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THE END OF THE DEVELOPMENTAL STATE?

**A General Equilibrium Investigation on the Sources of the Asian
Crisis within a Multi-Region, Inter-temporal CGE Model***

by

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The Asian financial crisis had a profound impact on the global economy. Growth is expected to be slower; risks are higher; and the international flows of capital have been dislocated. Above all, it has set out forces of new conditionality surrounding the developmental state, constraining its ability in designing an independent strategy of industrialization and foreign trade. With the aid of an inter-temporal, multi-region CGE model, we regard the crisis to be the result of a fundamental incompatibility between an independent financial policy with unregulated capital markets. We model the increased financial fragility surrounding the unregulated, short-term speculative capital flows as a sudden and unexpected rise in the domestic risk premium. Employing the CGE apparatus, we further document how global financial markets preclude governments from having independent exchange and interest policies to promote industrialization; and demonstrate the serious threats that the international capital flows pose to economic stability and development.

I. Introduction

The Asian financial-cum-economic crisis had a profound impact on the global economy and the international commodity and capital markets. Growth is expected to be slower; risks are higher; and the international flows of capital have been dislocated. Above all, it has set out forces of new conditionality surrounding the developmental state, constraining its ability in designing an independent strategy of industrialization and foreign trade.

Our reading of the crisis is that it cannot be explained by fiscal or monetary excesses. It is not due to a single factor but rather to a confluence in time of a multitude of factors to which both domestic and international circumstances contributed significantly. On the domestic front we have: lack of leadership commitment to development, major instances of corruption as well as a drifting towards an incorrect mix of government-intervention with market forces. The incorrect mix consisted of: combining government-mandated, corruption-motivated loans to mismanaged business groups; maintaining a high interest rate regime, with too low a spread between deposit rates and loan rates, while postponing the necessary adjustments on the foreign exchange rates to prevent the appreciation of the domestic currencies; an incorrect mix of regulation and liberalization of the financial system, characterized by very little prudential regulation of banks and corporations combined with greater freedom in borrowing and lending; and removing controls on financial markets

combined with setting high domestic interest rates and maintaining domestic financial repression.

One might also view the crisis as the result of a fundamental incompatibility between an independent financial policy with smoothly functioning, unregulated global capital markets. Two major policy mistakes were trying to have an exchange rate policy which was out of alignment with its purchasing power parity and an interest rate which was out of alignment with world interest rates while having largely liberalized capital flows. The Korean crisis, in particular, demonstrates graphically that this is an economic impossibility. Global financial markets preclude governments from having independent exchange and interest policies. The crisis also demonstrates how unforgiving global markets are to mistakes in economic policy and to institutional inadequacies within countries and how severe the penalties for mistakes are. One important lesson from the East Asian crisis is that international capital flows can pose serious threats to economic stability and that, iconoclastic as it may sound, some regulation or other impediments to short term capital flows is required.

We utilize a multi-region, inter-temporal computable general equilibrium (CGE) model to study the nexus of these issues. The global world economy is represented in three regions: developed, underdeveloped, and the crisis-hit Asian economies. Each region produces output via four sectors –agriculture, consumer manufacturing, producer manufacturing, and services. The model is in the Walrasian tradition with preference optimizing consumers and profit maximizing competitive producers in the factor and commodity markets. It further accommodates financial flows of domestic and foreign bonds in response to interest rate differentials.

Private foreign borrowing is a positive function of “financial arbitrage”, i.e. the differential between the net return on foreign exchange over the domestic rate of interest and the world interest rate. Increased foreign indebtedness leads to increased financial fragility of the region. We model such fragility with the introduction of a risk premium generator function, which is endogenously determined by the ratio of foreign deficit to aggregate GDP. We regard the emergence of the financial crisis as a sudden and unexpected increase of this variable.

With the aid of this modeling approach, our policy scenarios will address the following issues:

- (i) documentation of the extend of coercion of the newly industrializing nations in developing their independent strategies of foreign exchange and interest rate administration for promoting growth and an overall advancement of their status in the international division of labor under global financial liberalization;
- (ii) investigation of the inherent characteristics of the vicious circle associated with high domestic interest rates and currency appreciation under a regime of unregulated capital account;
- (iii) investigation of the trade-offs between easy access to foreign exchange through speculative financial arbitrage and the pressures on the real productive sphere of the economy, along with the unsustainable

character of economic growth financed through such inflows of short-term “hot money”.

The paper is planned as follows: in the next section we provide an overview of the elements of the *developmental state* as we have witnessed it in the realm of Asian path of industrialization and economic development. We introduce the salient features of our CGE model in section III. Section IV, in turn, provides a general equilibrium analysis of the root causes and consequences of the crisis. We conclude and draw policy implications from the development economics perspective in section V.

II. Elements of the Developmental State

Economic development, as distinct from mere economic growth, must combine five elements: (1) self-sustaining growth; (2) structural change in patterns of production; (3) technological upgrading; (4) social, political and institutional modernization; and (5) widespread improvement in the human condition. Prior to the end of the second World War, developing countries experienced only cycles in economic growth, not economic development. These cycles were related to the cycles in the economic growth of industrial countries. They were induced by fluctuations in the world-demand for food and raw materials and were enabled by exports of capital and skills from metropolitan centers. Economic development became possible only after the end of World War two, when several new elements coincided: (1) for the first time, most developing countries attained political autonomy; (2) there was a flow of subsidized capital and technical assistance from developed to developing countries; and (3) the international economic environment granted developing countries an unprecedented degree of autonomy in managing their economic destinies. Currently, the process of economic development is at risk because the nature of global institutions for short term capital flows is robbing developing countries of their economic autonomy.

To understand why this is the case, we must look at how development can be induced and how, with the current exchange rate and trade regimes, the free international movement of short-term capital undermines the ability of countries to induce economic development by robbing them of even the minimal economic instruments they retain.

II-1. Governments' Role in Initiating Development

Governments have used a large variety of instruments, both direct and indirect, to promote industrialization: general and targeted subsidies; tariffs; credit and direct finance; incentives; monetary policy; monopoly grants; quantitative restrictions; licensing; tax privileges; regulation of foreign investment and foreign capital inflows. Challenged by Britain's industrialization then and that of OECD countries now, governments enlarged the size of the domestic market by unifying their countries politically; by investing in inland transport; and by abolishing internal customs duties and tolls. They also added government demand for manufactures (e.g. military uniforms in Catherine the Great's Russia) to inadequate private demand. Governments increased the supply of labor by removing legal barriers to mobility of labor among regions and sectors; by establishing favorable immigration laws and, where necessary, importing foreign skilled workers; and by investing in education. Governments increased the supply of domestic finance by promoting the establishment of investment banks (now called development banks); the formation of financial intermediaries; institutions and

policies fostering the transfer of finance to industry; and, where necessary, by financing industrial enterprises themselves. Governments promoted the import of technology from advanced countries and were also a source of externality for private investment. They fostered the buildup of transport infrastructure by: investing in different transport modes directly; by providing finance for building canals and railroads then and highways, airports and ports now; by granting substantial incentives, such as rights of way, for the buildup of transport by the private sector. They also invested in electricity and power and built industrial parks and free processing facilities. Governments lowered risk by enabling the establishment of limited liability companies, increasing the security of property rights, and enforcing private contracts.

