Rough Draft

Some Global Consequences of Financial Market Liberalization in the Asia Pacific Region

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ABSTRACT

This paper explores the global impact of financial market liberalization by countries in the Asia Pacific region. Almost all studies of liberalization by these economies have focused on the impacts of trade liberalization with little attention to the role of the restrictions on financial flows between economies. One major reason for this focus has been because restrictions on financial flows are very difficult to measure and therefore there is a scarcity of data. In addition, the computable general equilibrium models that typically attempt to measure the consequences of trade liberalization do not explicitly or adequately model financial flows between economies. In an attempt to illustrate the importance of financial flows and the potential impacts of financial liberalization, this paper uses a dynamic intertemporal general equilibrium multi country model called the Asia Pacific G-Cubed model. This model is unique in that it does explicitly model the flows of financial assets as well as goods between economies. In this paper a very crude measure of the extent of financial market restrictions is calculated by bench-marking the global model to actual data for a base year. The size of the wedges that are calculated between the actual rates of return and the expected rates of return consistent with the model, giving a measure of the extent of financial market restrictions. The model is then simulated removing part of these wedges between expected rates of return to get an idea of the adjustment process that would be expected to be followed in response to a major removal of distortions to financial flows in APEC economies.

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1. Introduction

There has been a wide range of studies of APEC and GATT trade liberalization primarily using computable general equilibrium models. These studies include Dee and Walsh (1994), Francois et al (1995), Goldin and van der Mensbrugghe (1995), Harrison et al (1995), Hertel et al (1995), Huff et al (1995) Martin et al (1995) or Murtough et al (1994), Cheong (1997), and Yang, Duncan and Lawson (1997). Although providing information on the long run gains from reallocating resources between groups of countries, these papers ignore the issue of financial market adjustment during the liberalization. This is primarily because the models underlying the studies do not include financial markets in the modelling frameworks. Other studies using Dynamic Intertemporal General Equilibrium models (DIGEM) that focus on the dynamic adjustment to trade reform have a role for financial adjustment in the transmission of trade liberalization. These studies include Manchester and McKibbin (1995), McKibbin (1994) using the MSG2 model; McKibbin and Salvatore (1995) using the GCUBED model; and McKibbin Pearce and Wong (1995) and McKibbin (1996, 1997) using the Asia Pacific G-Cubed Model.

Although the role of financial markets during trade liberalization is beginning to be analyzed, no study to date (of which I am aware) has focused directly on the impact of financial market liberalization. The current paper is an initial attempt at quantifying the consequences of APEC financial market reforms on the global economy. This paper is not intended to give precise empirical estimates but rather to draw out some lessons for policy makers about the nature of the adjustment to financial market reforms in an increasingly integrated global economy.

There are two steps in the analysis. The first is to use a multi-country dynamic general equilibrium model to calculate the extent of restrictions in financial markets in a number of countries. This is done by using a full intertemporal solution of the model, adjusting behavioral equations in the model for “wedges” between actual and model generated rates of return such that the model exactly replicates a base period (1996) database. This exercise is meant to be indicative of the scale of effects and indeed, because it is in a sense a residual calculation, such an adjustment captures far more than purely financial restrictions. Once these wedges are calculated, the model is then simulated removing part of these restrictions in order to explore the dynamic process from financial liberalization.

The model used in this paper is derived from the G-Cubed model developed by McKibbin and Wilcoxen (1992, 1995). Because of this link, this model is named the Asia-Pacific GCUBED model (AP-GCUBED). As with the GCUBED model, this model captures simultaneously the macroeconomic and sectoral linkages in a global model with partially forward looking asset market and spending decisions (assuming rational expectations). The AP-GCUBED model has country/regional dis-aggregation of: Korea, Japan, Thailand, Indonesia, China, Malaysia, Singapore, Taiwan, Hong Kong, Philippines, Australia, New Zealand, United States, India, Rest of the OECD, Oil exporting developing countries, Eastern Europe and Former Soviet Union and all other developing countries. Each country/region has an explicit internal macroeconomic and sectoral structure with sectoral dis-aggregation in production and trade into 6 sectors based on data from standardized input/output tables.

Section 2 gives a brief overview of the theoretical basis of the AP-GCUBED model. The technique for calculating the extent of financial restrictions is outlined and some initial estimates are presented in section 3. The results for a range of countries over the period 1997 to 2010 of gradually removing these restrictions from 1997 through 2000 are presented in Section 4. A conclusion is presented in section 5.

