THE IMPACT ON THE ASIA-PACIFIC REGION OF FISCAL POLICY IN THE UNITED STATES AND JAPAN

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The Asia-Pacific Region in an Integrated World Economy

ABSTRACT

This paper explores the macroeconomic consequences of changes in fiscal policy in the United States and Japan, for countries in the Asia-Pacific region. The basis of the study is the McKibbin-Sachs Global model that now includes models for Korea, Australia and Japan. It is shown that the response of global financial markets is important in determining the short run impact and the dynamics of adjustment of countries in the Asia-Pacific region when macroeconomic policies change in Japan and the United States. It is also shown that whether a policy is anticipated or not has important consequences for the adjustment process. Indeed in the short run GDP may rise or fall in response to a change in fiscal policy depending on the announcement effect of the policy change.

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1. Introduction

The outstanding economic achievements of the Asia-Pacific region over the past decade have significantly raised the importance of this area in a more closely integrated world economy. For many of the countries in this area, economic growth continues to be based on access to regional and global markets for goods and capital. With the importance of these regional and global linkages, it is difficult to focus on a single country in the region without considering regional and in some cases global issues. For example, in a country such as Korea, it is not only policy actions and adjustments within Korea that are crucial for the future path of the Korean economy, but also the linkages between Korea and the Pacific region and in turn the linkages between the Pacific region and the rest of the world. Similarly it is difficult to consider future trends in the world economy without considering trends in the Asia-Pacific region. It seems clear that policy makers, and therefore the global models that they sometimes use, must pay greater attention to this region than has been the case until now¹.

This paper extends the McKibbin-Sachs Global (MSG2) model to incorporate countries in the Asia-Pacific region (at this stage we have developed models for Australia, Japan and Korea although models for additional countries are under development). The focus is on the macroeconomic interdependencies in the region. We have already found elsewhere (e.g.

¹ This criticism is leveled at global models. There is rich modelling literature on individual countries in the region. One global model that has covered the region is the Project Link model. See Ichimura and Ezaki (1985).

McKibbin and Sundberg (1990)) that the sectoral composition of trade and production can be important for the nature of the transmission of shocks within the Asia-Pacific region. A new model called AP-CUBED that directly focussed on the sectoral linkages is outlined in McKibbin and Bok (1994).

In this paper we set out the modelling approach followed. We first give an overview of the theoretical basis of the MSG2 model which now has country disaggregation for Korea, Japan and Australia. In section 3 we present some preliminary illustrative simulation results for the impact of an anticipated and unanticipated US fiscal contraction as well as a Japanese fiscal expansion on the Australian, Japanese, Korean and US economies. A conclusion and direction for future research are outlined in section 4.

2. The MSG2 Model

The MSG model was developed by Warwick McKibbin and Jeffrey Sachs, in two distinct stages. The first model called MSG formed the basis of a number of papers by the authors in the mid 1980s. This model is also the version which participated in the model comparison project reported in Bryant et.al. (1988). This earlier model was a macroeconomic model of the world economy with rational expectations in the foreign exchange market. The parameters were essentially reduced form parameters calibrated to the estimates of existing macroeconometric models.

This model was then completely reconstructed beginning in 1986, following the approach taken by CGE modelers which focuses on individual optimization by economic agents. This new

model, called MSG2, is reported in McKibbin and Sachs $(1991)^2$. It builds on the approach in Lipton and Sachs (1983) and McKibbin (1986) who constructed models in which explicit optimization of agents forms the basis of structural behavioral equations. The main difference to static CGE models is the use of intertemporal budget constraints and intertemporal objective functions for agents. In contrast to static CGE models, time and dynamics are of fundamental importance in the MSG2 model. In addition, money is explicitly introduced into the model through a restriction that households require money to purchase goods. To track the macro time series the behavior of agents is modified to allow for short run deviations from optimal behavior either due to myopia or restrictions on the ability of households and firms to borrow at the risk free bond rate on government debt. Deviations from intertemporal optimizing behavior take the form of rules of thumb which are consistent with an optimizing agent that does not update predictions based on new information about future events. These rules of thumb are chosen to generate the same steady state behavior as optimizing agents. Actual behavior is assumed to be a weighted average of the optimizing and rule of thumb assumption. For example, aggregate consumption is a weighted average of consumption based on wealth and consumption based on current disposable income. The final modification to the standard market clearing assumption in CGE models was the allowance for short run nominal wage rigidity in different countries. In the short run, dynamics are explicitly driven by asset accumulation and wage adjustment to a neoclassical steady state.

The MSG2 model is based more firmly on micro-foundations than the standard

² See also Argy et al (1989) for an application of the model to the choice of exchange rate regimes.

macroeconometric model. It is described by the authors as a dynamic general equilibrium model of a multi-region world economy. The version of the model used in this paper concentrates on the United States, Japan, Germany, the Rest of the European Monetary System (denoted REMS)³, Australia, the Rest of the OECD (denoted ROECD)⁴, Korea, non-oil developing countries (denoted LDCs)⁵, oil exporting countries (denoted OPEC)⁶, and eastern European economies including the former Soviet Union (EFSU)⁷. Other versions of the model also exist. There is a regional version for Asian economies which has the region divided into high income and low income regions (see Sundberg (1990) and McKibbin and Sundberg (1990)).

The model is of moderate size (about four dozen behavioral equations per industrial region). It is distinctive relative to most other global models because it is solved for a full intertemporal equilibrium in which agents have rational expectations of future variables. Fiscal and monetary policies are examined in an intertemporal perfect-foresight environment, with considerable attention given to intertemporal optimization and intertemporal budget constraints.

The model has a mix of Keynesian and Classical properties by virtue of a maintained assumption of slow adjustment of nominal wages in the labor markets of the United States,

³ This block consists of United Kingdom, France, Italy, Belgium, Denmark, Ireland, and Luxembourg.

⁴ This group of countries consists of Austria, Canada, Finland, Iceland, Norway, Spain, Sweden, