining U.S. exports, rising imports, and a deteriorating agricultural trade surplus. This is understandable, given that Asian countries purchase about 40 percent of U.S. food and agricultural exports (fig. 1). Less attention is given to the indirect effects of the Asian crisis on U.S. agriculture, such as lower interest rates stemming from the flight of Asian capital seeking "safe haven" in the United States, and lower costs for energy and other inputs due to reduced global demand.

International shocks are increasingly important to American agriculture. It was not until the mid-1960's that the trade balance for U.S. agricultural products turned positive and afterwards grew successively larger. Since then, in response to greater liberalization of world markets and an increasing U.S. comparative advantage in land-extensive and capital-intensive agriculture, U.S. farm product exports have grown to account for 20-30 percent of production, at least double the average export share for other U.S. industries.¹

Furthermore, American agriculture now depends to a much greater extent than before on

¹The 20- to 30-percent share is calculated as gross exports of agricultural products and processed food, divided by gross farm income. The exported share of value added in the agriculture and food processing sector was far less--9 percent in 1995, according to the version 4 GTAP data base.

purchased inputs and borrowed capital, the costs of which are determined by supply and demand conditions in an interdependent U.S. and global economy.

On the other hand, U.S. farm households are buffered from agricultural market instability by their rising reliance on the nonfarm economy for employment and income. Off-farm income now accounts for more than two-thirds of total farm household income (USDA, 1995-96).

We use a general equilibrium framework, with endogenously modeled financial markets to assess the effects of the Asian financial crisis on U.S. agriculture. We outline the basic features of the model, after presenting a brief background on the onset, causes, and consequences so far of the Asian financial crisis.

This paper lays out the rationale and implications of two simulations. In the first, the worst of the crisis is confined to Korea and Southeast Asia, where the problem is now most acute. In the second, the crisis is assumed to deepen in Japan, China, and Taiwan to the same extent as it already has in Korea and Southeast Asia. Japan and China are the two largest economies in the region, with Japan now accounting for 50 percent of U.S. agricultural exports to Asia. In the event that international efforts to contain the crisis fail, and Japan, China, and Taiwan are drawn into it to the same degree as Korea and Southeast Asia, the U.S. economy and its farm sector are likely to face much more significant adjustments.

Onset and Causes of the Crisis

The acute stage of the Asian financial crisis began when the Thai baht was floated and declined 15 percent on July 2, 1997 (fig. 2). Shortly afterwards, the currencies of Thailand's neighbors--Indonesia, Malaysia, and the Philippines--also declined. By October, the financial troubles had spread to East Asia, affecting South Korea the most seriously, and to a lesser extent, Japan and Taiwan. Korea's won declined the deepest and quickest, losing nearly 60 percent of its value in less than two months. Equity markets were also adversely affected across the region (fig. 3). By the end of 1997, there were three categories of Asian countries in crisis: those modestly affected (Japan, Hong Kong, Singapore, Taiwan, and China); those severely affected (Korea, Thailand, Malaysia, and the Philippines); and the extreme case of Indonesia, whose financial problems were compounded by a political crisis of succession. Markets outside of Asia, including Chile, Mexico, Brazil, Russia, and Eastern Europe, also have been affected by depreciating currencies and more uncertain economic growth prospects.

The worst of the crisis was confined to Korea and Southeast Asia, at least temporarily, in part because of measures taken by the International Monetary Fund (IMF), banks, and other institutions, which extended more than \$120 billion in credit to restore confidence in the most severely affected economies: Korea, Thailand, and Indonesia. Revisions were made to packages for South Korea in December 1997 and for Indonesia in January, April, and July 1998. In the

Box 1: Interrelated Causes of the Asian Financial Crisis

Rapid inflow of foreign capital into the region. The economic success of the region attracted foreign portfolio and direct investment, posing a challenge regarding their productive use and handling by financial systems that were not well developed. The surge in capital inflows to developing Asian countries came at a time when the OECD economies were experiencing slow economic growth, low interest rates, high liquidity, and rising stock markets. There was also some shift in investment flows toward developing Asia in the aftermath of the Mexican crisis in 1994-95.

Weak export markets and declining competitiveness. A marked slowdown in the region's export growth rates--particularly for China, Korea, Malaysia, Singapore, and Thailand--resulted from slowing growth in imports by developed markets, particularly Japan, a glut in global electronics markets, and policy measures in Asian economies to slow domestic growth to reduce inflation. Also contributing to the decline was the devaluation of the Japanese yen in 1995-97. East and Southeast Asia had gradually become more dependent on the Japanese export market. The sharp devaluation of the Chinese yuan in 1994, on the other hand, was a less important factor. The unification of the swap and official rates implied a devaluation of the official rate by 50 percent. But most foreign exchange transactions in China continued to be carried out at the swap rate, implying an effective depreciation of less than 10 percent.

Inefficiencies in the banking sector and pegged exchange rates. The rapid inflow of capital and slowing growth began to reveal problems in the banking systems across the region. One problem was the excessive reliance on political connections to determine the allocation of loans (the *chaebol* in Korea, the Suharto family in Indonesia, *keiretsu* in Japan, and state-owned enterprises in China). Another problem was the growing reliance on foreign loans available at lower rates, in part due to inefficiencies in domestic banking institutions (which had larger spreads between lending and deposit rates). These lower rates outside the region, combined with pegged currencies, led to excessive foreign borrowing without hedging against what seemed to be the unlikely possibility of a currency devaluation.

(Source: International Monetary Fund, *World Economic Outlook, Interim Assessment*, Dec. 1997)

case of Korea, the timetable for delivering credits was accelerated. In the case of Indonesia, a comprehensive reform program was accepted by Indonesia's then President Suharto in January 1998. Its provisions included far-reaching agricultural reforms and deregulation, such as reducing tariffs on food items to 5 percent; eliminating monopoly import licenses for sugar, wheat, wheat flour, and soybeans; and encouraging foreign investment, even in the politically sensitive palm oil sector. Stricter monitoring provisions were added in early April. Indonesia reached a new agreement with the IMF in July 1998, providing additional support on top of the \$43 billion already approved.

In late 1997 and early 1998, USDA extended \$1.1 billion in short-term credit guarantees to Korean importers and \$1 billion to Southeast Asian importers. About half of these credits

represented new allocations. While the effect of the IMF programs is still being assessed, economic conditions in South Korea, the Philippines, Malaysia, and Thailand seem to have stabilized. Political changes in Korea and Thailand also appear to have helped, with President Kim Dae Jung taking office in Korea in February 1998 and Prime Minister Chuan Leekpai taking office in Thailand November 1997. The resignation of Suharto in May 1998, coupled with the designation of vice president Habibie as the new president, brought some economic and political calm to Indonesia, but uncertainties remain. Short-term growth prospects for the most affected economies have been progressively reassessed downward in the last year, as food and other prices and interest rates have risen. The failure of many banks and businesses across the region has led to higher unemployment. In the trade sector, currency devaluations and reduced liquidity have constrained imports. Export sectors are generally buoyed by increased competitiveness *vis a vis* markets outside and even within the affected region, in some cases turning monthly current account deficits into surpluses. While exports also have been constrained by lack of liquidity, relatively large export sectors should generally mitigate against more serious effects.

A key uncertainty now is the extent to which China, Taiwan, and especially Japan will become more embroiled in the Asian financial crisis. Japan has had trouble recovering from the bursting of its "bubble" economy in the early 1990's, compounding its problems with macroeconomic policy mistakes such as raising consumer taxes in April 1997. While its current account and foreign exchange positions have remained relatively strong, economic growth slowed dramatically in the 1990's, compared with previous decades. In fact, Japan's economy went into recession in 1998, for the first time since 1974. Slow growth uncovered structural problems, including problems in its corporate and banking sectors. A central issue is the government's role in stimulating domestic demand, a difficult task in light of declining industrial production and corporate profits, coupled with consumer pessimism about the future.

Pressures may be mounting for China to devalue its currency. China's growth is forecast to continue above 7 percent through 1999, but slowing exports and the possibility of a declining current account surplus could change that outlook. However, China's political leaders are beginning to implement policies to stimulate domestic demand, which could lessen the economy's future reliance on exports. This could reduce the pressure to devalue its currency in the short term.

Taiwan has weathered the financial crisis in Asia better than most economies in the region. Its economy is based on small-scale, family-oriented businesses that are able to adjust to economic shocks relatively well. It is easier for new companies to start in Taiwan and for old ones to fail. Moreover, Taiwan is strengthened by a light foreign debt burden, large foreign exchange reserves, and better banking regulations than others in the region.

So far the effects of the Asian financial crisis on the U.S. economy, and on its agricultural sector in particular, have been mixed (see box 2). On the one hand, economic slowdowns in parts of Asia are reducing the amounts and prices of U.S. exports. On the other hand, rising imports and

Box 2: Impact of Asian Financial Crisis on the United States

Positive

- Declining consumer costs
- Declining capital costs, including yields on long-term bonds
- Lower costs for U.S. travelers in parts of Asia
- Opportunities for some U.S. interests to buy bargain-priced Asian assets

Negative

- Declining exports, including agricultural exports
- Increased competition for U.S. import-competing industries
- Much higher risk and declining returns on existing investments in Asia; declining profits for U.S. businesses with Asian exposure (e.g., Coca Cola, Boeing, McDonald's, Motorola)
- Deteriorating balance of trade: more imports, less exports
- Less tourism from Asia

capital inflows are reducing prices for consumer goods and intermediate inputs in the United States, and lowering capital costs. At the beginning of 1998, the yield on the 30-year U.S. Treasury bond had dropped below 6 percent and other benchmark interest rates have since declined or remained stable. The U.S. stock market continued its upward trend through July 1998, trended downward through September 1998, and since then has rebounded.

U.S. food and agricultural exports in fiscal year 1999 are forecast by USDA to be \$52 billion, off the 1997 level by more than \$5 billion, with declines to Asian markets being offset to some extent by increases to the NAFTA region. U.S. agricultural imports are forecast to rise slightly to \$39.5 billion, mainly because of growing imports of horticultural products. The net effect will be to reduce the U.S. agricultural trade surplus from \$21.5 billion in fiscal year 1997 to \$12.5 billion in fiscal year 1999.

The G-Cubed (Agriculture) Model ²

The analysis herein is based on a multi-region, multi-sector model designed for examining

² G-Cubed is short for Global Computable General Equilibrium Growth model. The G-Cubed (Agriculture) model differs from the original G-Cubed model by having a more detailed agricultural sector and country and regional disaggregations relevant to U.S. agricultural trade.

adjustments in agricultural markets resulting from a shock to the global economy. The model is called the G-Cubed (Agriculture) model. Since it is documented thoroughly in McKibbin and Wang (1998), the model description here will highlight only its major features (see boxes 3 and 4). The original G-Cubed model developed by McKibbin and Wilcoxon (1995) belongs to a class of dynamic intertemporal general equilibrium models that incorporate both financial and real economic activities in a global framework. A key feature of these models is the role of international capital mobility in economic adjustment and in the integration of financial markets with real economic activity. Since the adjustment of international capital flows is an

Box 3: Components of the G-Cubed (Agriculture) Model

Regions

United States
 Canada
 Japan
 Australia
 European Union
 Mexico
 Rest of OECD
 Korea
 Taiwan
 China
 ASEAN
 Rest of the World

Sectors

Energy
 Mining
 Forestry and fisheries
 Agriculture:
 Food grains
 Feed grains
 Non-grain crops
 Livestock products
 Manufacturing:
 Processed food
 Durable manufacturing
 Textiles and apparel
 Other non-durable mfg.
 Services

Agents

Households
 Firms
 Governments

Markets

Goods and services
 Factors of production
 Bonds
 Equity
 Money
 Foreign exchange

Box 4: Economic Characteristics of the Model

- The demand and supply sides of both real and financial markets are specified.
- Real and financial markets are integrated. Each financial asset is a claim over real resources: money over purchasing power, bonds over future tax revenues, equity over a firm's future dividend stream, and foreign assets over future exports of the debtor country.
- Real resources and financial assets are tracked over time.
- Intertemporal budget constraints are imposed so that agents and countries cannot forever borrow without undertaking the resource transfers required to service outstanding liabilities.
- Asset markets are linked globally through the international mobility of financial capital.
- Agents arbitrage between different assets within countries and across countries, taking into account the fixity of physical capital stock in each sector in the short run.
- Consumer and producer behavior in the short run is a weighted average of neoclassical optimizing behavior and "liquidity-constrained" behavior.
- The real side of the model is disaggregated to allow for production and trade of multiple goods and services within and across economies.
- Labor markets may not clear in the short run.
- Full macroeconomic closure occurs in both the short run and long run, with macro-dynamics at an annual frequency around a long run Solow/Swan neoclassical growth model.
- To estimate baseline conditions on a path toward the long run equilibrium that would prevail in the absence of economic shocks, the model is solved for a full rational expectations equilibrium for each of the years from 1993 to 2070. The effects of the Asian crisis are reported only from 1997 to 2005 for presentation.

For a complete specification of the model, see W. McKibbin and Z. Wang (1998).

important aspect of the Asian crisis, the G-Cubed class of models is appropriate for analyzing it. The G-Cubed (Agriculture) model divides the world economy into 12 regions. Within each region, production is disaggregated into 12 sectors. Box 3 shows the regional and sectoral breakdown of the model.

Each economy or region in the model includes three kinds of economic agents: households, the government, and a representative firm in each of the 12 production sectors. Each of these economic actors interacts in a variety of markets, both domestic and foreign. Firms purchase capital, labor, land, and inputs from other sectors to produce goods consumed in domestic and foreign markets.³ Households choose to consume products based on the relative prices of products and on their income and total wealth, which includes financial holdings and the expected value of lifetime earnings. The 12 regions are linked by flows of goods and assets. Flows of goods are determined by import demands for final consumption and for intermediate inputs. Trade imbalances are financed by flows of financial assets among countries.

It is assumed that wedges between rates of return on financial assets in different economies are generated by various market distortions that generate a risk premium on country-denominated assets. The initial wedges (based on calibrating the model to a 1996 base year) are calculated using a technique outlined in McKibbin (1998). The wedges (representing risk differentials) are taken as exogenous during simulation. When the model is simulated, the induced changes in expected rates of return in different regions alter the international flows of financial capital.

The underlying assumptions include population growth by country based on World Bank projections, productivity growth by country and by sector based on a technology catch-up model (Bagnoli, McKibbin, and Wilcoxon, 1996), and assumptions about tariff rates, tax rates, and other fiscal and monetary policy variables. Monetary policy is assumed to be targeting a fixed ratio of nominal money balances to GDP in each economy. Fiscal policy is defined as a set of fixed tax rates (apart from a lump sum tax on households that varies to satisfy the intertemporal budget constraint facing the government), and government spending set as a constant share of simulated GDP.

³ The input-output data used in this model is from Version 3 of the Global Trade Analysis Project (GTAP) database (Hertel, 1997). Other data are from the MSG2 model database, which draws on UN International Trade Statistics, the OECD Economic Outlook, IMF International Financial Statistics and Government Financial Statistics, World Bank Data, and data from the International Economic Database at the Australian National University. The model is solved using special software developed by the McKibbin Software Group Inc. (McKibbin and Wilcoxon, 1995).

International capital flows are assumed to be composed of portfolio investment, direct investment, and other capital flows (government transfers and private remittances). These alternative forms of capital flows are perfectly substitutable, adjusting to the expected rates of return across regions and across sectors.

Within an economy, the expected returns to each type of asset (that is, bonds of all maturities, equities for each sector, etc.) are arbitrated, taking into account the costs of adjusting physical capital stock and allowing for the exogenous risk premia. Because physical capital is fixed in the short run and is costly to adjust, any inflow of financial capital that is invested in physical capital (that is, direct investment) will also be costly to shift once it is in place. The decision to invest in physical assets is a function of Tobin's q^4 and a firm's current profit. Total net capital flows for each economy in which there are open capital markets are equal to the current account position of that country. The global net flows of capital are constrained to zero. The key features of the underlying analysis are summarized in box 4.

Simulation Design

In this analysis we model the crisis as a loss in confidence in each of the affected countries, following the approach in McKibbin (1998). First we outline how the baseline projections were generated without shocks to risk and productivity. This is an important first step before we do the simulations because it accounts for underlying changes in the global economy (which depend on exogenous assumptions about differential productivity growth across regions). A long projections period, 1996-2070, is used so that the model converges toward a steady state. The issue of projecting future trends using a dynamic intertemporal general equilibrium model, such as the G-Cubed model, is discussed in detail in Bagnoli *et al.* (1996).

Given all of the exogenous assumptions and initial conditions, as well as full rational expectations (those agents who look into the future have perfect foresight, including knowledge of all future prices), the model is solved using a numerical technique outlined in appendix C of McKibbin and Sachs (1991). This initial model solution will not generate the actual outcomes for the first year of simulation (in the current example 1996) because a range of forward-looking variables such as human wealth,⁵ exchange rates, stock market values, etc. will be conditioned on the future path of the world economy, and there is no reason these should be equal to the observed values for the initial year. The next step in the baseline generation is to calculate a vector of constants for all equations in the model, including arbitrage equations, such that the solution of the model in the base year (1996) is exactly equal to the observed data in that year. In

⁴Tobin's q is the ratio of the marginal value of new investment to the replacement cost of capital. When it is greater than one, investment will take place.

⁵Expected future income discounted to its current value.

no way are we assuming that 1996 is a steady-state solution of the model. It clearly cannot be. What we *are* assuming is that the 1996 database is on the unique stable path of a model in which all variables are moving toward a steady state in the distant future.

To see more precisely what the technique does and how a re-evaluation of risk is modeled, consider the uncovered real interest parity assumption relating the returns to government debt in each country that is used in the model:

$$r_t^i = r_t^U + {}_t e_{t+1}^i - e_t^i + \xi_t^i \quad (1)$$

Here the real interest rate (r) on 1-year government bonds in country i in period t is equal to the interest rate in the United States (r^U) in period t , plus the expected rate of variation in the bilateral real exchange rate between country i and the United States (${}_t e_{t+1}^i - e_t^i$), where e_t^i is the log of the real exchange rate in period t and ${}_t e_{t+1}^i$ is the expectation, formed in period t , about the exchange rate prevailing in period $t+1$. In addition, we assume that there is a risk premium ξ , which is the difference between the rational expectations solution and real world data. If it is positive, it means that country i interest rates on government debt (in real terms) are above the interest rates on comparable U.S. Government debt expressed in the same currency. In principle, this risk premium varies over time.

The term ξ captures a range of issues including sovereign risk, impediments to financial flows from government regulations, the degree of departure from rational expectations in actual data, and other factors. Equation 1 can also be interpreted differently. Solving for e_t^i , it can be shown that:

$$e_t^i = \int_t^T (r_s^U - r_s^i + \xi_s^i) ds + {}_t e_T^i \quad (2)$$

The real exchange rate in any period t is the sum of future expected interest rate differentials as well as the expected future risk premium on assets denominated in the home currency plus the steady state (period T) value of the real exchange rate.

In the baseline, we calculate a constant value for ξ such that the exchange rate (e) converted into nominal terms using the appropriate price deflators in 1996 is equal to the observed nominal exchange rate. In practice, this calculation could be done using actual data outside the model as long as some measure of the expected change in the exchange rate could be found. In this paper the model is used to calculate the expected change in the real exchange rate. Although the arbitrage relationship outlined earlier is based on bond rate differentials, within each economy the rates of return on all financial assets (bonds, money, equity, etc.) are linked through arbitrage.

The simulations for the pair of Asian crisis scenarios are based on two additional assumptions about the affected countries. First, risk premia are assumed to increase for 3 years before confidence in the affected economies is restored to pre-crisis levels. The premia used generate a devalued nominal exchange rate in those economies consistent with that observed in January 1998.

Second, the Asian financial crisis is assumed to cause disruptions in the affected economies that seriously affect aggregate factor employment. We simulate these effects by introducing negative supply side shocks that reduce total factor productivity growth across all sectors in the affected regions. In those economies in crisis, the sharp depreciation of exchange rates is accompanied by significant disruptions in domestic financial markets. Firms may suddenly find themselves liquidity-constrained, unable to finance the purchase of intermediate inputs and to obtain export credits. Many firms face bankruptcy. We model this financial disruption to the economy as a series of negative supply-side shocks to total factor productivity, since its effects shift the production possibility frontier inward, similarly to less than full employment of resources. The detailed simulation design can be found in McKibbin (1998). The time profile of the shocks is given in table 1.

Table 1 - Time profile for the simulation shocks

Region	Variable	1998	1999	2000	Starting in 2001
Contained crisis		<i>Percent change from baseline</i>			
ASEAN	Risk	20	20	10	0
	Productivity	-6	-4	-2	0
Korea	Risk	20	20	10	0
	Productivity	-6	-4	-2	0
Wider crisis					
ASEAN	Risk	20	20	10	0
	Productivity	-6	-4	-2	0
Korea	Risk	20	20	10	0
	Productivity	-6	-4	-2	0
Japan	Risk	20	20	10	0
	Productivity	-6	-4	-2	0
China	Risk	20	20	10	0
	Productivity	-6	-4	-2	0
Taiwan	Risk	20	20	10	0
	Productivity	-6	-4	-2	0

Results of the Simulations

First Scenario--Crisis Contained in ASEAN and Korea.

The implications of a temporary increase in risk and decline in productivity in Korea and the ASEAN countries are shown in figures 4A and 6A (and figs. 4B to 6B for the wider crisis scenario). These results are expressed as percentage deviations from baseline projections.

The macroeconomic adjustment process is the same as described in McKibbin (1998), though the magnitude and profile of the shocks imposed here are different. The rise in risk and fall in productivity lead to an outflow of financial capital from the affected countries. This outflow depreciates their exchange rates by around 60 percent in nominal terms and 30 percent in real terms through 1998 in the most affected economies (app. table 2 and fig. 4A). The real exchange rates recover over time, reflecting the assumed restoration of confidence in each economy. The outflow of capital also leads to a sharp rise in real interest rates and a general deflation of asset prices. The rise in real interest rates, decline in financial wealth, and sharp reduction in expected future incomes leads to a sharp reduction in domestic demand. According to the model results, consumption falls by about 35 percent in ASEAN and South Korea through 1999. Investment falls by about 40 percent in ASEAN and 25 percent in South Korea in 1998. This sharp contraction in economic activity is in part due to large capital losses stemming from the fixity of physical capital combined with the large increase in the cost of capital in these economies.

Despite the large contractions in domestic demand in the affected economies, gross domestic product (GDP) is not quite so badly hit (fig. 5A). South Korea and the members of ASEAN are able to partly cushion the effects of the sharp drop in domestic demand and on production, because the steep depreciation in the nominal and real exchange rates increases the demand for their products from abroad (app. table 2). This export surge (fig. 6A) is consistent with the change in the balance of payments reflecting a capital outflow. A capital outflow is associated with a current account surplus, which can be achieved through various blends of rising exports and falling imports. The model projects that this adjustment would occur through a large rise in exports and a small fall in imports. In 1998, however, it appears that the actual adjustment is occurring less through exports than through a sharp drop in imports. This largely reflects the collapse of the domestic and international financing of international trade. Given some signs of recovery in each economy (with the exception of Indonesia), the model's projections may come closer to being realized over the next year or so.

The effects on Asia are large. What are the effects on the United States? Figure 7 displays the projected values for U.S. GDP and consumption. After a small fall in U.S. GDP in 1998, the relocation of capital is expected to increase aggregate production in the United States for a number of years. Cheaper imports from Asia reduce growth in the Consumer Price Index and stimulates U.S. consumption (figs. 7 and 8).

The fall in Asian demand is projected to reduce U.S. agricultural exports by around 6 percent during 1998, except for livestock products, which are projected to fall nearly 10 percent (fig. 9A). In terms of the impact on the U.S. farm and food sector, the fall in agricultural exports is to some extent offset by the effects of an expanding U.S. economy, rising incomes, and increased domestic demand for food. Private investment in the U.S. farm economy increases in some sectors (fig. 10A), due to lower real interest rates (fig. 8) and a substitution of capital for labor and other inputs. The effects of the crisis on production varies by sector (fig. 11A). Output of the sector with the highest trade exposure, food grains--more than 40 to 50 percent of whose production is exported--declines the most, about 6 percent in 1998. Feed grains and non-grain crops (15 to 30 percent of whose production is exported) decline modestly, by about 2 percent. And output increases slightly for livestock products and processed food (less than 10 percent of whose production is exported) in response to cheaper capital and to strong domestic demand.

The reductions in U.S. exports are relatively similar across agricultural sectors, except for a larger drop in livestock products. The latter occurs because Asia accounts for a relatively large share of U.S. livestock product exports.

Capital stock increases in almost all agriculture-related sectors, with the processed food sector increasing the most (app. table 3). Increases in investment and capital stock drive the production expansion of the processed food sector and the recovery of other sectors shown in figure 11A.

Thus within the U.S. food and agriculture sector, we see different responses to the Asian crisis. As expected, the more exposed the commodity is to export markets, the greater the effect of the Asian crisis. The major additional insight from the model used here is the switch toward domestic demand and domestic investment driven by the changes in international capital flows that accompany the crisis.

What does this adjustment process imply for U.S. agricultural producers and consumers? Obviously, there is a drop in revenue because of declining export prices (fig. 12A) and shrinking export demand from Asia. These declines, however, are offset to some extent by lower energy and other intermediate input costs faced by U.S. agriculture because of the strong dollar, low import prices, and reduced demand for intermediate inputs resulting from the economic slowdown in Asia. Despite the resulting short-term drop in output in the most trade-dependent sectors in U.S. agriculture, investment and capital stock in these sectors actually rise. Firms take advantage of low short-term capital costs to replace or upgrade machinery and equipment, foreseeing that the Asian financial crisis is a temporary shock and that confidence in the region's economies will be restored in the near future.

Second Scenario--A Wider Crisis.

In the second scenario, the full severity of the crisis is assumed to spread to Japan, China, and Taiwan, whose economies so far have been less affected than those of Korea and Southeast Asia.

To do this, we assume that the rise in risk and the decline in productivity applied to Korea and Southeast Asia in the first scenario now also apply to Japan, China, and Taiwan (table 1). This simulation, like the previous one, is meant to be purely illustrative. It should not be interpreted as a forecast of the most likely evolution of events.

The changes in exchange rates in ASEAN and Korea in the wider crisis simulation are similar to the first simulation. The major difference between figure 4A and figure 4B is the much sharper depreciation in the yen relative to the U.S. dollar.

The effect of the wider crisis on GDP in regional economies is shown in figure 5B. The obvious difference is the sharp near-term declines in GDP in Japan, China, and Taiwan. However, the extent of GDP loss in ASEAN and Korea is about the same as in the other scenario. The negative effects of lower demand for Korean and ASEAN exports in the larger Asian economies are partially offset by the positive effects of lower world interest rates resulting from the relocation of capital.

On the other hand, the more widespread shock would more than double the extent of GDP slowdown that the United States would experience in 1998, and sustain the larger loss over time as illustrated in figure 7.

Results for U.S. agriculture are shown in figures 9B to 12B. The export decline in the more widespread shock ranges from 12 to 27 percent in the first year (fig. 9B), more than double the loss under the contained crisis. The ranking of sectors also changes, with the feedgrain sector experiencing a larger proportional export decline under the more widespread shock, due to significant imports of feedgrain by Japan and Taiwan. Figures 11A and 11B illustrate that a more widespread shock accentuates the differences among different agricultural products. The demand for food grains and feed grains drops sharply, while the demand for processed food rises slightly in the short term due to the strength of the domestic U.S. economy.

The simulation results show that the Asian financial crisis is a permanent setback for the world economy. Global real GDP declines 0.4 percent in 1998 and 1999 in the contained case, and by 2.9 and 3.6 percent in the wider case (table 2). It is interesting to note that in the contained case, the reduction of total world GDP is smaller than its reduction in Korea and Southeast Asia, implying that GDP rises in the rest of the world. However, if other Asian countries, especially Japan, become more embroiled in the crisis, the decline of world GDP would exceed that for the affected countries, indicating that the rest of the world would be much less shielded from the crisis if it were to spread to other parts of Asia, particularly a large economy like Japan.

Conclusions and Implications

Both scenarios show that the crisis in Asia will reduce not only U.S. agricultural and food exports, but also real interest rates, the cost of energy, and the costs of other intermediate inputs of production--in the contained crisis less so, in the wider crisis more so. Lower capital costs and input prices will stimulate the U.S. domestic economy, especially in interest-sensitive sectors, with beneficial implications for U.S. agriculture.

This stimulus to domestic demand may offset the negative effects of a decline in exports, depending on the relative reliance of each sector on U.S. versus Asian markets. The reallocation of financial capital away from Asia to the United States and other developed countries is expected to stimulate investment in the U.S. economy, especially in sectors that rely most heavily on the domestic market, such as processed food. Export-oriented sectors such as food grains would be more negatively affected by the crisis.

An important conclusion is that the spread of the crisis to China, Taiwan, and particularly Japan would have a far more serious effect on U.S. agricultural trade. In the wider crisis, U.S. agricultural exports are estimated to decline by about three times as much as in the contained case. This is understandable given Japan's significant role as a U.S. export market, accounting for about 20 percent of total U.S. agricultural exports in recent years. The countries in the contained scenario account for only 12 percent of U.S. agricultural exports.

This study provides useful insights on the partly offsetting effects of the Asian crisis on U.S. agriculture. However, since the model used here is a stylized representation of the United States and world economies, the results should not be interpreted as forecasts. Instead, they are indicative of the potential effects of the crisis. At present, only one representative household is defined for each region. Therefore, we are unable to make conclusions about the net welfare effects of the Asian financial crisis on U.S. farm households per se. Separating the characteristics of farm and nonfarm households requires further research and model development. Since many farm households earn a large share of their income from off-farm employment, it is difficult to sort out the allocation of costs and benefits going to farm households.