2. The AP- GCUBED model

The AP-GCUBED multi-country model is based on the GCUBED model developed in McKibbin and Wilcoxen (1992, 1995). It combines the intertemporal macroeconomic approach taken in the MSG2 model of McKibbin and Sachs (1991) with the dis-aggregated, econometrically-estimated, intertemporal general equilibrium model of the U.S. economy by Jorgenson and Wilcoxen (1989). The MSG2 model had one sector per country. The Jorgenson-Wilcoxen model has 35 separate industries, each of which is represented by an econometrically estimated cost function. The G-Cubed model has 8 countries and 12 sectors in each. The AP-GCUBED model has 6 sectors in each of 18 economies.

The GCUBED model was constructed to contribute to the current policy debate on global warming, trade policy and international capital flows, but it has many features that make it useful for answering a range of issues in environmental regulation, microeconomic, macroeconomic and trade policy questions. It is a world model with substantial regional dis-aggregation and sectoral detail. In addition, countries and regions are linked both temporally and intertemporally through trade and financial markets. The explicit treatment of financial flows has been shown to be important for analyzing the response to trade liberalization (see McKibbin(1997)) but it is absolutely crucial for analyzing the consequences of financial liberalization. Like MSG2, GCUBED contains a strong foundation for analysis of both short run macroeconomic policy analysis as well as long run growth consideration of alternative macroeconomic policies. Intertemporal budget constraints on households, governments and nations (the latter through accumulations of foreign debt) are imposed. To accommodate these constraints, forward looking behavior is incorporated in consumption and investment decisions. Unlike MSG2, the GCUBED model also contains substantial sectoral detail. This permits analysis of environmental and trade policies which tend to have their largest effects on small segments of the economy. By integrating sectoral detail with the macroeconomic features of MSG2, GCUBED can be used to consider the long run costs of alternative environmental regulations and trade policy changes yet at the same time consider the macroeconomic implications of these policies over time. The response of monetary and fiscal authorities in different countries can have important effects in the short to medium run which, given the long lags in physical capital and other asset accumulation, can be a substantial period of time. Overall, the model is designed to provide a bridge between computable general equilibrium models and macroeconomic models by integrating the more desirable features of both approaches. The AP-GCUBED model differs from the GCUBED model because of the focus on the Asia-Pacific region as well as having 6 sectors compared to 12 for GCUBED. The theoretical structure is essentially the same.

The key features of AP-GCUBED are summarized in Table 1. The country and sectoral breakdown of the model are summarized in Table 2. The model consists of eighteen economic regions (the new version (29) used in this paper also includes India and New Zealand) with six sectors in each region (there are also two additional sectors in each region that produce the capital good for firms and the household capital good). The regions in AP-GCUBED can be divided into two groups: 15 core countries/regions and three others. For the core regions, the internal macroeconomic structure as well as the external trade and financial linkages are completely specified in the model. Our approach for each country is to first model them assuming the theoretical structure we use for the "generic" country but calibrating each country to actual country data. We then proceed country by country to impose institutional features, market structures, market failures or government regulations that cause certain aspects of these economies to differ from our generic country model. In this paper we have only just begun this process, therefore the countries we represent in the region are endowed with resources, trading patterns, saving and investment patterns etc that are based on actual data for these countries but in many important ways may not be truly representative of these countries because of institutional factors that we are still implementing into the model.

Each core economy or region in the model consists of several economic agents: households, the government, the financial sector and the 6 production sectors listed in table 2. Each of these economic actors interact in a variety of markets, both domestic and internationally. Each of the six sectors within each country is represented by a single firm in each sector which chooses its flexible inputs (labor, energy, materials) and its level of investment in order to maximize its stock market value subject to a multiple-input production function (KLEM), knowledge that physical capital is costly to adjust once it is in place, and subject to a vector of prices it takes to be exogenous. Energy and materials are an aggregate of inputs of intermediate goods. These intermediate goods are, in turn, aggregates of imported and domestic commodities which are taken to be imperfect substitutes. Due to data limitations we assume that all agents in the economy have identical preferences over foreign and domestic varieties of each particular commodity. We represent these preferences by defining six composite commodities that are produced from imported and domestic goods.