Historically, governments intervened most directly and in more targeted manner in the least developed late-comers. Of course, this required administratively capable governments with a certain degree of autonomy in setting policies, forming institutions and designing interventions.

II-2. Korean Development Policy:

A more specific indication of the mechanisms employed to induce development can be obtained by looking at Korea, arguably the most successful post-war developer, where government guidance of the economy was also quite strong. Its development strategy and the mechanisms used to promote it are very similar to those used by Taiwan, and, earlier, Japan as well as to those of the 19th century late comers to the Industrial Revolution. The East Asian development process often gives rise to the misconception as a "macroeconomic policy myth" (known as the "Washington consensus"), that the initial development of a developing economy can be adequately engineered and kept going solely through the management of macroeconomic *fundamentals*, such as the money supply, budgetary deficits, interest rates and exchange rates, provided the economy's trade is liberalized and market institutions are allowed to operate internally.

When President Park came to power in 1961, he started by very quickly converting the corrupt, "soft" state he had inherited into a developmental, "hard" state, by transforming the bureaucracy and its incentives. He then proceeded to execute an industrial policy, using a large battery of targeted and untargeted interventions to implement his detailed vision of the public interest.

The primary development strategy employed to foster Korea's economic development has been export-led industrialization. This strategy was implemented primarily by forging a synergistic and cooperative relationship with business, in which business followed the directives of the government. The export-led growth period, which started in 1965, was preceded by a brief period of classical import-substitution, which set the stage for the export-led growth which followed. Korea's industrialization strategy emphasized rapid structural change, progressing from agriculture, first, to labor-intensive industries, followed by intermediate goods, capital-and-raw-material-intensive products, and finally by high-level-manpower-intensive industries. The export-led industrialization policies of Korea were mercantilist rather than inspired by neo-classical free-trade and were not characterized by neutral economic incentives¹. Furthermore, the trade policies were never pure: The import-substitution periods, both during 1961-66 and during 1973-81, emphasized exports as well as import substitution. Conversely, selective import-

¹ This occurred despite Bela Balassa's numerous efforts to turn trade policy into the neo-classical ideal.

substitution was also promoted even during the heyday of Korea's export-led growth from 1967-72. Main macroeconomic indicators of the Korean economy are tabulated in Table 1 below.

One can classify the instruments used by the Korean State to influence and direct economic activity into three major types: market and non-market incentives; discretionary and non-discretionary bureaucratic interventions; and moral suasion. The mix among types has varied over time, but at no time could Korea's institutions be described as fitting the purely neoclassical, laissez faire, mould or the purely Keynesian one.

The primary market incentives used to promote exports consisted of raising inducements for exports through a major devaluation and boosting the profitability of exports relative to imports through changes in the effective exchange rate attached to exporting. The effective exchange rate for exports was increased through a battery of largely non-discretionary measures: the allocation of subsidized credit to exporters; linking access to foreign exchange and to import licenses to export performance and allowing exporters to sell off their import licenses on a foreign exchange market; duty-free entrance of raw material inputs for export-production; a wastage-allowance system that permitted the domestic sale of some portion of the raw-materials imported for export purposes; tax and tariff rebates for exporters; and selective price controls on critical inputs and on wages. The export-incentives were detailed and commodity-specific, especially in the import-export linkage mechanisms. In practice, the specificity of the export-incentive design led to a system of multiple, commodity-specific, effective exchange rates, in which the effective government-subsidy rate varied substantially among commodities. Gradually, these incentives were reduced, effective exchange rates were unified, and, after 1980, these incentives were abolished.

Non-market, industry-specific, non-discretionary measures were used to stimulate exports as well. Government-financed institutions for export-promotion were created². Firms in most export-industries were afforded a sheltered domestic market in which they could sell the non-exported portion of their output at above world market prices. Initially, the domestic market was protected not only by tariffs but also by import-quotas and outright prohibition of imports³. Most of these measures were dismantled after 1980, as well.

Thus, government intervention was multifaceted, used a multitude of different instruments, and took many different guises. Korea's economic growth was not a case of simply "getting prices right"; in addition to price policy, a multitude of market and non-market, discretionary and non-discretionary incentives was used to achieve both general and specific industrial-policy goals. Neither was it a case of "getting prices wrong"⁴. Rather, it represented a creative mix of prices that were almost right with subsidies, targets, directives, regulation and controls that provided just the right mix of carrots and sticks. Institutions, and market and non-market incentives were crafted so as to make cooperation by *chaebols* and other economic actors a matter of rational pursuit of self-interest. Of course, this is not to say that the major thrust of economic policy was always

² These consisted of the Korea Trade Association, the Korea Trade Promotion Corporation, and government-sponsored technology-oriented research institutes.

³ Taiwan went even further, setting quotas and barring imports not only by commodity but also by country.

⁴ Alice Amsden 1989, argues that Korea's economic growth can be explained by this policy.