Table 2--The effect of the Asian financial crisis on the world: Macro indicators

Indicator	Affected countries' share of world total				World total			
	1998	1999	2000	2005	1998	1999	2000	2005
Contained crisis	<i>Percent change from baseline</i>							
Real GDP	-0.3	-0.5	-0.3	0.0	-0.4	-0.4	-0.2	-0.1
Real GNP	-0.3	-0.5	-0.3	0.0	-0.4	-0.4	-0.2	-0.1
HH wealth ¹	-1.7	-1.3	-0.6	0.1	-0.7	-0.7	-0.4	0.0
HH current income	-1.1	-1.3	-0.8	0.0	-0.4	-0.5	-0.3	-0.1
Private consumption	-1.0	-1.1	-0.7	0.1	-0.4	-0.5	-0.3	-0.1
Total investment	-1.9	-1.3	-0.4	0.2	0.0	0.0	-0.2	-0.1
Total imports	0.3	-0.1	-0.2	-0.2	-1.4	-1.0	-0.5	0.0
Total exports	2.2	1.4	0.3	-0.4	-0.3	-0.4	-0.3	0.0
Wider crisis								
Real GDP	-1.9	-2.8	-1.8	0.2	-2.9	-3.6	-2.0	0.2
Real GNP	-1.8	-2.7	-1.7	0.3	-2.2	-2.6	-1.5	0.1
HH wealth	-4.7	-3.8	-1.4	0.2	-2.0	-2.1	-1.1	0.0
HH current income	-4.7	-5.8	-3.7	0.5	-3.2	-3.8	-2.2	0.1
Private consumption	-4.1	-5.1	-3.1	0.6	-2.9	-3.6	-2.0	0.2
Total investment	-6.4	-4.4	-1.2	0.6	-0.7	-0.9	-0.9	0.0
Total imports	1.0	-0.3	-0.7	-0.3	-3.2	-2.7	-1.3	0.2
Total exports	5.9	3.3	0.7	-0.7	-0.8	-1.2	-0.7	0.1

1/ Household wealth includes expected future income plus financial holdings, including equities, bonds, foreign assets, and real money.

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Appendix table 1--Economic size, trade dependence, and factor endowments of model regions, 1992

Item	U.S.	Canada	Mexico	Japan	Australia	Korea	Taiwan	China	ASEAN5	EU12	ROECD	ROW
GDP and trade flows												
	<i>Billion U.S. dollars</i>											
GDP	5,671.8	572.3	327.9	3,644.9	285.4	307.3	211.5	461.2	389.9	6,616.4	900.4	3,047.7
Exports	573.8	140.0	56.2	378.4	48.7	83.4	92.0	122.0	176.0	734.0	267.6	453.5
Imports	640.5	144.0	72.7	309.5	52.8	90.2	83.3	141.3	183.2	788.8	254.4	544.6
Relative size in the world												
	<i>Percent</i>											
GDP	25.3	2.6	1.5	16.3	1.3	1.4	0.9	2.1	1.7	29.5	4.0	13.6
Exports	18.4	4.5	1.8	12.1	1.6	2.7	2.9	3.9	5.6	23.5	8.6	14.5
Imports	19.4	4.4	2.2	9.4	1.6	2.7	2.5	4.3	5.5	23.9	7.7	16.5
Trade dependence												
Exports/output	10.1	24.5	17.1	10.4	17.1	27.1	43.5	26.5	45.2	11.1	29.7	14.9
Imports/absorption	11.3	25.2	22.2	8.5	18.5	29.4	39.4	30.6	47.0	11.9	28.3	17.9
Share in world factor endowment												
Land	13.4	3.2	1.8	0.3	3.6	0.2	0.1	6.9	4.0	5.9	0.6	60.1
Agricultural Labor	0.2	0.0	0.8	0.3	0.0	0.4	0.1	41.7	6.1	0.8	0.1	49.4
Unskilled labor	8.1	1.0	1.8	4.7	0.6	1.3	0.7	17.7	6.0	11.0	1.1	46.1
Skilled labor	15.7	1.4	1.5	4.2	0.8	0.8	0.4	23.3	3.5	13.6	2.4	32.6
Total labor	5.2	0.6	1.3	2.6	0.4	0.8	0.4	29.4	5.8	6.5	0.8	46.2
Capital	23.3	2.2	1.4	17.5	1.5	1.0	0.6	1.8	1.4	30.6	4.7	14.0

Source: Data calculated from the 1992 multi-regional SAM estimated by the author from Version 3 GTAP database (Hertel, 1997) and additional factor endowment data collected by the author (Wang, 1997).

Appendix table 2 --Effect of Asian financial crisis on major affected and neighboring Asia countries: Macro indicators

Item	ASEAN				Korea				Japan				Taiwan				China and Hong Kong			
	1998	1999	2000	2005	1998	1999	2000	2005	1998	1999	2000	2005	1998	1999	2000	2005	1998	1999	2000	2005
Contained crisis:	<i>Percent change from baseline</i>																			
Real GDP	-7.5	-13.0	-10.9	-1.5	-9.2	-14.1	-8.7	0.2	0.3	0.0	0.0	0.0	-0.3	0.0	-0.1	0.0	-0.2	0.3	0.2	0.0
Real GNP	-9.8	-14.2	-10.5	-0.4	-9.9	-14.4	-8.4	0.8	0.4	0.0	0.0	0.0	0.2	0.3	-0.1	-0.1	-0.1	0.3	0.2	0.0
Private consumption	-34.3	-38.4	-25.4	1.6	-32.3	-35.5	-18.7	3.3	0.0	-0.4	-0.3	-0.2	2.8	2.1	0.6	-0.5	2.6	3.0	1.6	-0.4
Total investment	-43.4	-28.3	-8.4	3.7	-26.4	-18.4	-4.4	2.0	-1.6	-0.2	0.2	0.0	4.7	2.3	0.0	-0.4	4.7	2.3	0.0	-0.4
Total imports	4.0	-0.2	-2.8	-2.7	4.5	-1.8	-3.5	-1.5	0.9	0.3	0.2	0.3	-1.5	-0.6	-0.2	0.3	-2.0	-1.1	-0.3	0.4
Total exports	22.5	14.4	3.8	-4.6	21.7	12.9	2.8	-3.2	2.7	1.0	0.4	0.3	-2.4	-1.4	-0.3	0.5	-4.5	-3.0	-1.1	0.7
Balance of trade ¹	18.0	15.7	7.2	-1.6	16.8	15.0	5.9	-1.4	0.4	0.2	0.1	0.0	-1.6	-1.2	-0.3	0.3	-0.9	-0.7	-0.3	0.1
Real interest ²	8.6	6.3	2.0	-0.1	6.6	6.0	2.9	-0.1	1.1	0.3	0.0	0.0	-1.1	-1.1	-0.6	0.0	-1.0	-0.7	-0.3	0.0
Inflation rate ²	20.4	18.4	10.8	1.7	19.2	17.3	6.8	1.0	0.3	0.1	0.0	0.0	-0.6	-0.4	0.0	-0.1	-0.6	-0.3	0.0	0.0
Real exchange rate	-29.4	-18.6	-5.4	5.1	-30.0	-17.2	-3.6	4.2	-9.4	-5.1	-2.0	0.2	-1.2	-1.5	-1.0	-0.3	-1.0	-0.6	-0.4	-0.3
Nominal exchange rate	-60.5	-47.9	-23.1	4.1	-59.8	-45.1	-15.8	5.0	-10.1	-5.8	-2.2	0.3	-2.0	-1.1	-0.9	-0.3	-0.2	0.1	-0.1	-0.3
Real effective exch. rate	-25.8	-16.7	-4.7	5.3	-23.5	-13.3	-2.3	3.7	-1.3	-0.1	-0.5	-1.0	6.8	3.7	0.8	-1.2	8.9	5.3	1.5	-1.3
Wider Crisis:																				
Real GDP	-8.2	-12.7	-10.2	-1.3	-9.1	-13.6	-8.5	0.2	-6.9	-9.4	-6.0	1.7	-7.6	-17.7	-10.9	-1.5	-8.4	-12.9	-7.9	-0.3
Real GNP	-9.7	-13.3	-9.8	-0.5	-9.6	-13.8	-8.3	0.6	-6.4	-9.0	-5.8	1.7	-7.1	-17.2	-10.7	-1.5	-8.7	-12.6	-7.2	0.4
Private consumption	-29.6	-32.8	-22.0	0.7	-27.8	-31.5	-17.3	2.0	-13.1	-16.6	-10.5	2.8	-20.9	-33.1	-18.7	-2.1	-33.3	-39.9	-21.0	2.7
Total investment	-34.4	-23.1	-8.0	2.8	-20.3	-14.7	-4.3	1.5	-13.6	-9.3	-2.5	1.6	-28.7	-23.4	-7.3	1.3	-28.6	-17.3	-3.3	1.7
Total imports	2.2	-1.3	-2.9	-2.1	2.3	-2.8	-3.4	-1.0	5.2	-0.3	-2.1	0.5	1.5	-6.7	-5.0	-1.3	5.9	0.5	-2.2	-2.5
Total exports	16.5	9.7	2.2	-3.3	16.3	9.1	1.9	-2.0	18.7	10.4	2.7	-1.3	12.8	6.9	1.8	-0.7	22.1	12.7	1.8	-4.5
Balance of trade ¹	14.2	12.0	5.7	-1.1	13.7	12.3	5.2	-0.9	4.1	3.2	1.4	-0.5	18.6	24.3	11.1	0.6	6.0	4.5	1.3	-0.6
Real interest ²	6.4	3.9	0.8	-0.1	5.1	3.9	1.7	-0.1	3.5	2.7	1.1	0.0	6.1	5.7	3.4	-0.1	4.1	0.8	-1.0	0.1
Inflation rate ²	19.0	17.2	10.1	1.6	18.1	16.5	6.6	0.3	12.1	10.9	4.2	-1.8	19.3	22.6	9.3	2.0	13.9	11.2	3.8	1.0
Real exchange rate	-33.3	-21.3	-6.6	4.3	-33.5	-20.1	-5.4	3.2	-37.6	-22.7	-6.8	2.4	-31.1	-18.8	-5.9	1.8	-38.0	-23.6	-5.8	5.5
Nominal exchange rate	-62.2	-48.6	-23.2	3.2	-61.6	-46.9	-17.5	3.8	-53.8	-38.1	-13.6	4.9	-58.7	-53.0	-21.8	-0.7	-64.3	-48.2	-16.4	5.8
Real effective exch. rate	-13.8	-9.4	-3.0	3.3	-13.4	-7.7	-1.6	1.8	-22.0	-12.8	-3.8	0.9	-10.3	-6.0	-1.9	0.3	-16.7	-10.5	-1.6	4.2

See footnotes at the end of table.