Following the approach in the MSG2 model, we assume that the capital stock in each sector changes according to the rate of fixed capital formation and the rate of geometric depreciation. The investment process is assumed to be subject to rising marginal costs of installation, with total real investment expenditures in sector equal to the value of direct purchases of investment plus the per unit costs of installation. These per unit costs, in turn, are assumed to be a linear function of the rate of investment. One advantage of using an adjustment cost approach is that the adjustment cost parameter can be varied for different sectors to capture the degree to which capital is sector specific.

The price of labor is determined by assuming that labor is mobile between sectors in each region, but is immobile between regions. Thus, wages will be equal across sectors. The wage is assumed to adjust to varying degrees based on labor market institutions in the different economies. In the long run, labor supply is given by the exogenous rate of population growth, but in the short run, the hours worked can fluctuate depending on the demand for labor. For a given nominal wage, the demand for labor will determine short run unemployment in each industry. This will vary across industries depending on the composition of demand for each sectors good.

The solution of the optimization problem also gives that the rate of gross investment in sector h is a function of "Tobin's q" for that sector. Following the MSG2 model, it is assumed that investment in each sector is a weighted average of forward looking investment and investment out of current profits.

Households consume a basket of composite goods and services in every period and also demand labor and capital services. Household capital services consist of the service flows of consumer durables plus residential housing. Households receive income by providing labor services to firms and the government, and from holding financial assets. In addition, they also receive transfers from the government.

Aggregate consumption is chosen to maximize an intertemporal utility function subject to the constraint that the present value of consumption be equal to human wealth plus initial financial assets. Human wealth in real terms is defined as the expected present value of future stream of after tax labor income of households. Financial wealth is the sum of real money balance, real government bonds in the hand of the public, net holding of claims against foreign residents and the value of capital in each sector. The solution to this maximization problem is the familiar result that aggregate consumption is equal to a constant proportion of private wealth, where private wealth is defined as financial wealth plus human wealth. However, based on the evidence cited by Campbell and Mankiw (1987) and Hayashi (1982)) we follow the approach in the MSG2 model and assume that only a portion of consumption is determined by these intertemporally-optimizing consumers and that the remainder is determined by after tax current income. This can be interpreted as liquidity constrained behavior or a permanent income model in which household expectations regarding income are backward-looking. Either way we assume that total consumption is a weighted average of the forward looking consumption and backward-looking consumption.

Once the level of overall consumption has been determined, spending is allocated among goods and services based on relative prices.

We take each region's real government spending on goods and services to be a fixed share of GDP and assume that it is allocated among final goods (consisting of both domestically produced and imported goods), services and labor in fixed proportions, which we set to 1992 values. Total government outlays include purchases of goods and services plus interest payments on government debt, investment tax credits and transfers to households. Government revenue is generated from sales tax, corporate income tax and personal income taxes, and by issuing government debt. We assume that agents will not hold government bonds unless they expect the bonds to be paid off eventually. This transversality condition implies that the current level of debt will be equal to the present value of future budget surpluses.[2]

The implication of these constraints is that a government running a budget deficit today must run an appropriate budget surplus as some point in the future. Otherwise, the government would be unable to pay interest on the debt and agents will not be willing to hold it. To ensure that the constraint holds at all points in time we assume that the government levies a lump sum tax in each period equal to the value of interest payments on the outstanding debt.[3] In effect, therefore, any increase in government debt is financed by consols, and future taxes are raised enough to accommodate the increased interest costs. Thus, any increase in the debt will be matched by an equal present value increase in future budget surpluses. Other fiscal closure rules are possible, such as requiring the ratio of government debt to GDP to be unchanged in the long run. These closures have interesting implications but are beyond the scope of this paper.

The seventeen regions in the model are linked by flows of goods and assets. Flows of goods are determined by the import demands described above (based on demand for goods for consumption, investment and government uses).

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[2] Strictly speaking, public debt must be less than or equal to the present value of future budget surpluses. For tractability we assume that the government is initially fully leveraged so that this constraint holds with equality.

[3] In the model the tax is actually levied on the difference between interest payments on the debt and what interest payments would have been if the debt had remained at its base case level. The remainder, interest payments on the base case debt, is financed by ordinary taxes.

Trade imbalances are financed by flows of financial assets between countries (except where capital controls are in place). We assume that existing wedges between rates of return in different economies are generated by various restrictions that generate a risk premium on country denominated assets. These wedges are calculated using a technique outlined in section 3 below. They are assumed to be exogenous during simulation. Thus in general when the model is simulated, the induced changes in expected rates of return in different countries generate flows of financial capital reacting to return differentials at the margin. In this paper I also explore the impact of changing these wedges in some countries.