Table 1. Main Economic Indicators, Korea 1965-1998

| | GNP | X ¹ | X ² | I ² | S ² | P ¹ | r ¹ | Xer ³ | Mer ³ | Gdef ² | X-M ² | Fdebt ² |
|------|------|----------------|----------------|----------------|----------------|----------------|----------------|------------------|------------------|-------------------|------------------|--------------------|
| 1965 | 5.8 | 47 | 9 | 15.0 | 7.4 | 5.8 | 26.0 | 275 | 293 | 1.4 | -8.2 | 1.8 |
| 1966 | 12.7 | 45 | 10 | 21.6 | 11.8 | 12.7 | 26.0 | 284 | 296 | 1.2 | -11.7 | 2.9 |
| 1967 | 6.6 | 28 | 11 | 21.9 | 11.4 | 13.5 | 26.0 | 291 | 296 | 1.4 | -13.4 | 4.2 |
| 1968 | 11.3 | 42 | 13 | 25.9 | 15.1 | 13.8 | 25.2 | 294 | 303 | 1.0 | -15.9 | 6.4 |
| 1969 | 13.8 | 37 | 14 | 28.8 | 18.8 | 12.9 | 24.0 | 307 | 303 | 0.8 | -14.9 | 7.6 |
| 1970 | 7.6 | 34 | 14 | 26.6 | 17.3 | 13.5 | 24.0 | 331 | 336 | 0.7 | -11.5 | 7.7 |
| 1971 | 9.1 | 28 | 15 | 25.1 | 14.6 | 13.9 | 22.0 | 370 | 369 | 1.1 | -10.6 | 8.6 |
| 1972 | 5.3 | 52 | 20 | 22.2 | 16.5 | 16.1 | 22.0 | 404 | 415 | 0.2 | -4.7 | 9.5 |
| 1973 | 14.0 | 98 | 29 | 25.7 | 22.8 | 13.4 | 15.5 | 407 | 418 | 0.5 | -3.0 | 8.7 |
| 1974 | 8.5 | 39 | 27 | 31.8 | 20.3 | 29.5 | 15.5 | 415 | 425 | 2.2 | -11.2 | 8.9 |
| 1975 | 6.8 | 11 | 28 | 28.8 | 18.2 | 25.7 | 15.5 | 497 | 509 | 2.0 | -8.5 | 11.4 |
| 1976 | 13.4 | 56 | 32 | 26.6 | 24.3 | 20.7 | 18.0 | 496 | 515 | 1.4 | -1.3 | 10.3 |
| 1977 | 10.7 | 30 | 32 | 28.3 | 27.6 | 15.7 | 16.0 | 496 | 520 | 1.8 | -0.6 | 9.4 |
| 1978 | 11.0 | 27 | 30 | 32.6 | 29.7 | 21.9 | 19.0 | 495 | 527 | 1.2 | -3.4 | 11.3 |
| 1979 | 7.0 | 18 | 28 | 35.9 | 28.4 | 21.2 | 19.0 | 495 | 520 | 1.7 | -6.7 | 13.7 |
| 1980 | -4.8 | 16 | 34 | 32.0 | 23.1 | 25.6 | 20.0 | 639 | 653 | 2.2 | -7.4 | 14.0 |
| 1981 | 6.6 | 21 | 37 | 29.9 | 22.7 | 7.1 | 17.0 | 701 | 720 | 3.3 | -5.0 | 14.7 |
| 1982 | 5.4 | 3 | 34 | 28.9 | 24.2 | 3.4 | 10.0 | 741 | 779 | 3.0 | -2.6 | 16.1 |
| 1983 | 11.9 | 12 | 35 | 29.2 | 27.6 | 2.3 | 10.0 | 781 | 837 | 1.0 | -0.5 | 16.3 |
| 1984 | 8.4 | 20 | 35 | 30.3 | 29.4 | 2.4 | 11.5 | 806 | 838 | 1.2 | 0.2 | 16.3 |
| 1985 | 5.4 | 4 | 34 | 29.9 | 29.1 | 4.1 | 11.5 | 870 | 920 | 11.5 | 0.5 | 21.3 |
| 1986 | 12.3 | 15 | 38 | 33.5 | 33.7 | 2.7 | 11.5 | 881 | 943 | 0.1 | 6.1 | 24.4 |
| 1987 | 12.8 | 36 | 40 | 37.2 | 37.3 | 3.7 | 11.5 | 823 | 889 | -0.4 | 8.0 | 28.9 |
| 1988 | 12.4 | 28 | 38 | 38.8 | 39.3 | 5.9 | 13.0 | 731 | 780 | -1.6 | 8.2 | 13.5 |
| 1989 | 6.9 | 3 | 33 | 36.0 | 36.2 | 5.3 | 12.5 | 672 | 706 | -0.2 | 2.8 | 10.7 |
| 1990 | 9.6 | 4 | 30 | 37.1 | 36.0 | 9.9 | 12.5 | 709 | 748 | 0.7 | -0.6 | 9.6 |
| 1991 | 9.1 | 11 | 28 | 39.1 | 36.1 | 10.1 | 12.5 | na | na | 0.7 | -0.8 | na |
| 1992 | 5.0 | 7 | 29 | 36.8 | 34.9 | 6.1 | 12.5 | na | na | 0.7 | -0.6 | 14.0 |
| 1993 | 5.8 | 7 | 29 | 35.2 | 35.2 | 5.1 | 13.5 | na | na | 0.3 | 0.1 | 13.3 |
| 1994 | 8.2 | 17 | 30 | 36.1 | 35.2 | 5.4 | 13.5 | na | na | 0.5 | -1.2 | 14.7 |
| 1995 | 9.3 | 23 | 27 | 37.0 | 35.1 | 5.6 | 14.2 | na | na | 0.3 | -2.0 | 17.2 |
| 1996 | 10.5 | 19 | 29 | 38.2 | 33.3 | 3.4 | 14.5 | na | na | 0.3 | -4.9 | 21.6 |
| 1997 | 9.0 | 25 | 34 | 36.0 | 32.9 | 3.0 | 15.0 | na | na | -0.5 | -3.1 | 22.9 |
| 1998 | 6.6 | 10 | 35 | 33.5 | 32.9 | 4.1 | 15.0 | na | na | 0.2 | -0.6 | 30.7 |

Notes : 1 : annual growth rate %; 2: %of GNP;3: real effective exchange rate, won/\$, exports-Xer, imports-Mer.

Symbols: GNP nominal; X exports; M imports; I gross investment; S national savings; P inflation rate, GNP deflator; r annual rate of interest, general loans; Gdef government deficit; X-M trade balance; fdebt foreign debt.

Sources: Computed from Bank of Korea, *Economic Statistics Yearbook; National Account Statistics; and Major Statistics of Korean Economy*, various years. Xer and Rer are from Krueger, A. "Korean Industry and Trade over Fifty Years" in *The Korean Economy 1945-1995* Cha, D.S., K.S. Kim and D. Perkins, (Seoul, Korea Development Institute), 1995.

Fdebt sources are not consistent; for 1970 on, from World Bank, *World Debt Tables*; earlier years are from the Korean Statistics cited above.

correct⁵. But the saving grace has been that, when close monitoring of the economy revealed that a mistake had been made, the policy apparatus had sufficient autonomy, commitment to development and flexibility to be able to quickly switch out of it.

The important issue, however, is not whether government intervention existed, which no one denies, but rather whether it was required in order to induce development. Would the economy have grown even faster, at a smaller economic or social cost, without it? We believe that government intervention was essential to jump-start the development process and, up to a point, to keep it going and that, without extensive government intervention during the sixties and seventies, Korea could not have become the economic powerhouse that it now is. After all, Korea became a success story only after the major institutional and economic-policy framework for a hard developmental state was put in place. And similar interventions also worked extremely well in the other East Asian economies.

II-3. What Degrees of Policy-Freedom do Developing Countries Retain Currently?

Membership in WTO and adherence to GATT rules, which the more developed developing countries are pressured to obey, loses them most instruments of commercial trade policy. Countries cannot use tariffs and quotas, or sector-specific subsidies to promote climbing the ladder of comparative advantage. They cannot increase the effective exchange rate for exports through subsidized allocation of scarce resources, such as credit or foreign exchange or tax and tariff-rebates for exporters. The effective exchange rate for exports and imports must be the same and must be uniform across sectors. Thus WTO members lose most market, non-discretionary instruments. GATT/WTO members also lose most major non-market, industry-specific, non-discretionary measures: They cannot grant exporters virtual monopoly in the domestic market; if exported goods sell domestically at above export-price they are deemed to engage in dumping on the world-market. They also cannot impose export targets on firms for the same reason. Thus, by virtue of GATT/WTO, the major non-discretionary instruments that NICs retain are the macroeconomic ones, of exchange rate devaluation, setting economy-wide interest rates and wage repression. And the latter, though used, has clearly deleterious effects on income distribution and social welfare. But, as we shall see below, the freedom of short-term capital movements imposes the severe penalty of recurrent financial crises on governments that actively employ exchange rate and interest rate policies, in an aggressive manner, to further economic development.

With regulated foreign capital inflows, countries can choose two out of three of the following instruments: the exchange rate regime (managed float or flexible) and, with a managed float, the exchange rate level; the interest rate level (above or below world-market); or the rate of inflation. They cannot choose all three because, as evident from the discussion below, they are interconnected. But with unrestricted foreign capital inflows, countries lose control over all three of these instruments. Governments become unable to employ their traditional macroeconomic policy instruments (interest rates, government expenditures, and exchange rates) unilaterally. Thus, raising interest rates above world-market levels triggers a large foreign capital inflow, setting the stage for a subsequent financial crisis; there is an exchange rate appreciation; this leads to a loss of

⁵ For example, the emphasis on heavy and chemical industry development in the early seventies was premature relative to the country's comparative advantage and was initiated under (unforeseeable but) highly inauspicious international circumstances (the oil cartel and the slowdown of the world economy)

international competitiveness, decline in demand for domestic manufacturing and increase in demand for imports; this raises the trade deficit and reduces the current account surplus (point 1 of the process). As the process continues the current account surplus is transformed into a current account deficit, which mounts persistently. Eventually, both domestic capitalists and foreign speculators lose confidence in the currency. They rapidly withdraw massive amounts of liquid capital from the domestic economy, leading to massive capital flight from domestic currency; (point 2 of the process) and the crisis starts. The exchange rate tumbles. The burden of foreign debt service, denominated in foreign currency, escalates. There is a scramble for liquidity to service the debt and asset values tumble, as real estate prices and stock markets crash. Eventually, the corporate sector becomes illiquid and possibly even insolvent. Banks are also hit by the increase in value of their foreign debt, and decline in quality and price of their assets. A deep depression develops. Conversely, fixing interest rates below world markets, triggers a large foreign capital outflow, setting in motion the start of the crisis and initiating the second phase of the previous process. Thus, governments lose autonomy over domestic interest rate levels.

Similarly, under a managed-float exchange-rate regime, setting exchange rates above equilibrium levels leads to a current account deficit, as exports lose competitiveness and imports become more attractive. This raises the trade deficit and reduces the current account surplus, positioning the economy at point 1 in the process described in the previous paragraph. An early devaluation, returning the exchange rate to equilibrium levels, could short-circuit the process by restoring export competitiveness and raising the price of imports. But it is risky, because the devaluation might be taken as a signal of economic weakness and thereby precipitate capital flight and the start of the crisis. By contrast, fixing exchange rates below equilibrium stimulates capital flight and investment abroad, producing the financial crisis and initiating the process of severe and prolonged depression at point 2 of the process described in the previous paragraph.

Thus, governments cannot set their exchange rate levels without triggering a financial crisis and severe depression even under a managed float. Of course, with flexible exchange rates, countries give up the exchange rate as an instrument up front and must accept whatever exchange rate the global system generates. In addition, flexible exchange rates amplify the effects of short term international capital flows, by allowing speculation on foreign exchange markets that are excessively large (\$1.5 trillion of daily transactions, \$600 billion speculative); excessively liquid; excessively volatile; imperfectly informed; and subject to herd psychology.

The loss of economic autonomy resulting from unregulated short term capital flows afflicts both developed and developing nations, but has more severe consequences for developing ones. Developed countries are walking an economic tightrope in which they cannot afford to run a recession, for fear of capital flight and starting the process at point 2, but have lost the ability to use counter-cyclical policies except with multilateral agreement for the same reason. All countries, both developed and developing, are left with economic responsibilities without instruments they can control. It is therefore hardly surprising that, periodically, governments ignore the global constraints on their economic freedoms and trigger a financial crisis and real depression. It is noteworthy

that, since 1980, three quarters of the IMF's member countries, developed and developing alike, have been hit by financial crises⁶.

III. The model

The model is based on the neoclassical growth theory, and is a global dynamic CGE model with a multi-region specification. We distinguish three regions (Underdeveloped POOR, Developed RICH, and Crisis-Hit Asian region, CHAR), each of which produces four goods from the same number of production sectors.

Home produced goods are consumed domestically, sold to foreigners, and used for home capital formation. Infinitely-lived households consume home produced and imported goods to maximize an inter-temporal utility function. Household income is consumed or saved in the form of equity in domestic firms or foreign bonds. The private agents in each region has access to the world capital markets freely at a given world interest rate.

The domestic rate of interest is differentiated from the world interest rate by a risk premium, which is endogenously specified as a function of the ratio of foreign deficit to GDP. We model the "Asian Crisis" as a sudden and an unprecedented rise in the risk premium factor and the contagion it led over the "underdeveloped" regions of the globe.

III-1. The households and consumption/savings. In each region, the representative household owns labor, land and all financial wealth, and allocates income to consumption and savings to maximize an intertemporal utility over an infinite horizon. No independent government consumption and saving/investment behavior have been assumed. Government transfers all its tax revenues to households and, hence, fiscal deficit is ignored. In each region household's discounted utility of the temporal sequence of aggregated consumption over an infinite time horizon is:

$$(1) \quad \text{Max} \sum_{t=0}^{\infty} \left(\frac{1}{1+\rho} \right)^t U(TC_t)$$

where ρ is the positive rate of time preference; $U(.)$ is instantaneous felicity at each time period; TC_t is instantaneous aggregate consumption generated from final goods,

$$(2) \quad TC_t = \prod_{i=1}^4 C_{it}^{b_i},$$

where $0 < b_i < 1$, and $\sum b_i = 1$. The household in each region maximizes (1) subject to an intertemporal budget constraint:

$$(3) \quad \sum_{t=1}^{\infty} R_t P_{t-1} TC_t = \sum_{t=1}^{\infty} R_t (w_t L_t + w d_t N_t + T I_t) + \omega_1$$

⁶ So far, the United States has enjoyed both economic autonomy and immunity from crisis because dollars are the sole global asset. But, it is about to lose that immunity once the Euro joins the dollar.

where $R_t = \prod_{s=1}^t 1/(1+r_s)$ represents the discount factor; r_s is the instantaneous interest rate. Ptc is the consumer price index such that $Ptc_t TC_t = \sum_i PC_{it} C_{it}$ with PC_{it} denoting the (composite) price of commodity- i ; w_t is the wage rate; L_t is labor endowment; wd_t is the land rental rate; N_t is endowment of land; TI_t is the lump-sum transfer of government's tax revenues; and ω_t is the value of the private household's aggregate financial wealth.

