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The impact of the Asian Crisis on Australia's primary exports: why it wasn't so bad[†]

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This article explores the modest impact of the Asian Crisis on Australia's primary commodity exports. Simulations using a global general equilibrium model show: (i) as capital flees Asia, investment in Australia increases and the trade deficit grows; (ii) while terms of trade deteriorate in the short run, they improve in the medium run as import demand increases in the crisis countries; (iii) exports of primary commodities expand as the crisis countries try to export more; (iv) more income-elastic primary commodities fare less well than the income-inelastic foodstuffs as incomes decline in the crisis countries; (v) Australia's relatively low dependence on manufactured exports was a buffer as manufactured exports came under heavy pressure from exports from the crisis countries.

1. Introduction

Almost three years have passed since the onset of the Asian Crisis in mid-1997. Many commentators have been surprised by the resilience of the Australian economy to the crisis. Why has Australia weathered the storm so well despite its extensive trade links with Asia, and particularly with Southeast Asian countries which have been hardest hit by the crisis? Apart from the sound macroeconomic fundamentals, there have been no major government policy initiatives to combat the adverse impact of the crisis. Have we missed something important in analysing the impact of the crisis on Australia?

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In this article, we examine the impact of the Asian Crisis mainly through its effects on Australia's primary exports. We use the Global Trade Analysis Project (GTAP) computable general equilibrium model and its latest corresponding database (version 4). The multi-region nature of the model and its rich commodity and country details make it a useful tool to trace the impact of the crisis by looking at the capital account effect, the terms of trade effect, the trade structure, and sectoral links, among other aspects of economies that may be important in explaining the impact of the crisis.

The article is organised as follows. In the following section we briefly analyse how the consequences of the Asian Crisis were transmitted to the rest of the world. Here the focus is on the impact on the real economy, rather than on short-run macro dynamics. The model we employ cannot explain what caused the crisis, but it can take the consequences of the crisis in the affected economies as inputs and evaluate their impact on the rest of the world, including Australia. The next section sets out how we model the impact of the Asian Crisis on Australia. The model closure and the modeling of the shock of the Asian Crisis are spelt out. Then some detailed analyses of the simulation results are provided and the mechanisms through which the impacts from the Asian Crisis are transmitted to the Australian economy are identified. The final section concludes the article with a discussion of policy implications.

2. The Asian Crisis and its implications for Australia

The currency crisis that began in Thailand in July 1997 developed into a regional financial crisis that ultimately led to economic recession in several countries. These events are now well documented in the literature.[1] Efforts to explain the causes and policy responses continue, while research on the impact of the crisis on the real economy has also emerged recently.[2]

It was widely assumed that the Asian Crisis and the subsequent recession in the region would have a significantly adverse impact on the Australian economy because of Australia's close links with Asia through trade and investment. To understand how the Asian Crisis impacted on Australia —

[1] There is now a vast literature on the causes of the Asian Crisis. The following may interest the reader: McLeod and Garnaut (1998), Kalpana, Loungani and Stone (1998), Radelet and Sachs (1998), McKibbin and Martin (1998), Krugman (1998), Corbett and Vines (1998), Goldstein (1998), Corsetti, Pesenti and Roubini (1998) and Wong (1998). For an explanation of how economic vulnerability led to the Thai crisis, see Warr (1998).

[2] See Adams (1998), CIE (1998), Suryahadi (1998), McKibbin and Wang (1998), Tyers and Yang (1999) Noland, Robinson and Wang (1999), Ianchovichina, Hertel and McDougall (1999), Yang and Tyers (1999), and Wang and Xu (2000).

on its primary commodity trade in particular — we needed to examine how the Asian Crisis shocks were transmitted to Australia and to other countries.

There were two channels through which the Asian Crisis affected Australia's primary commodity trade. The first and obvious channel was the capital flight which precipitated the substantial depreciations of local currencies in the crisis economies.[3] This outflow sharply reduced domestic investment and hence demand for capital goods. The economies contracted. Meanwhile, the currency depreciations dramatically expanded the debt volume denominated in foreign currencies and the servicing cost of the debt. Net savings (saving minus investment) had to increase in order to pay the sharply expanded cost of debt servicing. The enhanced net saving will have to persist for at least several years before the foreign debt situation is stabilised. In addition, the crisis may have heightened the insecurity of the people affected, and increased saving can be seen as an insurance against future risks. Again, this impact on saving is likely to last well beyond the short run, and should lead to increases in capital account deficits in the crisis countries and capital account surpluses in non-crisis countries such as Australia. Increases in capital inflows into Australia stimulate investment, which in turn generates greater demand in the economy as a whole. This is what Yang and Tyers (1999) called the 'capital account effect' of the Asian Crisis.

The second channel was the reduction of Asian imports from Australia and an increase in Australia's imports from Asia. The Asian Crisis and the subsequent recession have substantially reduced the wealth that these countries have accumulated over the long boom prior to the crisis, as well as their incomes. The collapse of stock and real estate markets have seen many people and firms become bankrupt, while the recession has significantly reduced incomes. Thus, consumption falls and imports contract. In the short run, however, exports were not able to expand or even had to decline as widespread insolvency and the ensuing credit crunch led to widespread plant closures. This observation is confirmed by a recent World Bank survey of 3700 companies in Indonesia, Korea, Malaysia, the Philippines and Thailand.[4] On average, insolvency struck 15 per cent of the companies surveyed. In Indonesia, which was the worst hit by the crisis, fully 51 per

[3] These include the Republic of Korea, Indonesia, Malaysia, Thailand, and the rest of ASEAN (the Philippines and Singapore).

[4] Survey results were reported to the Conference on Asian Corporate Recovery: Corporate Governance and Government Policy, Bangkok, 31 March–2 April 1999. A summary of the survey results is available in *Asiaweek*, 16 April 1999.

cent of the surveyed companies reported insolvency. Illiquidity was even more widespread than insolvency, reaching 28 per cent among the surveyed companies.

Widespread plant closures (permanent or temporary) arising from insolvency and illiquidity led to substantial contractions of production in the short run, probably to a greater extent than that caused by the reduction in domestic investment. In the medium run, however, as insolvency issues are being resolved and access to credit improves, production will expand and exports rise, spurred by the substantial real depreciations of the local currencies. From Australia's perspective, it is inevitable that the trade deficit will rise. With the increase in the trade deficit, some sectors of the Australian economy will expand and others will contract. This is what Yang and Tyers (1999) called the 'trade compositional effect' of the Asian Crisis. How this effect translates into changes in Australia's primary commodity exports will depend on demand and supply responses in both domestic and overseas markets.

Both the capital account and trade compositional effects need to be modelled to evaluate the impact of the Asian Crisis on Australia's primary commodity exports. The way in which these effects are captured in the GTAP model through the crafting of the model closure and construction of shocks is spelt out in the next section.

3. Modelling the impact of the Asian Crisis

The GTAP comparative static framework is a model of the real economy and is therefore not suitable for the analysis of financial issues that have been central to the Asian Crisis.[5] Nor can it address issues of a short-run dynamic nature, such as adjustments in the nominal exchange rate. Other models, such as the G-Cubed model (McKibbin and Wilcoxen 1995) and the Monash model (Dixon and Rimmer 1997), are more suited to such tasks. The GTAP model is more suitable for the analysis of the short-run to medium-run impact on the real economy.

For our purposes, the following features of the GTAP model prove to be very useful. It explicitly incorporates a capital goods sector to service investment and a utility function to determine consumption and savings in each region. The average saving rate is normally exogenous but can be made endogenous if the capital/current account balance change is imposed, based on prior information. Together with any change in investment, which can also be made exogenous, this provides a realistic representation of global

[5] Readers interested in the details of the model should refer to Hertel (1997) and McDougall, Elbehri and Truong (1998) for the GTAP theory and database.

capital movements arising from the Asian Crisis. Observed differences in tastes across regions are explicitly modelled using the non-homothetic constant difference of elasticities (CDE) function. In the analysis of the Asian Crisis, this feature of the model is important as both the income and price changes involved are substantial. Another useful feature of the model is its incorporation of empirically based differences in technology across regions. This is not only reflected in the cross-regional and cross-industrial differences in the factor intensity of the five explicitly identified primary factors (land, unskilled labour, skilled labour, capital and natural resources), but also in different usage of intermediate inputs based on regional input–output tables. Finally, the model incorporates product differentiation by country of origin, and this allows the tracing of changes in bilateral trade flows of the various commodities (see Appendix table A1 for the Armington elasticities used).

We have crafted two closures (short and medium run) to reflect the length of time in which we allow the impact of the Asian Crisis to work through.[6] Common to both closures, capital is made sector-specific. All factors are domestically owned and there is no factor mobility across countries. As a result, returns to all factors are intra-regional.[7] Labour (both skilled and unskilled) is assumed to be fully mobile across industries in both the short and medium runs, while land and natural resources are 'sluggish' in their movement across industries. Labour is fully employed in both the short and medium runs. Wages therefore are flexible. This may appear inconsistent with the oft-reported increases in unemployment in the wake of the Crisis in the affected countries (World Bank 1999). Our judgement is that these reported increases in unemployment tend to come from official estimates, whereas in reality, people who have lost their jobs in the formal sector have been forced to find jobs in the informal sector or simply moved back into rural households in the absence of a social safety net.[8] Real wages therefore have fallen substantially (World Bank 1999).[9]

Investment in the crisis countries is made exogenous and reduced by the observed magnitude. The trade balance is also made exogenous and altered

[6] By short run, we mean a time period of one year or so, whereas the medium run refers to a time frame of 2–3 years.

[7] This may lead to biases in the evaluation of the income effect of the Asian Crisis as the crisis countries were clearly the host of large amounts of foreign investment. The flight of short-term capital precipitated the currency crisis and subsequently the financial crisis.

[8] This observation seems to be supported by social impact studies of the Asian Crisis (Tambunlertchai 1998; Azis 1998; Siamwalla and Sophchokchai 1998). Considerable anecdotes seem to confirm this (Vatikiotis 1998; Crispin 1998; Cohen 1999).

[9] Also see references cited in the previous footnote.

by the observed values, while the average saving rate is made endogenous. In non-crisis countries, the investment and the trade accounts are endogenous while the average saving rate is exogenous.

In the short run, reductions in investment in the crisis economies cannot fully explain the extent of output contraction. In industries where this is the case, we make output exogenous and reduce it by the magnitude of observed changes.[10] Furthermore, we assume that output contractions arising from insolvency and illiquidity result in sectoral unemployment of capital — to reflect temporary shutdowns of plants in the crisis economies. Thus, capital stock at the industrial level is made endogenous.

Normally, if unemployment of a factor is allowed, some form of factor price rigidity has to be introduced. In this study, however, capital unemployment is linked to the contraction of industrial production. We impose exogenous reductions in production based on the observed changes in sectoral output collected from national production statistics. Yang and Tyers (1999) have shown that if output is reduced because some firms shut down, the quantity of capital that is still in use is determined so long as the remaining firms behave perfectly competitively. That is, there is a one-to-one relationship between profit-maximising output and capital use under such circumstances.

In the medium run, we assume that insolvency and illiquidity problems are resolved, so that all capital stock returns to full employment and its subsequent supply becomes exogenous. However, the capital stock remains sector-specific. Industrial output therefore returns to endogeneity.

In the short run, to reflect the evidence that some urban labour retreated to the countryside following the crisis, labour productivity in agriculture is reduced and land productivity is raised.[11] There is anecdotal evidence that those who have returned to the countryside in the wake of the crisis often lack experience in farming, but tend to invest their savings in farmland to produce for urban markets (Cohen 1999). The magnitude of these shocks is based on our best judgement, rather than hard empirical evidence, which is lacking. These agricultural shocks, together with those to investment and the balance of trade are summarised in table 1.

Contractions in investment tend to be smaller in the medium run than in the short run. In the medium run, as production bounces back, the value of

[10] Agricultural industries are excluded from this screening process. Therefore, all industries that suffer from plant closures are in the industrial sector. Appendix table A2 reports these industries by country and the extent of production contraction observed. Many of these statistics are based on preliminary estimates or projections.

[11] On the evidence that some labour has retreated to the countryside in the wake of the crisis, see the references cited in footnote 8.

Table 1 Shocks to the Asian developing economies in the short run (percentage)

	Investment (percentage)	Balance of trade (1995 US$ billion)	Agricultural labour productivity (percentage)	Land productivity (percentage)
Indonesia	−57.7 (−57.7)	9.4 (12.3)	−5	3
Korea	−43.6 (−37.2)	44.6 (50.3)	−5	3
Malaysia	−14.2 (−14.2)	7.4 (19.1)	−3	2
Thailand	−57.3 (−56.5)	18.8 (24.5)	−5	3
Other ASEAN [a]	−25.9 (−25.9)	10.9 (27.2)	−2	1
Chinese economies [b]	2.3 (2.3)	10.7 (11.1)	0	0

Notes: Numbers in the parentheses are for the medium-run scenario.
[a] The Philippines and Singapore.
[b] China, Taiwan and Hong Kong.
Source: IMF, *International Financial Statistics*, IMF, Washington, DC, October 1999; *The Economist*, various issues; and authors' assumptions for productivity estimates.

savings increases from their short-run levels. With investment continuing to be subdued to a large extent, the capital account deficit and trade account surplus tend to increase in the medium run. We assume that this situation is likely to last for several years and is not entirely transitory. As Krugman (1999) points out, even though the recovery of the crisis economies is inevitable, it will take quite some time before foreign capital returns, and when it does return, its share in total investment in these economies is unlikely to be soon restored to pre-crisis level. Huge distortions in the capital market had probably already led to rapidly diminishing returns prior to the crisis. In addition, the value of the domestic assets that constituted the collateral behind much of the earlier investment in Asia has been greatly reduced in value. Although there is evidence that investment in the crisis economies has begun to rise, the impact that this might have in reducing their capital account deficit is probably offset in the current account by a rise in debt service flows (Yang and Tyers 1999).

4. Tracing the effects of the Asian Crisis

As discussed in the previous section, the first channel through which the Asian Crisis is transmitted into Australia is the capital account. In the short run, as investment falls in the crisis economies, capital is sent overseas. Real exchange rates depreciate substantially against the rest of the world. In the current account, exports expand, but imports decline, reflecting the effect of reduced domestic absorption (see table 2). Note that in the short run, export

Table 2 Changes in trade in Australia's trading partners as a result of the Asian Crisis, 1995 base (percentage)

	Short run		Medium run	
	Exports	Imports	Exports	Imports
Japan	−5.5	2.7	−5.6	3.2
Korea	12.2	−21.5	31.1	−10.6
Indonesia	−1.3	−21.9	14.1	−12.9
Thailand	1.3	−22.4	16.3	−19.3
Malaysia	1.2	−9.8	16.5	−10.5
Rest of ASEAN	4.4	−3.5	13.3	−6.2
Chinese economies	2.1	−0.9	2.4	−0.5
South Asia	−1.7	1.1	−1.9	1.8
Rest of world	−1.1	0.6	−1.8	1.0

Source: Simulation of the GTAP model, database version 4.

expansion is limited for most of the crisis economies, and the current account surplus is achieved mainly through the contraction of imports.[12]

In Australia, as in the rest of the world, there is a real currency appreciation against the crisis economies, but a moderate depreciation against other industrial economies in North America and Europe (see table 3). Changes in the external accounts in Australia therefore mirror images of what happens in the crisis countries. Investment increases as the capital account surplus increases. This is balanced by an enlarged current account deficit. The increase in the current account deficit is attributed to a decline in the price of exports relative to the price of imports. Import volumes decline more than export volumes.

In the medium run, this pattern of global redistribution of investment is retained. Notice, however, that capital movement across regions is considerably larger. As production in the crisis economies recovers in the medium run, incomes recover and saving increases much more strongly (or declines to a lesser extent) than in the short run, leading to a larger capital outflow. Export expansion is no longer so constrained by the contraction of production, and imports contract to a much lesser extent. On balance, a larger current account surplus is observed in the medium run than in the short run for some countries (table 1).

In the short run, GDP in Australia hardly changes following the Asian Crisis (see table 4). Domestic consumption falls slightly, but this is offset by an increase in investment. Measured by equivalent variation, Australia's

[12] This result is consistent with the development of the trade account in the crisis economies since 1997. See Appendix table A3. The simulated changes in trade balances by industry are reported in Appendix table A4.

Table 3 Changes in Australia's balance of payments and the real exchange rate as a result of the Asian Crisis, 1995 base (US$ billion)

	Short run	Medium run
Trade account		
Exports, X	−1.7	−1.9
Imports, M	−1.0	0.4
Balance of trade ($X - M$)	−0.7	−2.3
Capital account		
Saving, S	−0.4	0.0
Investment, I	0.3	2.3
Capital account balance ($S - I$)	−0.7	−2.3
Real exchange rate (percentage) [a]	6.2 (−1.4)	8.4 (−0.5)

Note: [a] Against the crisis economies (Indonesia, Korea, Malaysia, Thailand, other ASEAN economies). Numbers in the parentheses are against the 'rest of the world' (mainly North America and Europe). The change in the real exchange rate is approximated by the percentage change in the ratio of Australia's GDP deflator with the trade-weighted averages of the economies in comparison.
Source: IMF and model simulations described in the text.

Table 4 Macroeconomic impact of the Asian Crisis on Australia, 1995 base (percentage)

Economic variable	Short run	Medium run
GDP	0.0	0.0
Equivalent variation (US$b)	−1.1	0.4
Allocative efficiency	−0.1	0.1
Terms of trade	−1.0	0.3
Real wages	0.1	0.1
Exports	−0.4	−2.0
Imports	−0.7	1.0
Export price	−1.6	−0.2
Import price	−0.4	−0.5
Consumption	−0.3	0.1
Terms of trade	−1.2	0.3
World price effect	−0.7	0.0
Export price effect	−0.6	0.1
Import price effect	0.1	0.2

Source: Simulation of the GTAP model, database version 4.

economic welfare is reduced slightly by the Asian Crisis, largely as a result of the deterioration in its terms of trade. Such a result is not surprising, as in the short run, declines in import demand in the crisis economies drive down Australia's export prices (table 4).[13]

[13] Australia's terms of trade fell by 1.7 per cent from the 2nd quarter 1997 to the 2nd quarter 1998, according to the IMF (2000). Farmers' terms of trade fell by 5 per cent from 1996–97 to 1998–99, according to ABARE (1999).

Table 5 Impact of the Asian Crisis on sectoral output in Australia, 1995 base (percentage)

Industry	Short run	Medium run
Rice and wheat	0.2	0.1
Other grain	0.1	−0.2
Oil seeds	0.0	−0.3
Plant-based fibres	−1.4	1.2
Other crops	−1.2	−0.7
Livestock	−0.2	−0.3
Wool	−0.4	−0.3
Other agriculture	−0.8	−0.3
Mineral energy	−0.2	0.0
Other minerals	−0.1	0.0
Meat and dairy products	0.2	−0.5
Processed rice	−1.0	−0.9
Other food	−0.3	−0.9
Labour-intensive manufactures	1.2	−0.8
Import-competing manufactures	1.1	−0.2
Services	−0.1	0.1

Source: Simulation of the GTAP model, database version 4.

In the medium run, Australia's exports fall further and imports increase, leading to an even larger current account deficit (table 3). As exports from the crisis economies expand, however, Australia begins to enjoy cheaper imports. At the same time, increased demand for imports in the crisis economies begins to push up the prices of Australian exports. Together, these lead to an improvement in Australia's overall terms of trade. This, in turn, leads to an enhancement of Australia's economic welfare, along with its gross domestic product. Real wages increase, and so does domestic consumption.

The real depreciation of the Australian dollar against the crisis economies inevitably leads to the contraction of the more tradable sectors and the expansion of the less tradable sectors. This, however, does not happen in the short run (see table 5). As mentioned earlier, the substantial reduction in production as a result of under-utilisation of capital in the crisis economies severely restricts their capacity to export. Thus, the expansion of Australia's imports from these economies is limited in most cases (table 6). As a result, the more heavily traded sectors expand relative to the less traded sectors (mainly the services sector) (table 5, 'Short run' column). There are, however, some variations among the more heavily traded industries even though most changes are small. Most primary industries contract.[14] The exceptions are

[14] The working definition of primary industries (commodities) is all industries with the exception of manufacturing and services industries.

Table 6 Impact on Australian trade by destination and source, 1995 base (percentage)

Destinations/sources	Short run		Medium run	
	Exports	Imports	Exports	Imports
Japan	1.2	−4.0	−1.3	−3.0
Korea	−20.4	18.4	−6.4	35.8
Indonesia	−16.9	−3.9	−5.0	13.4
Thailand	−18.7	2.2	−18.0	19.0
Malaysia	−8.2	1.1	−13.7	19.6
Rest of ASEAN	−0.4	6.4	−12.3	18.0
Chinese economies	0.6	2.2	−3.3	3.6
South Asia	2.5	−2.3	−0.7	−2.2
Rest of world	4.5	−2.4	1.6	−2.8

Source: Simulation of the GTAP model, database version 4

cereals, oil seeds, meat and dairy products. The general observation is that the less income-elastic commodities and those that are less likely to be intermediate inputs tend to suffer less or not to suffer at all from the Asian Crisis (see Appendix table A5 for the relevant income elasticities).[15]

In the medium run, however, the more heavily traded sectors contract and the less heavily traded sectors expand (table 5). Furthermore, labour-intensive industries tend to contract more than capital-intensive industries. The services sector as a less-traded sector benefits from the real appreciation of the Australian currency. Most agricultural commodities experience small declines in production, but the output of mineral commodities remains steady. The labour-intensive industries are among the most adversely affected, but even here, the contraction is not large.

To understand why production is so little affected by the Asian Crisis, one has to look at how Australia's trade changes in different overseas markets in response to the crisis. As is evident in table 6, exports to the crisis economies are severely hampered, but exports to the rest of the world expand considerably, offsetting to a large extent the loss of exports to the crisis economies. This is especially true in the short run, where exports to the Chinese economies and South Asia, as well as those to the 'rest of the world', expand. On the import side, only imports from Korea experience a substantial increase in the short run; increases in imports from most other crisis

[15] ABARE (1999) statistics show that the production and exports of red meat, dairy products and oilseeds grew strongly in 1997–98. Rice exports also grew considerably despite a slight fall in production. In contrast, wheat production and exports fell sharply. The latter seems largely due to factors other than the Asian Crisis as exports to the crisis countries actually increased significantly in 1997–98.

Table 7 Australia's exports by destination, March quarter 1997–December quarter 1999 (percentage of total)

	USA	EU	Japan	ASEAN	Other Asia
Mar-97	8.5	12.8	25.5	19.5	33.8
Jun-97	9.5	13.1	23.7	20.2	33.5
Sep-97	10.0	12.2	25.3	18.8	33.6
Dec-97	9.7	13.4	25.5	18.5	32.9
Mar-98	12.9	16.0	27.1	12.9	31.1
Jun-98	13.0	18.0	24.4	13.0	31.7
Sep-98	12.4	19.9	25.8	12.4	29.6
Dec-98	11.9	18.9	25.6	11.9	31.7
Mar-99	11.7	16.6	25.8	11.7	34.2
Jun-99	13.1	15.8	24.5	13.1	33.6
Sep-99	13.5	14.7	26.1	13.5	32.3
Dec-99	12.6	18.4	25.0	12.6	31.4

Source: Australian Bureau of Statistics, *International Trade — Australia* (cat. 6422.0).

economies are moderate. Imports from Indonesia even decline due to the severe contraction of domestic production there.

In the medium run, Australia's exports to most crisis economies decline less; however, exports to Malaysia and the 'rest of ASEAN' decline further. The improvement of exports to the crisis economies is, however, more than offset by the reduced expansion of exports to the rest of the world markets. In fact, exports to Japan, the Chinese economies, and South Asia decline in the medium run, in contrast to the increases in the short run. In the medium run, as the crisis economies recover, their exports expand, competing with Australian exports.

Table 7 shows Australia's actual exports by destination. It is evident that a significant diversion of Australia's exports from Asia to North America and Europe has occurred since the Asian Crisis. Since late 1998, however, the process of diversion seems to have ceased, and the Asian markets, especially developing Asia, have recovered considerably. This trend seems to be consistent with our simulation results.

Turning to sectoral export performance, over half of Australia's primary commodity exports are negatively affected, especially in the short run (see table 8). The most severely affected tend to be income-elastic commodities, such as plant-based fibres, vegetables and fruits ('other crops'), livestock, forestry and fishery ('other agricultural commodities').[16] Cereals, oil seeds

[16] Yang (1998) noted in relation to the impact of the Asian Crisis on China that the initial impact tended to be dominated by the income effect. Over time, the price effect tended to gain dominance as the real depreciation of the crisis economies' currencies led to greater price competitiveness.

Table 8 Impact of the Asian Crisis on Australia's trade in the short run, 1995 base (percentage)

	Exports			Imports		
	To crisis economies	To non-crisis economies	Total	From crisis economies	From non-crisis economies	Total
Rice and wheat	−1.6	2.2	0.5	13.6	−0.2	−0.2
Other grain	−5.6	1.4	0.7	18.5	−1.2	−1.2
Oil seeds	−7.0	1.8	1.5	25.5	−0.6	−0.4
Plant-based fibres	−12.8	6.5	−3.4	48.2	−8.0	−0.9
Other crops	−16.9	2.2	−3.5	13.8	−3.7	0.0
Livestock	−21.0	4.2	−2.7	19.6	−1.4	−0.3
Wool	−18.8	1.1	−0.9	26.4	−0.8	−0.8
Other agriculture	−20.3	2.0	−5.6	81.4	−7.7	−2.5
Mineral energy	−12.2	0.6	−1.2	7.1	−2.9	0.1
Other minerals	−11.6	1.0	−0.9	17.9	−1.3	0.6
Meat and dairy products	−9.5	2.5	0.5	19.2	−2.0	0.0
Processed rice	−10.9	−2.3	−2.4	8.1	−4.0	1.9
Other food	−9.0	1.0	−1.1	10.0	−3.3	0.2
Labour-intensive manufactures	−15.0	5.7	0.6	−2.6	−0.6	−0.9
Capital-intensive manufactures	−4.1	4.9	3.0	−2.5	−1.1	−1.2
Services	−24.1	1.0	−1.9	31.3	−4.1	−0.1
Total	−13.3	−2.6	−0.4	6.4	−1.7	−0.7

Source: Simulation of the GTAP model, database version 4.

and meats and dairy products fare quite well. The exports of these commodities increase not only because exports to the crisis economies fall to a lesser extent, but also because exports to the rest of the world increase. As noted earlier, the moderate falls in manufactured exports to the crisis economies are more than offset by the increases in the exports to the non-crisis economies, leading to net increases in the exports of manufactured exports in the short run.

On the import side, the large real depreciations of the currencies of the crisis economies lead to substantial short-term increases in Australia's imports from the region, especially primary commodities (although they start from a very low base). However, imports of manufactured products from the region decline. In contrast, Australia's imports from the rest of the world fall across the board, and this slightly more than offsets the increased imports from the crisis economies for most commodities.

In the medium run, most exports of primary commodities to the crisis economies begin to increase, with the exception of 'other crops', livestock products, meat and dairy products, processed rice and 'other food' (table 8). The most adversely affected exports are, however, manufactures and services. This is not only because the recovery of domestic production in the crisis economies reduces the need for imports from Australia, but also because recovery inevitably leads to export surges in third country markets. Although the Australian currency depreciates against those used in third country markets, currencies of the crisis economies depreciate even more. This erodes Australia's competitiveness in the major markets in North America, Europe and the Chinese economies. As a result, Australia's exports to these markets perform less well in the medium run than in the short run.

In contrast to the short run, imports from the crisis economies increase across the board, and in many industries, especially manufacturing industries, the increases are substantial. Imports from non-crisis economies decline in almost all industries as a response to the real depreciation of the Australian dollar, but these declines do not offset the import surges from the crisis economies.

It is noteworthy that in the short run, Australian primary industries bear the brunt of the impact of the Asian contraction in the immediate aftermath of the crisis. Over time, however, the pressure tends to shift to manufacturing industries as the main exports from the crisis economies are manufactured commodities. Australia's structure of exports favouring primary commodities therefore alleviates the longer-term impact of the Asian Crisis.

In many cases, Australia's primary exports are also helped by the expansion of exports of manufacturing industries which use Australian commodities as intermediate inputs. This is evident from the considerable increases in Australia's exports of plant-based fibres, wool and mineral

commodities to the crisis economies (tables 8 and 9).[17] This means that agriculture-based processing industries in Australia will face strong competition from the crisis economies. Thus, meat and dairy products, processed rice, and 'other food' industries are likely to be slower in recovering export markets.

5. Conclusion

It was a common assertion that the Asian Crisis would have a severe impact on the Australian economy. Such assertions seem to be supported by the increasing trade deficit since the onset of the Asian Crisis. While this development in the trade account is expected, it does not reflect the total impact of the crisis on Australia.

There is no doubt that the recessions in the crisis countries led to declines in demand for Australian products. In the short run, falling incomes and real depreciation in the crisis economies hurt Australian primary industries most, especially the more income-elastic ones. Widespread plant closures and illiquidity restricted these economies' major exports, most of which are manufactured products. Thus, in the short run, Australian manufacturing industries were more insulated from the impact of the Asian Crisis than primary industries. This meant that Australia's export prices fell more than its import prices in the short run, resulting in a deterioration in Australia's terms of trade and hence in its economic welfare (although the welfare impact was negligible).[18]

As the crisis economies recover, their import demand, and hence Australia's export prices, will strengthen. The recovery in Asia is spurred by real depreciations which lead to increased supply of exports to Australia. Thus Australia's import prices also fall over time, further improving its terms of trade. With this, consumer products and capital goods become cheaper, and real incomes in Australia increase, rather than decline.

At the industry level, primary industries that produce more income-elastic commodities tended to be the hardest hit in the short run, while manufacturing industries were protected by the collapse of production in the crisis economies. As these economies recover in the medium run, Australia's tradable sector as a whole will contract. However, some industries within the sector, especially those primary industries that provide inputs to the

[17] According to ABARE (1999), Australia's cotton exports to Indonesia increased by 30 per cent in 1998–99; to Korea by 40 per cent; and to Thailand by 43 per cent. Wool exports to Korea increased by 39 per cent in 1998–99.

[18] This ignores the reduced incomes from repatriated profits of Australian investment in the crisis economies.

Table 9 Impact of the Asian Crisis on Australia's trade in the medium run, 1995 base (percentage)

	Exports			Imports		
	To crisis economies	To non-crisis economies	Total	From crisis economies	From non-crisis economies	Total
Rice and wheat	1.5	0.4	0.9	0.5	−0.4	−0.4
Other grain	2.3	1.1	1.2	13.8	−1.1	−1.1
Oil seeds	5.9	1.8	2.0	−5.1	−0.3	−0.3
Plant-based fibres	8.4	−3.1	2.8	4.4	0.7	1.2
Other crops	−6.8	1.0	−1.3	9.2	−2.8	−0.2
Livestock	−3.4	1.7	0.3	17.8	−1.1	−0.1
Wool	4.2	−0.6	−0.1	6.6	−0.6	−0.6
Other agriculture	1.0	−1.9	−0.9	41.1	−2.3	0.3
Mineral energy	4.2	−0.4	0.3	1.0	−0.2	0.2
Other minerals	6.0	−0.7	0.3	8.0	−0.8	0.1
Meat and dairy products	−8.8	0.8	−0.9	22.0	−1.6	0.6
Processed rice	−19.9	−2.1	−2.4	4.0	−2.3	0.8
Other food	−11.3	−0.6	−2.9	12.1	−2.8	1.1
Labour-intensive manufactures	−17.0	0.6	−3.8	16.4	−1.3	1.0
Capital-intensive manufactures	−11.8	0.6	−2.0	27.6	−2.0	0.6
Services	−19.6	−1.8	−3.3	36.7	−2.9	1.6
Total	−9.7	−0.3	−2.0	21.5	−1.9	1.0

Source: Simulation of the GTAP model, database version 4.

manufacturing sector in the crisis economies, may well expand. The basis for this to occur is that recovery in the crisis economies must be led by strong export expansion following the substantial real depreciation of their currencies. This generates demand for Australia's raw materials, including many agricultural and mineral products. Overall, the contractionary pressure on primary industries will ease over time while the pressure on manufacturing industries will increase for some time into the future.

The challenge for the manufacturing industries is that they have to compete more fiercely in third country markets with similar products to the crisis countries. While they may have an advantage in the crisis country markets because of the real depreciation of Australian currencies against those of North America, Europe and possibly China, competition from local industries will be strong because of the real depreciation of their currencies against the Australian dollar. Manufactured exports are not as important to Australia as to many other countries. This often less desired trade structure may have significantly alleviated the impact of the crisis on Australia.

It is inevitable that as the Asian Crisis economies recover, their tradable sectors will expand while their non-tradable sectors contract, at least in a relative sense. This structural change in the crisis economies necessitates a mirror image change in the Australian economy. In particular, Australia's trade deficit will tend to increase and some manufacturing industries will be under renewed pressure. This could be a political as well as an economic problem given Australia's low savings rate, areas of inefficient labour-intensive manufacturing, and the volatility of the Australian dollar since mid-1997. Having weathered the storm of the Asian Crisis so well, Australia stands to benefit from Asia's recovery if it can maintain macroeconomic stability and avoid protectionist responses to a growing trade account deficit.

Appendix

Table A1 Elasticities of substitution

Commodity	Between domestic goods and imports	Among sources of imports
1 Rice and wheat	2.2	4.4
2 Other grain	2.2	4.4
3 Oil seeds	2.2	4.4
4 Plant-based fibres	2.2	4.4
5 Other crops	2.2	4.4
6 Livestock	2.8	5.6
7 Wool	2.2	4.4
8 Other agricultural products	2.8	5.6
9 Mineral energy	2.8	5.6
10 Other minerals	2.8	5.6
11 Meat and dairy products	2.2	4.4
12 Processed rice	2.2	4.4
13 Other food	2.2	4.4
14 Labour-intensive manufactures	3.1	6.1
15 Import-competing manufactures	2.7	5.9
16 Services	2.0	3.8

Source: GTAP database, version 4.

Table A2 Short-run output contractions in the crisis economies (percentage)

	Korea	Indonesia	Thailand	Malaysia
Mineral energy	−12.4	−2.1	−3.7	n.a.
Other minerals	−12.4	−4.7	−5.3	n.a.
Labour-intensive manufactures	−15.8	−15.9	−13.6	−7.7
Import-competing manufactures	−12.3	−19.7	−16.5	−11.8
Services	−10.2	−22.6	−11.9	−0.8

Note: n.a.: Not applicable as output in these industries is endogenous.
Sources: National statistics: Websites:
Indonesia: http://www.bps.go.id/statbysector/natres/gdp/tables.shtml;
Malaysia: http://www.bnm.gov.my/pub/msb/199904/
Korea: http://www.bok.or.kobank/owa/
Thailand: http://www.nesdb.go.th/

Table A3 Trade balance in the crisis economies, 1996–99 (US$ billion)

		1996	1997	1998	1999
Indonesia	Exports	50.2	56.3	50.4	37.3
	Imports	44.2	46.2	31.9	22.8
	Trade balance	5.9	10.1	18.4	14.5
Korea	Exports	129.7	136.2	132.3	144.2
	Imports	150.3	144.6	93.3	119.7
	Trade balance	−20.6	−8.5	39.0	24.5
Thailand	Exports	55.7	57.4	54.5	31.8
	Imports	72.3	62.9	43.0	27.0
	Trade balance	−16.6	−5.5	11.5	4.9
Malaysia	Exports	78.3	78.7	73.3	n.a.
	Imports	78.4	79.0	58.3	n.a.
	Trade balance	−0.1	−0.3	15.0	n.a.

Source: IMF, *International Financial Statistics*, January 2000.

Table A4 Trade balances in the crisis economies by industry, 1995 base (US$ million)

Industries	Korea	Indonesia	Thailand	Malaysia	Other ASEAN
1 Rice and wheat	17	−9	12	31	1
2 Other grain	126	18	3	19	2
3 Oil seeds	59	26	3	15	1
4 Plant-based fibres	133	219	115	6	0
5 Other crops	938	612	81	316	133
6 Livestock	400	60	20	23	17
7 Wool	71	0	13	3	1
8 Other agricultural products	471	381	−23	161	10
9 Mineral energy	2584	322	380	86	345
10 Other minerals	314	501	−23	118	11
11 Meat and dairy products	396	167	120	133	50
12 Processed rice	19	144	20	18	−5
13 Other food	1318	783	256	401	201
14 Labour-intensive manufactures	9598	3859	12205	932	5196
15 Import-competing manufactures	4509	388	3389	651	1202
16 Services	23648	1928	2229	4487	3734

Source: Simulation of the GTAP model, database version 4.

Table A5 Income elasticities by region and commodity

	Commodity	Australia	Japan	Korea	Indonesia	Thailand	Malaysia	Other ASEAN	China	South Asia	Rest of world
1	Rice and wheat	0.14	0.16	0.18	0.41	0.08	0.18	0.36	0.42	0.31	0.47
2	Other grain	0.14	0.16	0.18	0.41	0.08	0.18	0.21	0.40	0.30	0.29
3	Oil seeds	0.14	0.36	0.57	0.66	0.53	0.57	0.44	0.63	0.74	0.53
4	Plant-based fibres	0.27	0.36	0.57	0.66	0.53	0.57	0.65	0.40	0.75	0.59
5	Other crops	0.20	0.36	0.57	0.66	0.53	0.57	0.55	0.83	0.74	0.42
6	Livestock	0.22	0.69	0.64	0.77	0.33	0.35	0.57	1.06	0.67	0.42
7	Wool	0.85	0.84	0.87	0.83	0.79	0.88	0.83	0.95	0.87	0.87
8	Other agricultural products	0.24	0.36	0.71	0.70	1.05	0.59	0.68	0.80	1.32	0.81
9	Mineral energy	1.00	0.99	1.05	1.02	0.95	1.05	1.06	1.11	1.08	0.98
10	Other minerals	1.12	1.09	1.28	1.39	1.14	1.22	1.38	1.15	1.64	1.28
11	Meat and dairy products	0.16	0.66	0.64	0.80	0.39	0.36	0.59	0.69	0.66	0.27
12	Processed rice	0.15	0.16	0.18	0.41	0.08	0.18	0.21	0.34	0.39	0.26
13	Other food	0.18	0.36	0.57	0.66	0.53	0.57	0.57	0.71	0.74	0.35
14	Labour-intensive manufactures	1.01	0.98	1.06	1.08	0.95	1.09	0.99	1.06	0.98	1.05
15	Import-competing manufactures	1.07	1.01	1.15	1.18	1.12	1.18	1.25	1.17	1.49	1.14
16	Services	1.08	1.11	1.24	1.31	1.12	1.17	1.22	1.10	1.42	1.08

Source: GTAP database, version 4.

References

ABARE (Australian Bureau of Agricultural and Resource Economics) 1999, *Australian Commodity Statistics*, ABARE, Canberra.

Adams, P.D. 1998, *Computable General Equilibrium Analysis of the Consequences for Australia of the Asian Crisis*, Centre for Policy Studies, Monash University, Melbourne.

Azis, I.J. 1998, 'Transition from financial crisis to social crisis', in UNDP, *Social Implications of the Asian Financial Crisis*, Korea Development Institute, Seoul, pp. 139–66.

Centre for International Economics (CIE) 1998, *Asia's Meltdown and Agriculture*, Centre for International Economics, Canberra.

Cohen, M. 1999, 'Back to basics', *Far Eastern Economic Review*, 7 October, pp. 80–1.

Corbett, J. and Vines, D. 1998, 'Asian currency and financial crises: lessons from vulnerability, crisis, and the collapse', paper presented at the Conference on International Capital Markets and International Financial Crisis, University of Warwick, UK, 24–25 July.

Corsetti, G., Pesenti, P. and Roubini, N. 1998, *What Has Caused the Asian Currency and Financial Crisis?,* Department of Economics, New York University, March 1998.

Crispin, S.W. 1998, 'Without a net', *Far Eastern Economic Review*, 9 July, p. 69.

Dixon, P.B. and Rimmer, M.T. 1997, *Monash: A Disaggregated, Dynamic Model of the Australian Economy*, draft book, Centre of Policy Studies and Impact Project, Monash University, Melbourne.

Goldstein, M. 1998, *The Asian Financial Crisis: Causes, Cures and Systemic Implications*, Policy Analysis in International Economics, No. 55, Institute for International Economics, Washington, DC, June.

Hertel, T. (ed.) 1997, *Global Trade Analysis: Modeling and Applications*, Cambridge University Press, Cambridge.

Ianchovichina, E., Hertel, T. and McDougall, R. 1999, 'The East Asian economic crisis: it's not all bad news', *Choices: The Magazine of Food, Farm, and Resource Issues*, Second Quarter, pp. 20–5.

International Monetary Fund 1999 and 2000, *International Financial Statistics*, IMF, Washington, DC, October 1999 and February 2000.

Kalpana, K., Loungani, P. and Stone, M.R. 1998, *The East Asian Crisis: Macroeconomic Development and Policy Lessons*, IMF Working Paper, WP/98/128, the International Monetary Fund, Washington, DC.

Krugman, P. 1998, 'What happened to Asia?', January 1998 at the Official Krugman homepage: http://web.MIT.edu/Krugman/www/.

Krugman, P. 1999, 'Recovery? Don't bet on it', *Time Magazine Asia,* 21 June 1999b, www.pathfinder.com/time/asia/magazine/1999/990621/cover1.html.

McDougall, R.A., Elbehri, A. and Truong, T.P. 1998, *Global Trade Assistance and Protection: The GTAP 4 Data Base*, Center for Global Trade Analysis, Purdue University, West Lafayette, Indiana.

McKibbin, W. and Martin, W. 1998, *The East Asian Crisis: Investigating Causes and Policy Responses,* Working Papers on Trade and Development, TD98-2, Asia-Pacific School of Economics and Management, Australian National University, Canberra.

McKibbin, W. and Wang, Z. 1998, *The G-cubed (Agriculture) Model: A Tool for Analyzing Agriculture in a Globalizing World*, Brookings Discussion Paper in International Economics, No. 139, Brookings Institution, Washington, DC, June 1998.

McKibbin, W.J. and Wilcoxen, P. 1995, *The Theoretical and Empirical Structure of the GCUBED Model*, Brookings Discussion Paper in International Economics, No. 119, Brookings Institution, Washington, DC.

McLeod, R. and Garnaut, R. 1998, *East Asia in Crisis: From Being a Miracle to Needing One?*, Routledge, Sydney.

Noland, M., Robinson, S. and Wang, Z. 1999, 'The continuing Asia financial crisis — global adjustment and trade', *The Japanese Economy*, vol. 25, pp. 70–95.

Radelet, S. and Sachs, J. 1998, *The Onset of the East Asian Financial Crisis*, NBER Working Paper No. W6680, National Bureau of Economic Research, Cambridge, MA, August.

Siamwalla, A. and Sophchokchai, O. 1998, 'Responding to the Thai economic crisis', in UNDP, *Social Implications of the Asian Financial Crisis*, Korea Development Institute, Seoul, pp. 427–65.

Suryahadi, A. 1998, 'An analysis of possible policy responses to globalization and changes in wage inequality in Indonesia: a global CGE approach', Chapter 7, PhD dissertation in progress, Australian National University, Canberra.

Tambunlertchai, S. 1998, 'The social impact of the financial crisis in Thailand and policy responses', in UNDP, *Social Implications of the Asian Financial Crisis*, Korea Development Institute, Seoul, pp. 115–38.

Tyers, R. and Yang, Y., 1999, *Agricultural Reform After the Uruguay Round: A Bridge Too Far?,* Working Papers in Economics and Econometrics, No. 378, Faculty of Economics and Commerce, Australian National University, Canberra.

Vatikiotis, M., 1998, 'No safety net', *Far Eastern Economic Review*, 8 October, pp. 10–13.

Wang, Z. and Xu, D.Q. 2000, 'The road to economic recovery in Asia — a recursive dynamic CGE analysis', paper presented at AEA-CES joint session 'The Global Financial Crisis and Implications for China' at ASSA annual conference, Boston, 9 January 2000; and at Workshop on Financial Crisis in East Asia, Taipei, Taiwan, 23 January 2000.

Warr, P.G. 1998, 'Thailand', in R. McLeod and R. Garnaut (eds), *East Asia in Crisis: From Being a Miracle to Needing One?*, Routledge, Sydney, pp. 49–65.

Wong, K.Y. (ed.) 1998, *The Asian Crisis: What Has Happened and Why?,* Department of Economics, University of Washington, Seattle.

World Bank 1999, *Global Economic Prospects and the Developing Countries 1998/99: Beyond Financial Crisis*, World Bank, Washington, DC.

Yang, Y. 1998, 'Export growth and the exchange rate', *China Update* 1998, Australian National University, Canberra. http://ncdsnet.anu.edu.au/online/workpaper.htm#update

Yang, Y. and Tyers, R. 1999, *The Asian Recession and Northern Labour Market,* Working Papers in Economics and Econometrics, No. 372, Faculty of Economics and Commerce, The Australian National University, Canberra.