Determining initial net asset positions and hence base-case international capital flows is non-trivial. We assume that capital flows are composed of portfolio investment, direct investment and other capital flows. These alternative forms of capital flows are perfectly substitutable ex ante, adjusting to the expected rates of return across economies and across sectors. Within an economy, the expected return to each type of asset (i.e. bonds of all maturities, equity for each sector etc) are arbitraged, taking into account the costs of adjusting physical capital stock and allowing for exogenous risk premia. Because physical capital is costly to adjust, any inflow of financial capital that is invested in physical capital (i.e. direct investment) will also be costly to shift once it is in place. The decision to invest in physical assets is based on expected rates of return. However, if there is an unanticipated shock then ex-post returns could vary significantly. Total net capital flows for each economy in which there are open capital markets are equal to the current account position of that country. The global net flows of private capital are constrained to zero.

The data used in the AP-GCUBED model comes from a number of sources. Unlike the GCUBED model we have not yet estimated the CES production elasticities of substitution. We currently assume the production function are Cobb-Douglas.

The input-output tables for the Asia-Pacific economies are from the Institute of Developing Economies. The Australian table is from the Australian Bureau of Statistics. In lieu of obtaining input-output tables for the aggregate ROECD region, we currently create the tables for this region based on the U.S. table and adjusted for actual final demand components from aggregate ROECD macroeconomic data. In effect, we are assuming that all countries modeled share the same production technology but differ in their endowments of primary factors and patterns of final demands. This assumption is a temporary necessity while we complete construction of the AP-GCUBED database.

Trade shares are based on the United Nations SITC (Standard Industry Trade Classification) data for 1992 with sectors aggregated from 4 digit levels to map as closely as possible to the SIC (Standard Industry Classification) used in the U.S. input/output data. This data is from the International Economic Databank at the ANU.

The parameters on shares of optimizing versus backward looking behavior are taken from the MSG2 model. These are based on a range of empirical estimates (see Campbell and Mankiw (1987) and Hayashi (1982)) as well as a tracking exercise used to calibrate the MSG2 model to the experience of the 1980s (see McKibbin and Sachs (1991)). It is important to stress that the results in this paper are very sensitive to the range of parameters used in the model. In particular the substitution possibilities in production are important. It is worth stressing that the adjustment cost model of capital accumulation implies that short run changes in inputs for a given relative price change will be lower than the long run substitution possibilities (despite having the same partial substitution elasticities in the short and long runs) precisely because physical capital is fixed in the very short run and therefore substitution possibilities are reduced.

AP-GCUBED is solved using the same software as the MSG2 model The model has approximately 7,400 equations in its current form with 140 jumping or forward looking variables, and 263 state variables. For further details on the model the reader should refer to McKibbin and Wilcoxen (1995) and McKibbin and Wong (1997).

3. Methodology for Estimating the Extent of Financial Impediments

Before running counterfactual simulations, we first solve the model from 1996 to 2070 to generate a model baseline based on a range of assumptions. These assumptions include assumptions about population growth by country (based on World Bank projections) and sectoral productivity growth by country by sector as well as assumptions about tariff rates, tax rates, and a range of other fiscal and monetary policy settings. Monetary policy is assumed to be targeting a stock of nominal money balances in each economy. Fiscal policy is defined as a set of fixed tax rates (apart from a lump sum tax on households that varies to satisfy the intertemporal budget constraint facing the government) and government spending constant relative to simulated GDP. With higher output, tax revenues rise implying a move towards fiscal surplus in each economy. The issue of projecting the future using a dynamic intertemporal general equilibrium model such as the AP-GCUBED model, is discussed in detail in Bagnoli et al (1996). This initial projection step is important for simulations because it builds in underlying structural change in the global economy which is endogenous to the exogenous assumption about differential productivity growth.

Given all of the exogenous assumptions and initial conditions the full rational expectations solution of the model is found using a numerical technique outlined in Appendix C of McKibbin and Sachs (1991). Without additional intervention, this solution will not generate the actual outcomes for the first year of simulation (in the current example 1996) because a range of forward looking variables such as human wealth, exchange rates, share markets etc will be conditioned on the future path of the world economy and there is no reason these should be equal to the observed values for the initial year. The next step of baseline generation is then to calculate a vector of constants for all equations in the model, including arbitrage equations, such that the solution of the model in the base year (1996) is exactly equal to the observed data in that year. It is important to stress that in no way are we assuming that 1996 is a steady state solution of the model. It clearly can't be. What we are imposing is that the 1996 database is on the stable manifold of the model in which all variables are moving on a stable path towards a steady state in the long distant future.