Households allocate their total income flows, including financial and non-financial, between consumption and savings. The *current* budget constraint for the household is:

$$(4) \quad SAV_t = [W_t L_t + Wk_t K_t + Wd_t N_t + TI_t - r_{Dt} D_{t-1}] - Ptc_t TC_t$$

where SAV is regional private savings; Wk is the capital rental rate, and K_t is the stock of physical capital at period t . Note that the term $r_t^D D_{t-1}$ give total interest payments on the foreign debt outstanding.

The Euler equation (derived from the first order condition of utility maximization) implies that the marginal utility across two adjacent periods satisfy the following condition:

$$(5) \quad \frac{U'_{t+1}}{U'_t(1+\rho)} = \frac{Ptc_{t+1}}{Ptc_t(1+r_{t+1})}$$

where U'_t is the derivative of the utility function at time t with respect to the aggregate consumption TC_t . Equation (5) states that the marginal rate of substitution between consumption at time t and $t+1$ is equal to the ratio of the consumption price index across the same time periods. Given the consumption aggregation function (2), the price index of aggregate consumption, Ptc , is determined from the individual good prices according to,

$$(6) \quad Ptc = \prod_{i=1}^4 \left[\frac{PC_i}{b_i} \right]^{b_i}.$$

III-2. Firms and investment. The model distinguishes four production sectors: agriculture, basic industry, machinery and transport, and services. Each sector produces a single output using inputs of labor, capital and intermediate goods. Agriculture uses land as an additional primary input. None of the primary inputs are internationally traded. Value added in each sector is a Cobb-Douglas function of capital and labor (and, in the case of agriculture, of land). Intensities of intermediate input use are fixed.

The aggregate capital stock is managed by an independent investor who decides on investment and passes all profits to the households. This setup is adapted from Wilcoxon (1988) and Ho (1989). For a multi-sector model, the introduction of this bank artifact serves to isolate the capital pricing and investment decision from

household consumption and saving decisions. The investor chooses a time path of investment to maximize the discounted profit over an infinite horizon:

$$(7) \quad \text{Max} \sum_{t=1}^{\infty} R_t (Wk_t K_t - VI_t)$$

subject to capital accumulation constraints:

$$(8) \quad K_{t+1} = (1-\delta) K_t + I_t$$

where VI_t is the value of investment at t ; I_t is the new physical capital good, and δ is the (constant) capital depreciation rate. We assume that the technology to produce capital equipment exhibits constant returns to scale, and that there are no additional capital installation costs beyond the costs of the final goods used in capital goods production. Hence, at equilibrium with a positive level of investment, the value of each unit of capital equipment is uniquely determined by the prices of the final goods. Thus, $VI_t = PI_t I_t$, where PI_t is the cost for each unit of I_t . We specify the no-arbitrage condition as follows:

$$(9) \quad r_t^D PI_{t-1} = Wk_t - \delta PI_t + PI_t - PI_{t-1}$$

This condition indicates that the total returns to capital have to match the return to a perfectly substitutable asset of size PI_{t-1} . The left-hand-side of equation (9) represents the returns from a perfect substitutable asset of size PI_{t-1} , and the right side of (9) is the total returns from one unit of capital equipment, which includes: "dividends" from capital ownership at each period, Wk_t , minus the loss of the value of capital equipment caused by depreciation, δPI_t , plus a claim to an instantaneous capital gain (or loss) which is, $PI_t - PI_{t-1}$, if the cost to produce one unit of capital changes over time. The no-arbitrage condition of equation (9) is used to determine the level of investment demand, given the specification of imperfect substitution between a domestically produced and consumed good and a foreign good (the Armington specification).

III-3. The Foreign Sector and Foreign Assets. Regions are linked by the Armingtonian composite good system, and the constant elasticity of transformation (CET) system, so that commodities are differentiated in demand and supply by their geographical origin. In this structure, domestically produced and foreign goods are regarded as imperfect substitutes in trade, given an elasticity of substitution/transformation.

In each period, as investment and savings are independently determined in the model, the difference between the value of investment, $PI_t I_t$, and the regional private savings, SAV_t , if positive, is the increase in *debt* of the home region borrowed from the other two foreign regions; i.e.,

$$(10) \quad D_t - D_{t-1} = r_t^W D_{t-1} + FB_t,$$

where a positive FB_t represents foreign trade *deficit*.

III-3-A: Determination of the Risk Premium

We follow on the classic Fisher (1930) identity and construct the following relationship between the domestic and world interest rates:

$$r_D + \Delta P_R = r^* + \Delta P^* + \Delta \varepsilon_R + \pi_R$$

where r_D denotes domestic (region R's) interest rate; r^* world interest rate in the international capital market; ΔP_R changes in domestic (region R's) price level; ΔP^* changes in world price level; $\Delta \varepsilon_R$ changes in nominal exchange rate; and π_R the risk premium in the domestic (region R's) capital market.

Transforming, we obtain the real interest parity:

$$r_D - r^* = (\Delta P^* - \Delta P_R + \Delta \varepsilon_R) + \pi_R$$

which is expressed in two components: deviations from relative purchasing power parity and a real risk premium. Note, however, that in the absence of nominal assets and currency, the model does not admit “nominal” exchange rates. Per contra, the *real* exchange rate is defined as the ratio of domestic versus foreign price levels (see, e.g., Obstfeld and Rogoff, 1996). Thus, the terms in the parenthesis vanish. In the conceptualization of our real model we have: $r_D = r^* + \pi_D$

We model the risk premium as a function of the ratio of foreign deficit to GDP:

$$(11) \quad \pi_{D_t} = PR \left(\frac{FB_t}{GDP_t} \right)$$

With investment risk, domestic banks may borrow from the external markets at the prevailing rate, r^* , but lend to domestic firms at the rate including risk premium, π . However, if prudential regulation and supervision are lacking, domestic banks may be able to assume “open foreign exchange position” and not cover the risk associated with external borrowing. This will be particularly strengthened if the banking sector assumes that it will most like be bailed out in the event of a crisis.

III-4. Equilibrium. Intra-temporal equilibrium requires that at each time period, (i) in each region, demand for the production factors equal to their supply; (ii) in the world commodity markets, aggregate demand for each sectoral good equals its total supply; (iii) in the world capital market, the aggregate household savings equals zero.

Intertemporal equilibria are described mainly by the difference equations (5), (9) and (10), while for the steady state equilibrium path, the following constraints must also be satisfied for each region:

$$(12) \quad r_{ss} + \delta = Wk_{ss}/PI_{ss}$$

$$(13) \quad I_{ss} = \delta K_{ss}$$

$$(14) \quad FB_{ss} + r_{ss} D_{ss} = 0$$

Equation (12) implies that at the steady state, the net marginal return of capital normalized by the marginal value of capital, is constant and equals to the interest rate plus the depreciation rate; hence the marginal cost of investment and the capital rental rate are also constant. Equation (13) implies that aggregate investment just covers the depreciation of capital; hence the stock of capital per labor remains constant. Equation (14) states that foreign debt holding is also constant. If a region holds foreign debt in the steady state (i.e., D_{ss} is positive), then it has to have a trade surplus to pay the interest costs to foreigners on the outstanding debt (i.e., FB_{ss} has to be negative). Also, at the steady state, as each region ceases to borrow from foreigners, domestic household savings ought to equal to the value of aggregate capital investment.

Central to the value system of any general equilibrium model is the specification of the *numeraire*, which we now make precise. In each region K , define the cost of living index at period t by,

$$(15) \quad PINDEX_{Kt} = \sum_i \Omega_{Ki} PC_{Kit}$$

where Ω_{Ki} is the price weight (share of consumption demand of the i -th good). We choose the *period 1* price index of the *RICH region* as our unit of value in our analysis. Therefore, all nominal values are expressed relative to $PINDEX_{RICH,1}$. Of particular interest, is the concept of *the real exchange rate*, which we define as the relative cost of the common reference basket of goods among two regions, where the baskets' costs in the two regions are compared after conversion to the common numeraire. For two regions A and B , with price levels $PINDEX_{A,t}$ and $PINDEX_{B,t}$, we say the Region- A experiences a *real appreciation* (region- B , a *real depreciation*) when the ratio of the respective price indexes, $PINDEX_{A,t}/PINDEX_{B,t}$, rise (see, e.g., Obstfeld and Rogoff, 1996, chp. 4).

IV. General Equilibrium Analysis of the Asian Crisis

We focus on two sets of issues and conduct two scenarios. The first scenario (*EXP-1*) is used to evaluate the general equilibrium effects of the crisis on the Crisis-Hit Asian economy, CHAR. Next, we study the contagion effects spilling over the underdeveloped POOR region (*EXP-2*). We model the financial fragility of the CHAR with the aid of the risk generator function (equation 11 above) where risk premium rises in proportion to the ratio of foreign deficit to GDP. The so-called "herd behavior" leading to financial panic and crisis is formulated as a sudden increase in the sensitivity of the risk generator function to the given foreign deficit/GDP ratio. Thus, conceptually we simulate the crisis as an unprecedented rise of the parameter PR , leading to increased risk. More specifically we parametrically increase PR 10-folds. This has the effect of increasing the domestic rate of interest over the world interest rate and choking of foreign borrowing. Consequently investment demand slows down and the GDP contracts. We numerate the main

macroeconomic aggregates in response to the crisis and the contagion effects in the world financial and commodity markets in Table 2.

Table 2. General Equilibrium Results (Ratios to Base Run Equilibrium)

Crisis Hit Asian Region, CHAR

| | Exp1 | | | Exp2 | | |
|---------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| | Period 1 | Period 10 | Period 15 | Period 1 | Period 10 | Period 15 |
| Gross Domestic Product | 0.979 | 0.984 | 0.993 | 0.976 | 0.984 | 0.996 |
| Consumption | 0.993 | 0.995 | 0.998 | 0.994 | 0.995 | 0.998 |
| Investment | 0.980 | 0.973 | 0.974 | 0.978 | 0.974 | 0.978 |
| Capital Stock | 0.998 (2) | 0.990 | 0.985 | 0.999 (2) | 0.990 | 0.986 |
| Exports | 1.011 | 1.007 | 1.002 | 1.007 | 1.003 | 1.001 |
| Imports | 0.968 | 0.976 | 0.990 | 0.965 | 0.977 | 0.995 |
| Real Exchange Rate ¹ | 0.979 | 0.988 | 0.998 | 0.976 | 0.987 | 0.998 |
| Output Supply | | | | | | |
| Agriculture | 0.998 | 0.997 | 0.997 | 0.999 | 0.997 | 0.996 |
| Consumer Manufacturing | 1.007 | 0.999 | 0.994 | 1.006 | 0.998 | 0.993 |
| Producer Manufacturing | 1.007 | 0.996 | 0.989 | 1.007 | 0.996 | 0.989 |
| Services | 0.997 | 0.992 | 0.991 | 0.998 | 0.993 | 0.991 |

Underdeveloped Region, POOR

| | Exp1 | | | Exp2 | | |
|---------------------------------|------------|-----------|-----------|-----------|-----------|-----------|
| | Period 1 | Period 10 | Period 15 | Period 1 | Period 10 | Period 15 |
| Gross Domestic Product | 1.001 | 1.002 | 1.003 | 0.927 | 0.939 | 0.968 |
| Consumption | 1.002 | 1.001 | 1.000 | 0.977 | 0.982 | 0.991 |
| Investment | 1.007 | 1.008 | 1.007 | 0.913 | 0.879 | 0.884 |
| Capital Stock | 1.0001 (*) | 1.003 | 1.004 | 0.996 (*) | 0.965 | 0.946 |
| Exports | 0.993 | 0.997 | 1.002 | 1.033 | 1.018 | 0.956 |
| Imports | 1.003 | 1.003 | 1.003 | 0.892 | 0.912 | 1.001 |
| Real Exchange Rate ¹ | 1.001 | 0.999 | 0.999 | 0.928 | 0.954 | 0.989 |
| Output Supply | | | | | | |
| Agriculture | 0.999 | 1.000 | 1.000 | 0.996 | 0.992 | 0.991 |
| Consumer Manufacturing | 0.997 | 0.999 | 1.002 | 1.031 | 1.002 | 0.978 |
| Producer Manufacturing | 1.001 | 1.003 | 1.004 | 0.988 | 0.952 | 0.936 |
| Services | 1.001 | 1.002 | 1.002 | 0.993 | 0.975 | 0.965 |

1) Ratio of The Consumer Price Index to the Consumer Price Index of the RICH

2) Period 2.

Our results reveal that gross domestic product in the Asian region contracts by 2.5% upon impact, and can recover only after period 16. In Figure 1, the path of post crisis level of GDP is portrayed as ratio to the base-path.

The sudden increase of the risk premium factor leads to a divergence of the domestic (regional) interest rate from the world interest rate. We portray the path of the equilibrium interest rate in Figure 2.

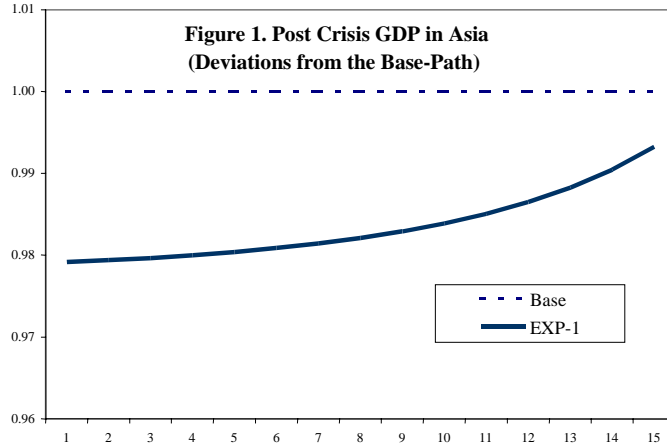
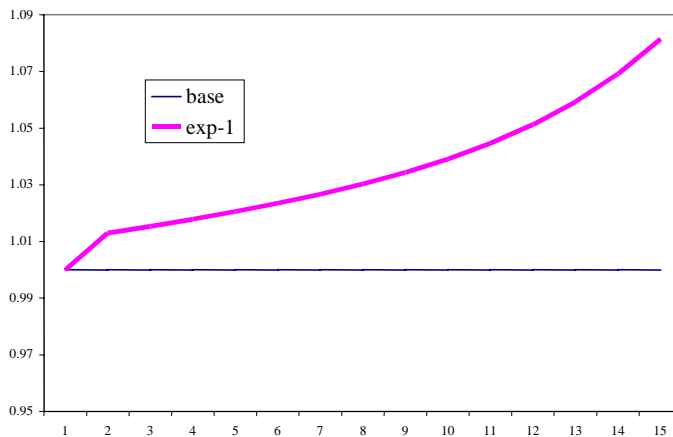


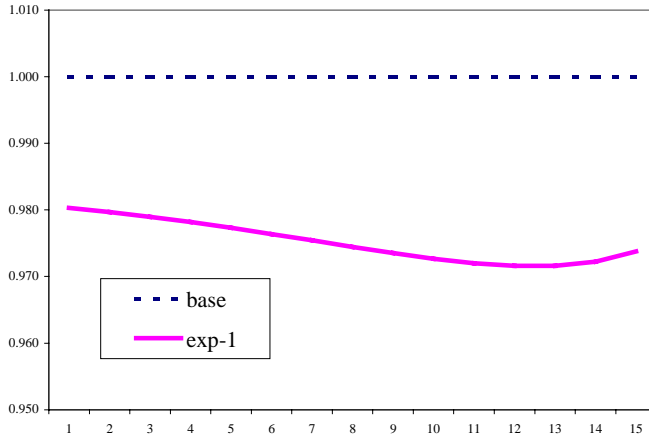
Figure 2. Interest Rate in the Post Crisis Asian Region



The increase of the regional rate of interest chokes both investment demand and the private consumption expenditures. The contraction of investment directly leads to a slow down of the capital accumulation. The deceleration of the rate of growth of the capital stock deepens progressively, and by period 15, we find that its path registers a decline of 1.5% vis-a-vis to the base-path capital stock. (Figure 3). Clearly, the post-crisis adjustments of the Asian economies involve contraction of real output together with sluggish accumulation patterns.

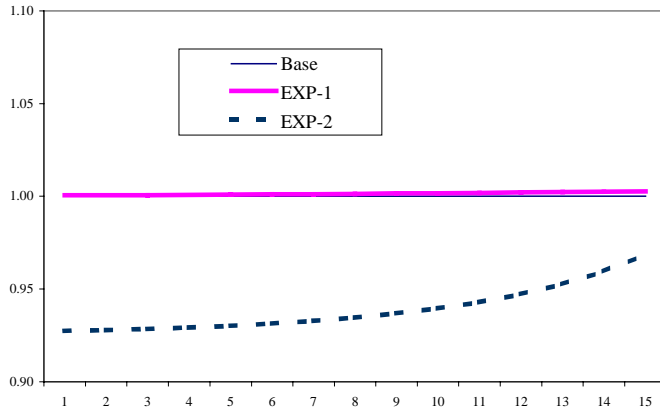
Next we study the effect of contagion, and increase the risk premium parameter in the Underdeveloped regions of the world. Technically, we re-iterate the experiment for the UDC region. Thus, now we impose increased fragility into the global asset markets identified in our analytical model.

Figure 3. Total Investment in Post Crisis Asian Region



We find that the contagion effects are more contractionary for the rest of the developing world. The GDP is observed to decline by as much 7.3% (EXP-2 path, Figure 4); and fixed investment demand collapses by 8.7% (Figure 5) upon impact. As in the case of Asia, the long terms effects of the crisis are felt more severely as the deceleration of the rate of capital accumulation deepens.

Figure 4. Aggregate GDP of the Underdeveloped Regions after Contagion of Asian Crisis (Ratios to the Base Path)



A counterpart of all these adjustments is the behavior of the (real) exchange rate. Our numerical results disclose a 2.1% real depreciation of the currency in post-crisis Asia, and 2.5% in the post-contagion underdeveloped region. Not surprisingly, the main driving force behind this adjustment is the drainage of foreign finance for both of these regions. As the capital flows change direction, domestic currencies necessitate real depreciation and call for a contraction of domestic investment demand as witnessed above. The flows of foreign finance in the Asian and the Underdeveloped regions are portrayed in Figures 6 and 7.

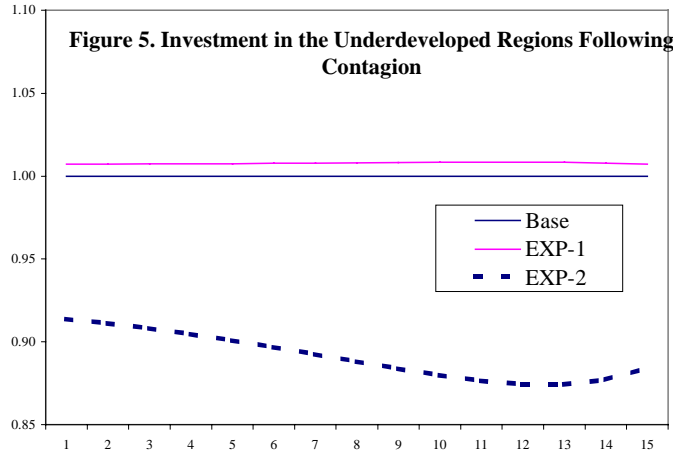


Figure 6. Foreign Capital Inflows: Crisis-Hit Asia

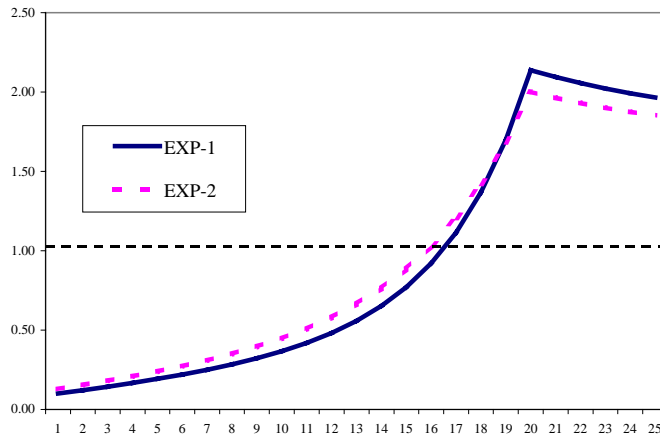
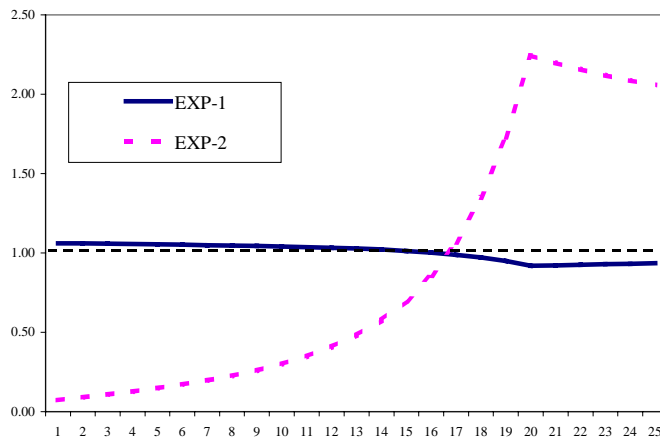


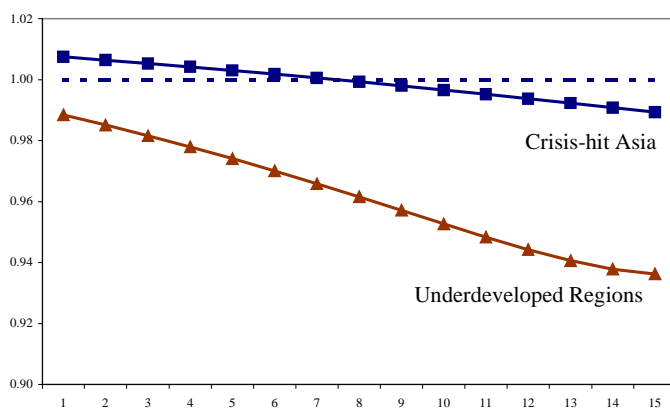
Figure 7. Foreign Capital Inflows: Underdeveloped Region



Yet the most direct effects of the Asian crisis is felt on the real output supplies, especially in relation to capital accumulation and growth. Upon impact we observe a

rise in manufacturing industries and a fall in agriculture and services. This effect is purely a result of relative price movements in the short run. In the medium term horizon, the contraction of aggregate investment demand results in a deflationary environment wherein demand for producer manufacturing falls in a sustained fashion. (Figure 8). As patterns of capital accumulation diverge from its base path, producer manufacturing output growth slows down and a process of *de-industrialization* sinks in. We find this to be the most detrimental consequence of the financial crisis episodes as we have witnessed since the 1980s.

Figure 8. Producer Manufacturing Real Output Following Contagion of the Asian Crisis



V. Policy Discussion and Concluding Comments

In this paper we have highlighted that, as witnessed in the East Asian path of industrialization, the main characteristic of the “developmental state” has been the strategic use of the exchange rate and the rate of interest as crucial instruments of growth. Under the East Asian path of export-led industrialization, the state was observed to play a central and pervasive role in the initiation and guidance of economic development. However, with the recent attempts towards full liberalization of the capital account under pressures from the US and the IMF (the so-called Washington consensus), governments lost their independence in designing a strategic mix of these two instruments for promotion of industrialization targets. As open capital markets replaced closed short term capital markets and regulated flows of foreign investment, governments became unable to employ their traditional policy instruments (interest rates, government expenditures, and exchange rates) unilaterally: Raising interest rates above world markets triggers a large FCI, setting the stage for a financial crisis; fixing them below world markets, triggers a large foreign capital outflow, generating the crisis. Similarly, setting exchange rates above equilibrium levels leads to a current account deficit; fixing them below equilibrium stimulates capital flight and investment abroad, producing the crisis. Finally, running a budget deficit to stimulating growth or providing social programs more generous than the international norm causes capital outflows. Flexible exchange rates amplify the effects of these international capital flows, by allowing speculation on foreign

exchange markets that are excessively large; excessively liquid; excessively volatile; imperfectly informed; and subject to herd psychology.

In the words of the UNCTAD's 1998 *Trade and Development Report*, "the ascendancy of finance over industry together with the globalization of finance have become underlying sources of instability and unpredictability in the world economy. (...) In particular, financial deregulation and capital account liberalization appear to be the best predictor of crises in developing countries" (pp. v and 55). Almost all recent episodes of financial-cum-currency instability disclose that the observed sharp swings in capital flows are mostly a reflection of large divergences in domestic financial conditions relative to those of the rest of the world. These divergences are frequently reflected in interest differentials vis-à-vis the foreign markets. Reversals of capital flows are often associated with deterioration of the macroeconomic fundamentals in the recipient country. However, "such deterioration often results from the effects of capital inflows themselves as well as from external developments, rather than from shifts in domestic macroeconomic policies". (*ibid*, p. 56).

By generating the financial crisis within a set of global interacting world regions embedded in a CGE model, we inadvertently stripped away some features of reality documented above which have sometimes been blamed for giving rise to the crisis. The model is a completely neoclassical one with fully functioning commodity and financial markets, in which both factors and trade adjust flexibly to market conditions. It is not plagued by moral hazard or incomplete information. Financial transactions are arms-length transactions, not characterized by crony capitalism. Corruption does not play a role in the model economy and its interaction with either the government or the financial system. There is also no IMF.

The crisis is generated by a single trigger: an increase in the risk premium that is fully justified by the mounting level of foreign indebtedness and the increasing size of the current account deficit in the period preceding the crisis. The rising deficit and foreign indebtedness were due to large inflows of foreign capital fueled by expectations of high economic growth. When expectations turned, the risk premium soared, triggering large short term capital outflows and giving rise to a full-blown financial-real crisis.

From a policy point of view, the very starkness of the picture of the financial crisis painted by our simulations implies that many of the remedies suggested for avoiding future financial crises will do no such thing. These include: financial sector reform; better information; the creation of a new international institution to supervise international financial transactions and operate as a lender of last resort; cleaning up corruption in lending; getting government out of the targeting business; and improving the governance of the corporate sector. Our model generated a crisis in an economy in which all of these reforms, other than a new international financial institution, were already in place. The only thing our model required for a crisis to develop was short term financial markets open to international financial flows and the herd behavior induced by common perceptions of future prospects typical of all expectation-based markets. In this vein, our analytical model suggests that the primary basic remedy for financial crises lies in regulating short-term international flows.