Continued--

Appendix table 2 -- Effect of Asian financial crisis on major industrial countries: Macro indicators--Continued

Item	United States				Canada				EU12				Australia				Other OECD			
	1998	1999	2000	2005	1998	1999	2000	2005	1998	1999	2000	2005	1998	1999	2000	2005	1998	1999	2000	2005
Contained crisis:	<i>Percent change from baseline</i>																			
Real GDP	-0.1	0.1	0.1	-0.1	-0.2	0.2	0.1	-0.1	-0.2	0.1	0.2	-0.1	0.0	0.2	0.1	-0.1	-0.2	0.2	0.2	-0.1
Real GNP	-0.1	0.1	0.1	-0.1	-0.1	0.2	0.1	-0.2	-0.3	0.0	0.1	-0.1	0.0	0.3	0.1	-0.2	-0.3	0.1	0.1	-0.2
Private consumption	0.6	0.7	0.5	-0.1	1.2	1.3	0.6	-0.4	0.6	0.8	0.6	-0.2	1.3	1.4	0.6	-0.4	0.8	1.0	0.6	-0.4
Total investment	3.2	1.6	0.1	-0.4	3.2	1.9	0.2	-0.3	3.4	2.0	0.4	-0.3	3.5	2.1	0.2	-0.3	3.7	2.4	0.4	-0.5
Total imports	-2.6	-1.5	-0.5	0.2	-0.8	-0.4	-0.1	0.1	-2.5	-1.3	-0.4	0.3	-1.3	-0.5	-0.1	0.2	-1.3	-0.7	-0.2	0.1
Total exports	-6.3	-4.0	-1.5	0.4	-3.0	-1.9	-0.6	0.4	-3.4	-2.1	-0.7	0.4	-4.3	-3.0	-1.2	0.4	-3.4	-2.1	-0.8	0.4
Balance of trade ¹	-0.2	-0.2	-0.1	0.0	-1.0	-0.7	-0.2	0.2	-0.3	-0.3	-0.3	0.1	-0.7	-0.6	-0.3	0.1	-0.6	-0.5	-0.2	0.1
Real interest ²	-0.6	-0.5	-0.2	0.0	-0.9	-0.7	-0.3	0.0	-1.0	-0.9	-0.5	0.0	-0.8	-0.8	-0.4	0.0	-1.0	-0.9	-0.5	0.0
Inflation rate ²	-0.4	-0.3	-0.1	0.1	-0.6	-0.5	0.1	0.1	-0.4	-0.5	-0.2	0.0	-0.6	-0.5	0.5	0.1	-0.8	-0.7	-0.2	0.2
Real exchange rate	na	na	na	na	-0.8	-0.6	-0.4	-0.2	-1.2	-0.8	-0.4	-0.1	-0.9	-0.7	-0.5	-0.3	-1.0	-0.6	-0.3	-0.1
Nominal exchange rate	na	na	na	na	-0.5	-0.3	-0.4	-0.3	-1.2	-0.7	-0.2	0.0	-0.5	-0.5	-0.6	-0.4	-0.7	-0.3	-0.1	-0.3
Real effective exch. rate	7.8	4.6	1.6	-0.6	0.9	0.4	0.0	-0.4	7.1	4.1	1.2	-0.9	5.6	3.2	0.8	-0.9	1.2	0.8	0.3	-0.2
Wider crisis:																				
Real GDP	-0.4	0.2	0.3	-0.1	-0.5	0.2	0.3	-0.2	-0.5	0.1	0.4	-0.1	-0.1	0.4	0.2	-0.3	-0.5	0.4	0.5	-0.3
Real GNP	-0.3	0.4	0.4	-0.1	-0.3	0.3	0.2	-0.4	-0.7	-0.1	0.2	-0.3	0.0	0.6	0.2	-0.5	-0.9	-0.1	0.1	-0.4
Private consumption	1.5	2.0	1.4	-0.2	2.8	2.9	1.5	-1.1	1.5	1.8	1.4	-0.7	3.3	3.5	1.7	-1.0	1.9	2.3	1.6	-0.8
Total investment	8.7	4.8	0.1	-0.9	8.9	5.4	0.3	-1.0	8.8	5.4	0.7	-0.9	10.2	6.4	0.7	-0.9	10.2	7.1	1.3	-1.1
Total imports	-6.8	-4.2	-1.4	0.3	-2.3	-1.2	-0.2	0.6	-6.1	-3.4	-0.6	1.0	-2.7	-1.2	-0.2	0.5	-3.1	-1.6	-0.4	0.3
Total exports	-16.5	-11.3	-4.2	0.8	-7.8	-5.2	-1.5	1.5	-8.6	-5.6	-1.7	1.3	-12.2	-9.5	-3.7	1.6	-8.7	-5.6	-1.8	1.0
Balance of trade ¹	-0.5	-0.4	-0.2	0.0	-2.5	-1.8	-0.6	0.4	-0.9	-0.8	-0.4	0.1	-2.2	-1.9	-0.8	0.2	-1.8	-1.3	-0.4	0.2
Real interest ²	-1.6	-1.4	-0.6	0.1	-2.2	-2.4	-1.2	-1.50	-2.4	-2.6	-1.4	0.1	-2.1	-2.8	-1.7	0.1	-2.2	-2.5	-1.5	0.1
Inflation rate ²	-0.9	-0.9	-0.2	0.1	-1.4	-1.2	-0.4	0.2	-1.0	-1.2	-0.6	0.1	-1.5	-1.3	-0.2	0.3	-1.8	-1.8	-0.7	0.4
Real exchange rate	na	na	na	na	-3.1	-2.4	-1.5	-1.0	-3.4	-2.6	-1.5	-0.8	-3.5	-3.0	-1.7	-0.9	-2.8	-2.2	-1.1	-0.6
Nominal exchange rate	na	na	na	na	-2.6	-2.0	-1.4	-1.3	-3.7	-2.5	-1.1	-0.8	-2.7	-2.4	-1.7	-1.2	-2.3	-1.5	-0.7	-0.9
Real effective exch. rate	23.2	14.6	4.8	-1.2	2.3	0.8	-0.5	-1.4	20.2	11.8	2.5	-3.3	13.3	7.5	1.6	-2.1	3.9	2.3	0.8	-0.3

1. Percentage of GDP change from baseline.

2. Percentage point change from baseline.

na = Not applicable

Source: Simulation results from G-Cubed (Agriculture)

2

Appendix table 3 --Effect of Asian financial crisis and global adjustment on structure of U.S. agriculture

Item	Production				Consumption				Imports				Export volumes				Export prices				Export value			
	1998	1999	2000	2005	1998	1999	2000	2005	1998	1999	2000	2005	1998	1999	2000	2005	1998	1999	2000	2005	1998	1999	2000	2005
Contained Crisis:																								
	<i>Percent change from baseline</i>																							
Food grains	-6.0	-4.0	-1.5	0.5	2.6	1.3	1.3	-1.2	0.0	-3.6	0.0	0.0	-6.5	-4.6	-2.0	0.5	-2.1	-1.6	-0.7	0.2	-8.4	-6.1	-2.6	0.7
Feed grains	-2.0	-1.2	-0.4	0.0	0.0	3.8	0.0	0.0	-4.3	0.0	0.0	0.0	-6.7	-4.6	-1.9	0.3	-1.2	-0.9	-0.4	0.1	-7.7	-5.4	-2.2	0.4
Nongrain crops	-2.1	-1.1	-0.3	0.1	3.1	2.3	1.1	-0.4	0.6	0.3	0.1	-0.1	-5.3	-3.3	-1.3	0.4	-2.8	-1.7	-0.6	0.3	-7.8	-4.9	-1.8	0.6
Livestock products	-0.2	0.1	0.2	-0.1	1.0	1.1	0.7	-0.2	0.6	0.6	0.3	0.1	-9.4	-6.7	-2.8	0.7	-0.7	-0.6	-0.2	0.1	-10.0	-7.3	-3.0	0.8
Processed food	0.3	0.5	0.4	0.0	1.3	1.2	0.7	-0.2	2.5	1.6	0.4	-0.6	-5.7	-3.8	-1.4	0.5	-1.0	-0.7	-0.3	0.1	-6.6	-4.5	-1.7	0.6
Ag. total	-0.3	0.1	0.2	0.0	1.4	1.3	0.7	-0.2	0.9	0.6	0.2	-0.1	-6.2	-4.2	-1.7	0.5	-1.8	-1.2	-0.4	0.2	-7.8	-5.3	-2.1	0.6
Total	0.0	0.2	0.1	-0.1	0.8	1.0	0.6	-0.2	2.6	1.5	0.5	-0.2	-5.2	-3.3	-1.3	0.3	-1.5	-1.1	-0.4	0.2	-6.6	-4.3	-1.6	0.5
Wider Crisis:																								
Food grains	-15.7	-11.5	-4.5	1.1	6.5	5.1	3.8	-1.2	40.3	12.2	4.7	1.0	-17.3	-13.2	-5.5	1.2	-5.3	-4.4	-1.9	0.4	-21.5	-16.8	-7.1	1.5
Feed grains	-8.0	-6.1	-2.4	0.4	3.8	3.8	0.0	0.0	16.3	7.0	0.9	0.0	-27.1	-22.9	-10.3	1.4	-3.9	-3.4	-1.4	0.3	-29.8	-25.4	-11.5	1.7
Non-grain crops	-4.7	-2.6	-0.7	0.0	6.2	5.1	2.6	-0.7	22.3	9.2	17.2	2.3	-12.0	-8.2	-3.2	0.6	-5.4	-3.7	-1.2	0.5	-16.6	-11.3	-4.2	1.0
Livestock products	-0.5	0.5	0.7	0.0	2.9	3.3	2.1	-0.3	3.4	1.8	2.5	0.1	-25.3	-19.2	-8.1	1.8	-2.1	-1.9	-0.7	0.2	-26.8	-20.6	-8.8	2.0
Processed food	0.6	1.3	1.2	0.0	3.1	3.3	2.1	-0.2	5.9	1.8	4.9	0.8	-15.7	-11.5	-4.5	1.0	-2.4	-1.9	-0.7	0.1	-17.7	-13.1	-5.1	1.1
Ag. total	-1.0	0.0	0.5	0.0	3.3	3.4	2.1	-0.3	7.7	2.9	4.9	0.6	-17.1	-12.8	-5.3	1.0	-4.0	-3.0	-1.1	0.3	-20.3	-15.3	-6.2	1.3
Total	0.1	0.5	0.4	-0.2	2.0	2.7	1.8	-0.3	5.6	1.5	6.2	2.1	-13.4	-9.4	-3.6	0.6	-4.2	-3.2	-1.2	0.4	-17.0	-12.2	-4.7	1.0

Continued--

Appendix table 3 — Effect of Asian financial crisis and global adjustment on input structure of U.S. agriculture--Continued

Item	Investment				Capital Stock				Labor				Energy				Material			
	1998	1999	2000	2005	1998	1999	2000	2005	1998	1999	2000	2005	1998	1999	2000	2005	1998	1999	2000	2005
Contained crisis:																				
	<i>Percent change from baseline</i>																			
Food grains	6.4	3.9	1.2	0.1	0.0	0.2	0.3	0.1	-6.4	-3.8	-1.8	0.0	-6.3	-4.6	-1.5	1.3	-5.6	-3.7	-1.5	0.4
Feed grains	3.7	1.5	-0.3	0.0	0.0	0.1	0.1	0.0	-2.6	-1.4	-0.5	0.0	-2.5	-0.8	0.0	0.0	-1.9	-1.1	-0.3	0.0
Non-grain crops	0.5	-0.9	-1.4	0.1	0.0	0.0	0.0	-0.1	-3.3	-1.6	-0.5	0.0	-2.3	-1.5	-0.7	0.0	-2.6	-1.2	-0.3	0.1
Livestock products	1.5	0.9	0.2	0.4	0.0	0.1	0.1	0.0	-0.9	-0.2	0.1	0.0	-0.3	0.0	0.0	0.0	-0.1	0.2	0.2	-0.1
Processed food	5.5	8.1	5.3	0.2	0.0	0.2	0.4	0.2	-0.5	0.1	0.3	0.0	0.0	0.4	0.4	0.0	0.7	0.8	0.5	-0.1
Ag. total	2.8	1.9	0.6	0.1	0.0	0.1	0.2	0.1	-1.3	-0.4	0.0	0.0	-0.9	-0.3	0.0	0.1	-0.1	0.2	0.3	-0.1
Total	2.3	1.2	0.0	-0.3	0.0	0.2	0.2	0.0	-0.2	0.1	0.1	-0.1	0.1	0.2	0.1	0.0	0.8	0.6	0.1	-0.1
Wider crisis:																				
Food grains	16.4	10.8	3.1	-0.6	0.0	0.5	0.8	0.3	-16.7	-11.8	-5.0	1.1	-15.9	-12.3	-4.5	1.3	-14.7	-10.8	-4.3	0.9
Feed grains	11.4	6.7	0.3	0.3	0.0	0.3	0.4	0.1	-9.3	-6.9	-2.8	0.3	-9.1	-6.5	-2.3	0.0	-7.6	-6.0	-2.4	0.3
Non-grain crops	-1.9	-4.2	-5.1	0.0	0.0	-0.1	-0.2	-0.5	-7.5	-4.0	-1.0	0.1	-6.3	-3.8	-1.5	0.6	-5.6	-3.0	-0.6	0.1
Livestock products	4.1	2.6	0.6	-0.3	0.0	0.2	0.3	0.1	-2.4	-0.7	0.3	-0.1	-1.1	-0.3	0.3	0.0	-0.3	0.6	0.8	0.0
Processed food	13.2	21.6	15.0	-5.6	0.0	0.4	1.0	0.6	-1.4	0.3	0.8	-0.2	-0.2	0.7	0.9	0.0	1.5	1.9	1.4	-0.2
Ag. total	7.3	5.3	1.6	-0.6	0.0	0.3	0.5	0.1	-3.5	-1.4	0.0	-0.1	-2.9	-1.5	-0.2	0.1	-0.5	0.4	0.7	-0.1
Total	6.5	3.6	0.1	-0.7	0.0	0.4	0.6	0.1	-0.5	0.3	0.3	-0.2	0.1	0.3	0.3	0.0	2.4	1.7	0.4	-0.3

Source: Simulation results from G-Cubed (Agriculture) model.

Figure 1—U.S. agricultural export shares, FY 1997

Source: USDA / ERS, Foreign Agricultural Trade of the United States

About 12 percent of U.S. agricultural exports go to the most severely affected regions, ASEAN and South Korea.

An additional 30 percent go to other parts of Asia.

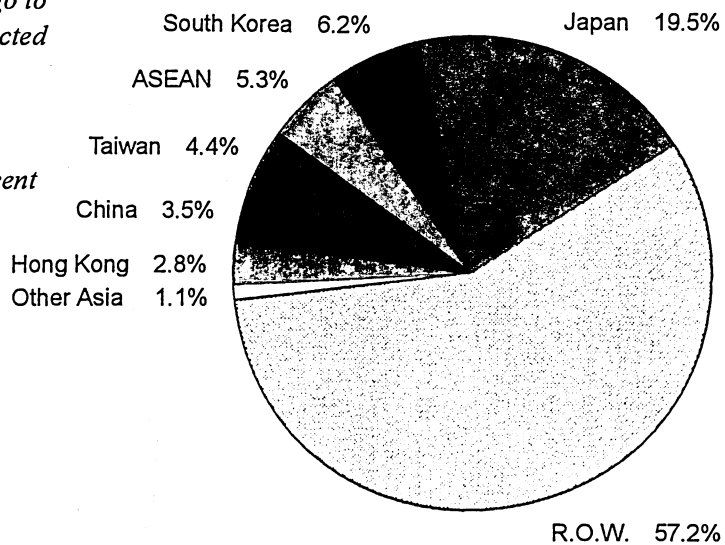


Figure 2—Asian currency exchange rates

Source: USDA / ERS, using data from Pacific Exchange Rate Service

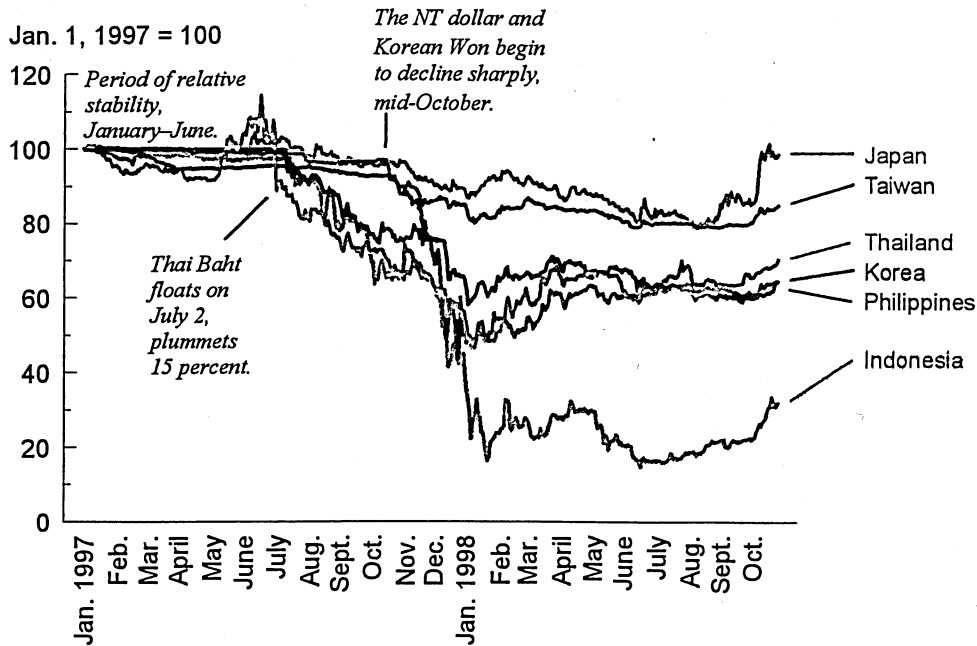


Figure 3—Equity markets in Asia and the United States

Source: USDA / ERS, using data from National Australia Bank and the Financial Times

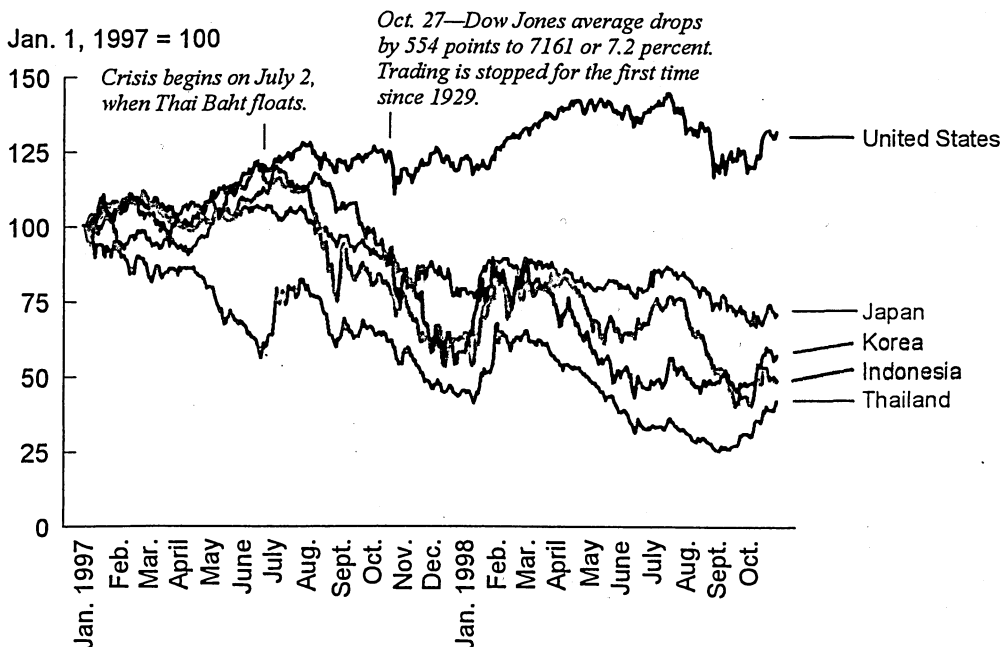


Figure 4A—Contained crisis: Nominal exchange rates

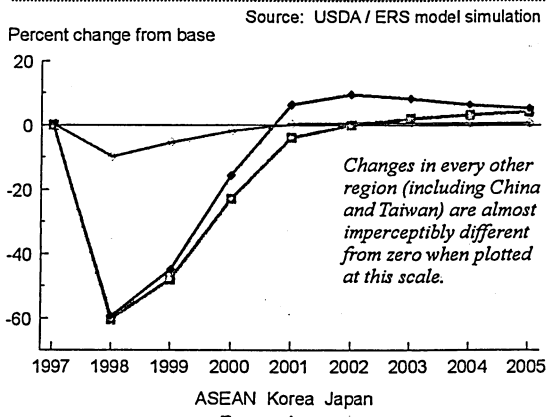


Figure 4B—Wider crisis: Nominal exchange rates

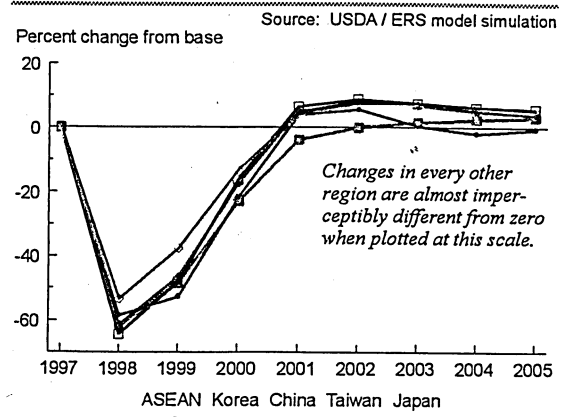


Figure 5A—Contained crisis: Changes in real GDP

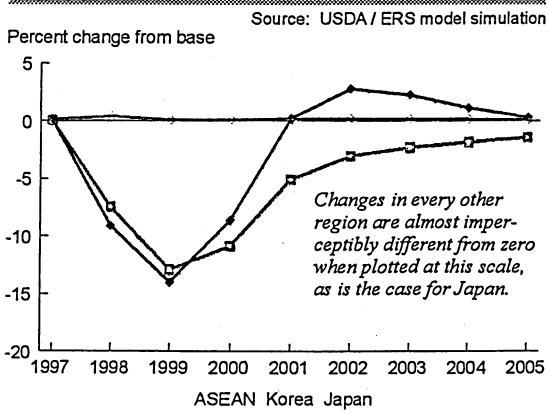


Figure 5B—Wider crisis: Changes in real GDP

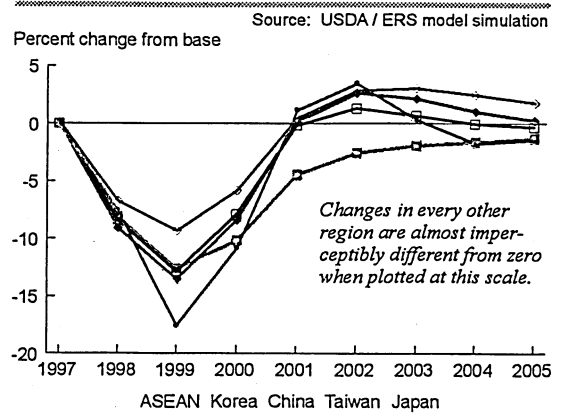


Figure 6A—Contained crisis: Changes in real exports

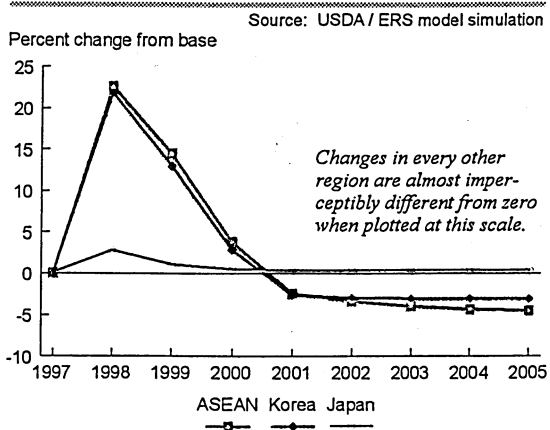


Figure 6B—Wider crisis: Changes in real exports

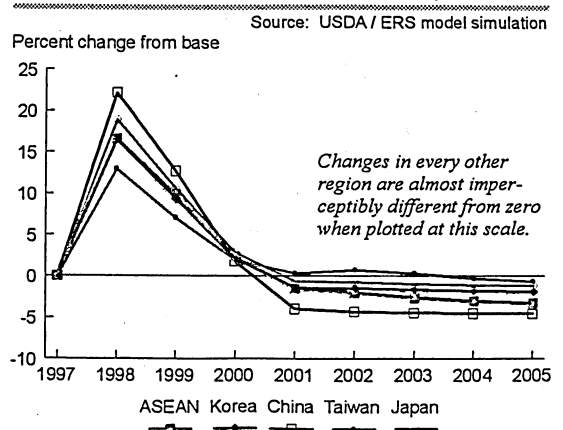


Figure 7—U.S. real GDP and real consumption

Source: USDA / ERS model simulations

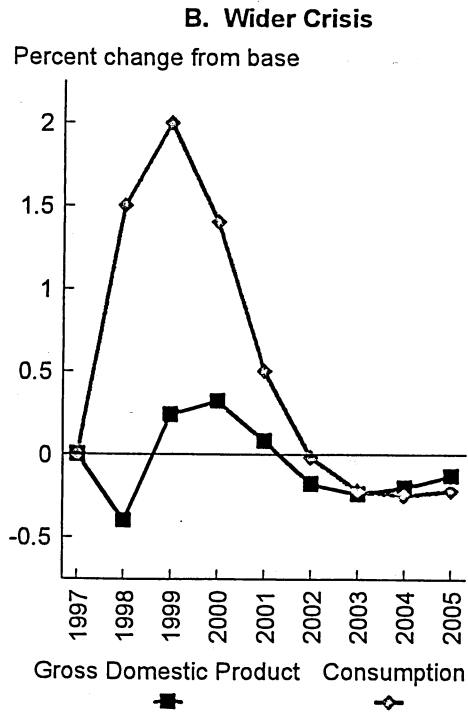
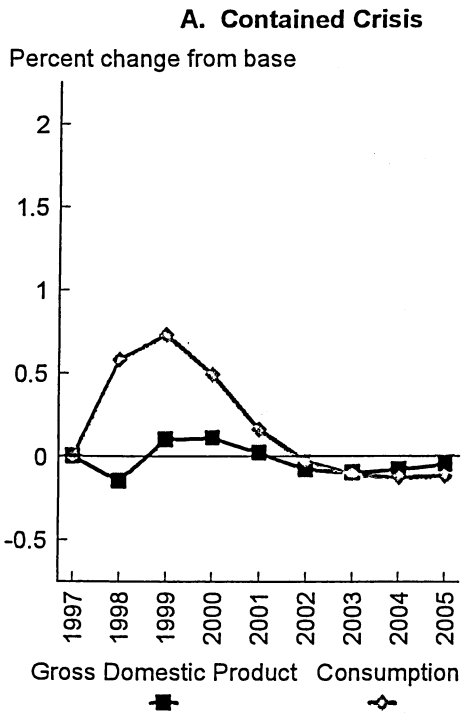


Figure 8—U.S. real interest rate and consumer price index

Source: USDA / ERS model simulations

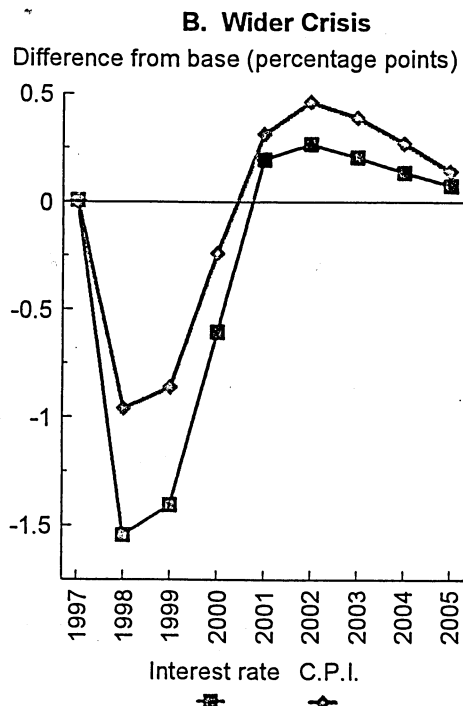
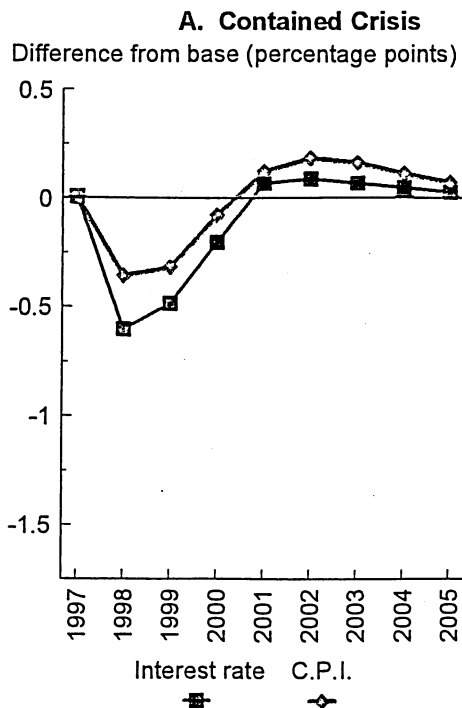


Figure 9A—Contained crisis: U.S. agricultural exports

Source: USDA / ERS model simulation

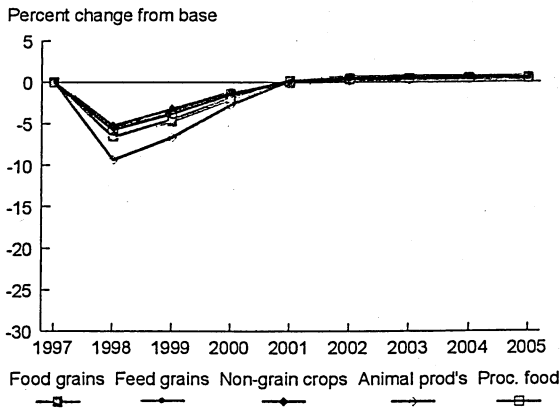


Figure 9B—Wider crisis: U.S. agricultural exports

Source: USDA / ERS model simulation

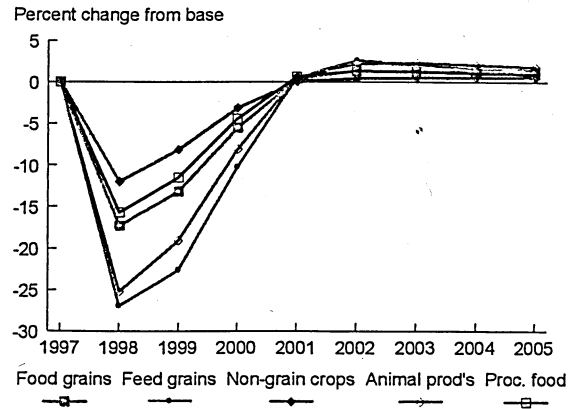


Figure 10A—Contained crisis: U.S. agricultural investment

Source: USDA / ERS model simulation

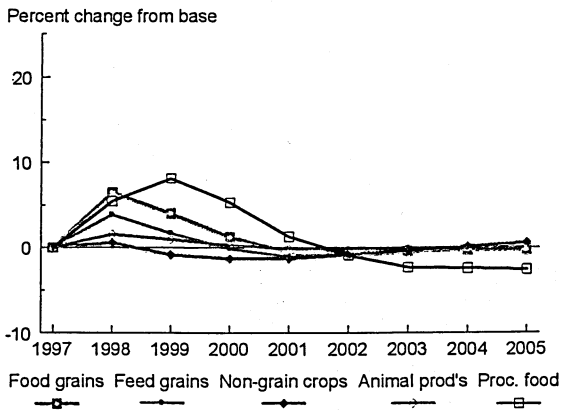


Figure 10B—Wider crisis: U.S. agricultural investment

Source: USDA / ERS model simulation

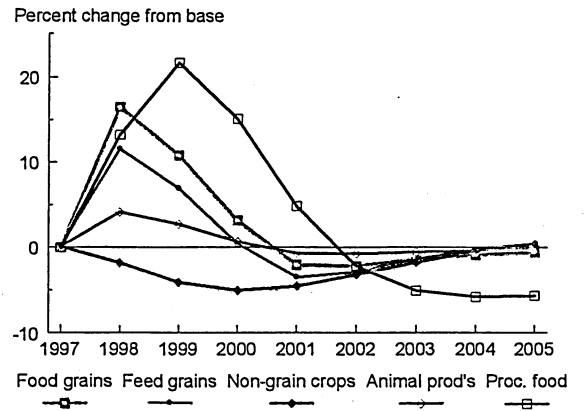


Figure 11A—Contained crisis: U.S. agricultural output

Source: USDA / ERS model simulation

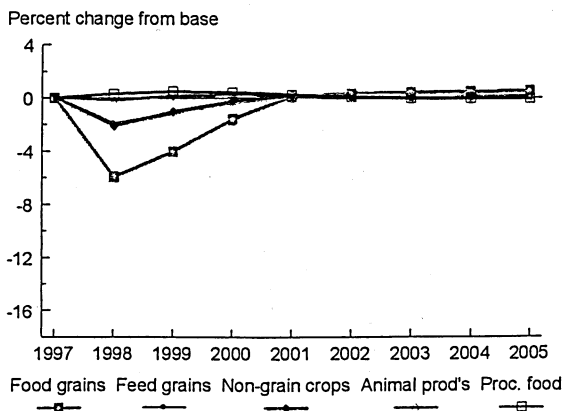


Figure 11B—Wider crisis: U.S. agricultural output

Source: USDA / ERS model simulation

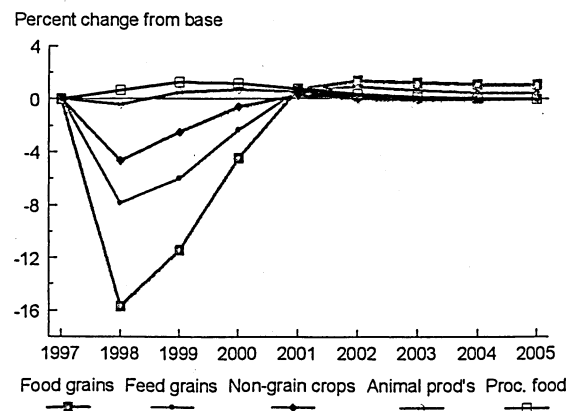


Figure 12A—Contained crisis: U.S. agric. export prices

Source: USDA / ERS model simulation

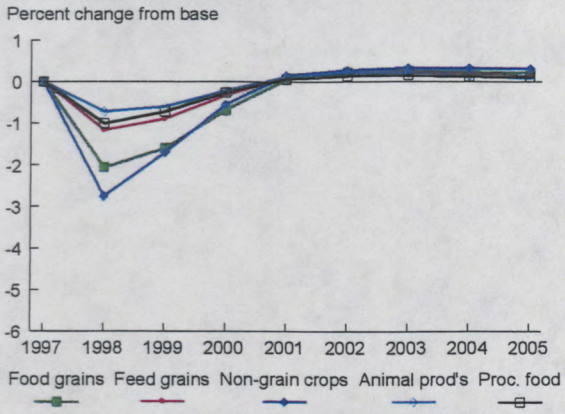
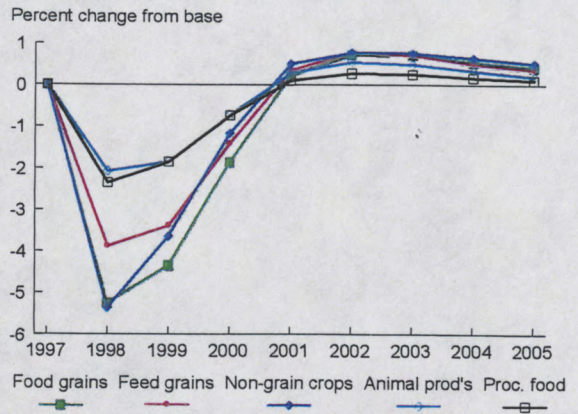
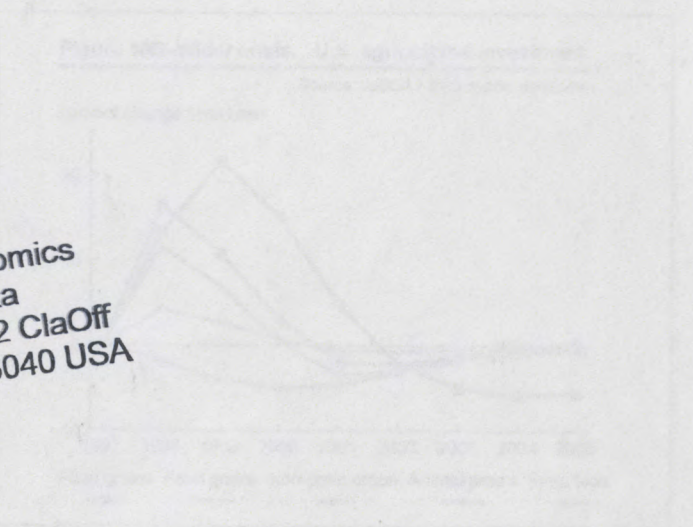
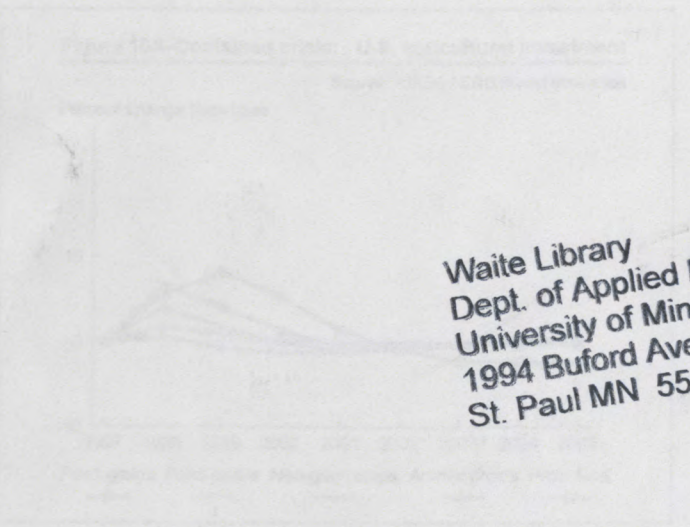
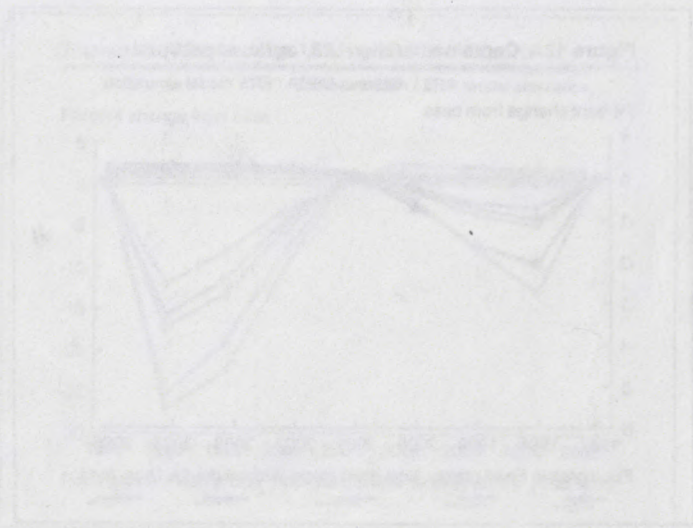
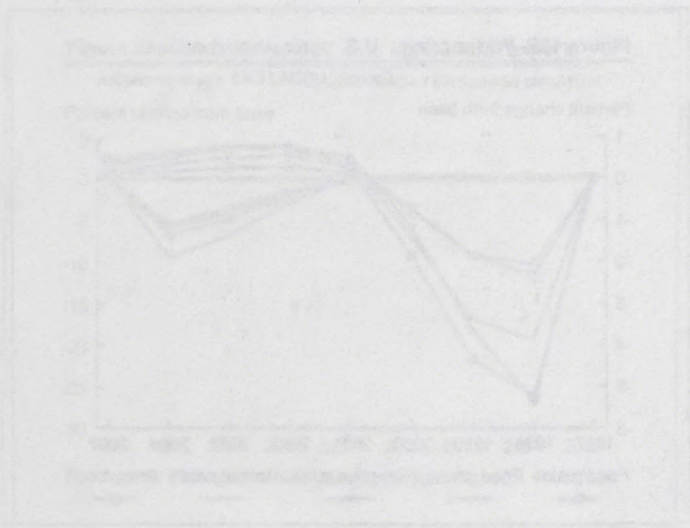


Figure 12B—Wider crisis: U.S. agric. export prices

Source: USDA / ERS model simulation





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