To see more precisely what the technique does, consider the uncovered interest parity assumption that is used in the model. This is shown in equation (1).

$$r_t^i = r_t^U + {}_te_{t+1} - e_t + \xi \qquad \textbf{(1)}$$

Here the real interest rate (r) in country i in period t is equal to the interest rate in the United States (r^U) in period t, plus the expected rate of depreciation in the bilateral real exchange rate between country i and the United States (${}_te_{t+1}$-e_t) where e_t is the log of the real exchange rate in period t and ${}_te_{t+1}$ is the expectation, formed in period t, about the exchange rate to prevail in period t+1. In addition we assume that there is a risk premium ξ which if positive means that country i interest rates on government debt (in real terms) are above the interest rates on comparable US government debt expressed in the same currency.

The term ξ is used in this paper to measure the extent of financial restriction. In fact it measures a range of factors including sovereign risk, impediments to financial flows, the degree of departure from rational expectations in actual data as well as a range of other factors. In the simulations below I assume that 50% of this wedge reflect financial restrictions that can be removed by government intervention.

In practice this calculation can be done using actual data outside the model as long as some measure of the expected change in the exchange rate can be found. The difference in this study is that the model is used to calculate the expected change in the real exchange rate. This is crucial because it is an ex-ante concept that matters and using ex post actual exchange rate changes may bias the estimate.

It is also important to stress that although I focus on the bond rate differential, recall that within each economy all financial assets (bonds, money, equity etc) are being arbitraged and therefore removing this wedge between bond rates will also affect the relative returns of a range of domestic and foreign assets.

The wedges calculated for a range of countries in the model using this bench-marking procedure are shown in Table 3. This table suggests that in 1996 Australian real interest rates were 84.5 basis points (or .845 percentage points) below US real interest rate after adjusting for the model consistent expected exchange rate change between 1996 and 1997. As can be seen for the countries shown, the wedges tended to be positive suggesting investors required a high rate of return for investing in these economies, or that the return on bonds and therefore capital and other assets were higher in these economies, not because of risk but because of impediments to capital flowing into these economies and therefore preventing the rate of return on a range of assets being driven towards the rate of return on US assets.

4. Simulation Results for Investment Liberalization

In this section the results from section 3 are used as a basis for simulating the effect of financial market liberalization. The experiment performed is for developing Asian economies to remove 50% of the wedges calculated above, in equal increments from 1997 to 2000. In 1997 this is fully anticipated by all agents in the global economy. In 1997 12.5% of the wedge in removed, 25% in 1998, 37.5% in 1999 and 50% from 2000 onwards.

The results are presented in figure 1 through 3. Only a subset of results are presented to make the key points. These are results for Indonesia, Thailand and Korea on the one hand (where wedges are reduced) and the United States, Japan and Australia on the other (where no wedges are changed). Results are all expressed as changes relative to the underlying baseline projections. Variables such as GDP, consumption, investment and real exchange rates are expressed as percentage deviation from baseline. The trade balance is percent of GDP deviation from baseline. Real interest rates are percentage point deviation from baseline.

The consequences of the financial liberalization is to initially lead to an arbitrage opportunity for investment funds initially held in assets outside the liberalizing economies. Financial capital flows into these economies very quickly leading to a large real and nominal exchange rate appreciation. In Thailand for example the real exchange rate (relative to the US) appreciates by close to 18% in 1997. This real exchange rate appreciation crowds out net exports and leads to a large deterioration in the current account and trade balance (reflecting the capital inflow). This capital that flows into the liberalizing economies goes into a range of assets but more importantly into physical capital accumulation over time. The marginal product of capital is above the return of government debt when the liberalization is announced. Because of adjustment costs in capital accumulation, arbitrage does not remove this differential because the economies can't absorb a large quantity of physical capital instantly. Over time, investment continues to be above the steady rate of investment. In the steady state, real investment is permanently higher because of the higher desired capital stock resulting form a necessary fall in the marginal product of capital in the steady state (being arbitraged to the US return).

As the capital stock rises, GDP rises because of the expansion of production possibilities in the economy. GDP continues to rise over time as more investment is put in place. In the long run GDP is permanently higher in each liberalizing economy.

An important point to note is that income in these economies does not rise by as much as production (measured by GDP) because the capital that being put in place is partly owned by foreigners and the return to this investment is repatriated over time. This can be seen by the gradual depreciation of the real exchange rate over time as well as the gradual improvement in the trade balance which is the transfer of real resources through additional net exports for foreigners. Note that consumption rises sharply, reflecting both a rise in expected future income in these economies a well as short run Keynesian style stimulus from the strong economy. Over time, consumption falls as more of the gains in production are repatriated to foreign consumers. Thus the income gains (reflected in GNP - not shown) are smaller for residents in the liberalizing economies than the GDP gains.

In economies not liberalizing, the adjustment is the mirror image of the results for liberalizing economies. Financial capital initially flows out of these economies leading to a depreciation of their real exchange rates (figure 3). Note that in figure 3 the real exchange rate relative to the US appreciates for Australia and Japan because the US real exchange rate is depreciating and both rates are expressed relative to the United States. But relative to the liberalizing economies, these real exchange rates depreciate. The outflow of financial capital leads to a decline in the desired capital stock in these economies which leads to a fall in investment (2.6% in the United States). The lower capital stock reduced GDP and through a multiplier channel reduced private consumption in the non liberalizing economies for a number of years. Consumption which falls initially gradually rises as incomes rise through the repatriation of the returns to foreign capital investments.

The outflow of capital also leads to an improvement in the trade and current account balances in non liberalizing economies reflecting the capital outflow. The liberalization also permanently raises interest rates in the non liberalizing economies by various amounts around 20 basis points because of the liberalization process. Thus real returns fall in liberalizing economies and rise in non liberalizing economies when the financial distortions are removed.

5. Conclusion

This paper has demonstrated that relatively small distortions in returns to assets, both financial and real, can have large effects on global production location and consumption possibilities. Removing these distortions have important implications for international capital flows that need to be carefully managed by liberalizing economies. The changes in trade balances and real exchange rates can be quite large. In the model the investment is channeled into productive activities which pay a return over time sufficient to cover the repatriation of dividends and servicing of accumulated debts. As we have seen in practice in Thailand, the investments may not be into productive assets which can transform a sustainable current account deficit into a crisis.

Adding the results from this paper for financial liberalization to the results from McKibbin (1997) for trade liberalization suggest that the gains to consumers in the APEC region from the APEC Bogor Agenda of free and open trade and investment in the Asia Pacific region could be large. This is particularly true when physical capital accumulation is brought into the analysis as this paper and the preceding paper do. Both this study and the trade liberalization study imply a strong inflow of financial capital into the liberalizing regions. This adjustment process has been shown to lead to large fluctuations in real and nominal exchange rates and trade balances which are optimal in the model but which may induce inappropriate and even counter productive responses from policy makers in the region.

Future research in this project will focus on the sensitivity of the quantitative results to parameters as well as the sensitivity of the financial wedge calculations to model specification and exogenous assumptions. Nonetheless the lessons from this paper are not just that the results may potentially be large but also that the adjustment process is going to have to be handled very skillfully by policymakers.

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Table 1: Summary of Main Features of AP-GCUBED

☻ Specification of the demand and supply sides of economies;

☻ Integration of real and financial markets of these economies with explicit arbitrage linkage real and financial rates of return;

☻ Intertemporal accounting of stocks and flows of real resources and financial assets;

☻ Imposition of intertemporal budget constraints so that agents and countries cannot forever borrow or lend without undertaking the required resource transfers necessary to service outstanding liabilities;

☻ Short run behavior is a weighted average of neoclassical optimizing behavior based on expected future income streams and Keynesian current income;

☻ The real side of the model is dis-aggregated to allow for production of multiple goods and services within economies;

☻ International trade in goods, services and financial assets;

☻ Full short run and long run macroeconomic closure with macro dynamics at an annual frequency around a long run Solow/Swan/Ramsey neoclassical growth model.

☻ The model is solved for a full rational expectations equilibrium at an annual frequency from 1996 to 2070.

Table 2: Overview of the AP-GCUBED Model

Regions:	***Sectors***:
United States	Energy
Japan	Mining
Australia	Agriculture
New Zealand	Non Durable Manufacturing
Rest of the OECD	Durable Manufacturing
India	Services
Korea	
Thailand	
Indonesia	
China	
Malaysia	
Singapore	
Taiwan	
Hong Kong	
Philippines	
Oil Exporting Developing Countries	
Eastern Europe and the former Soviet Union	
Other Developing Countries	
Agents	***Markets***:
Households	Final Goods
Firms	Services
Governments	Factors of production
	Money
	Bonds
	Equities
	Foreign Exchange

Table 3: Estimated Rate of Return Wedges Between Each Country and the United States in 1996

Australia	-0.845
Indonesia	4.169
Malaysia	4.682
Philippines	4.375
Singapore	5.900
Thailand	4.375
China	4.151
India	3.028
Taiwan	3.516
Korea	3.148
Hong Kong	3.914

Source: AP-CUBED Model simulations

Figure 1: GDP, Consumption, Investment and Trade Effects for Financially Liberalizing Economies

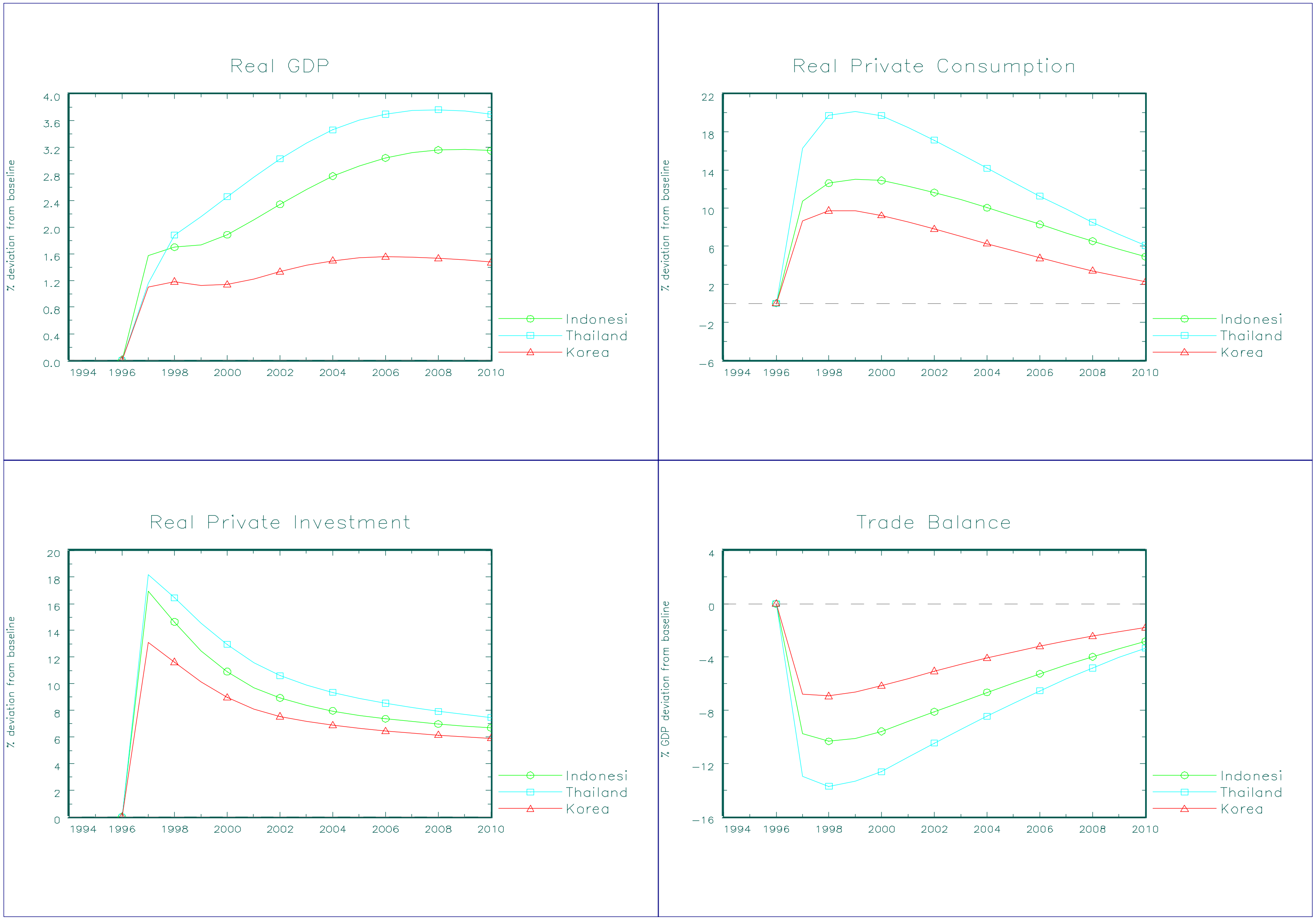

Figure 2:GDP, Consumption, Investment and Trade Effects for non- Financially Liberalizing Economies

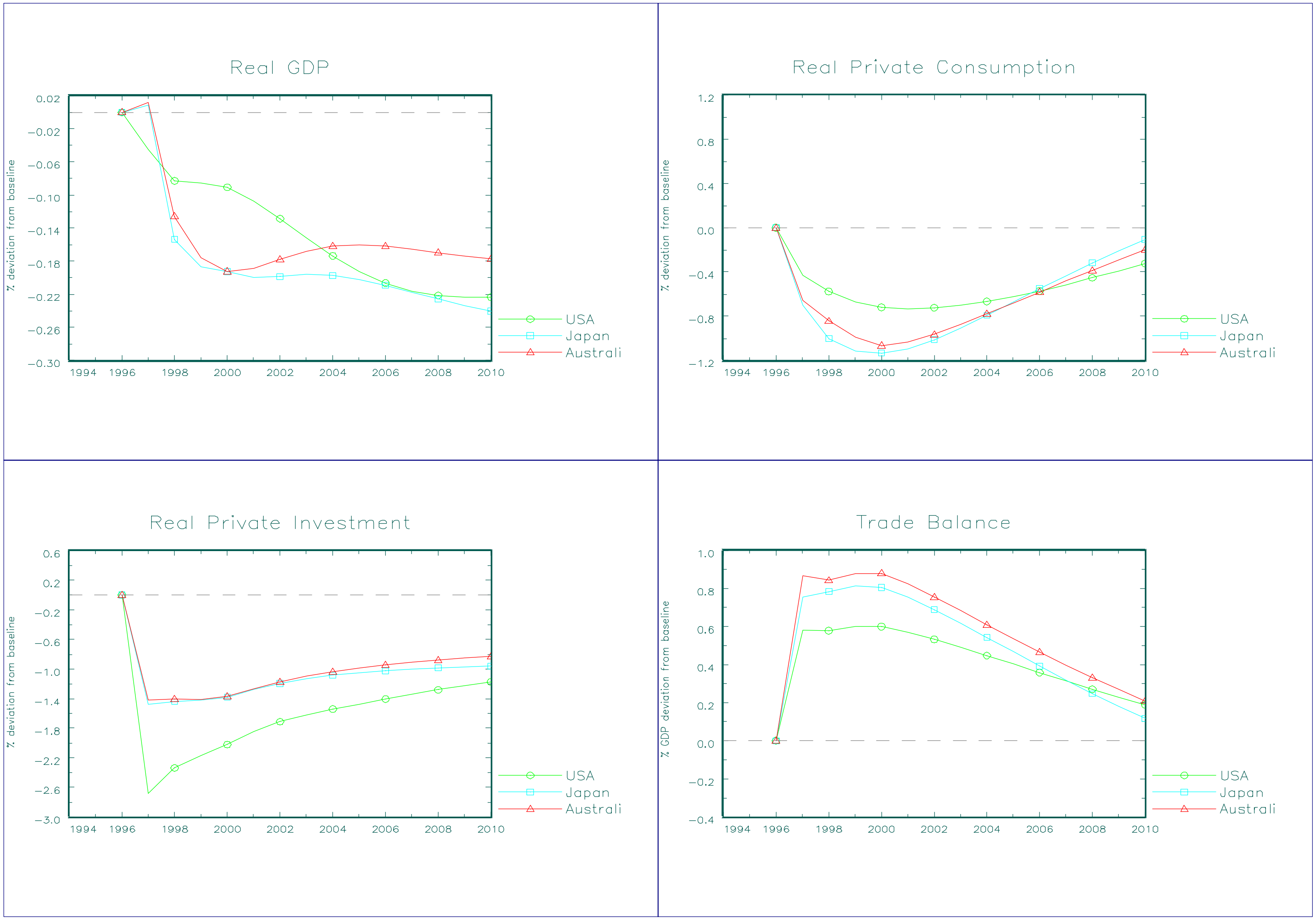

Figure 3 Financial Consequences for Liberalizing and non-Liberalizing Economics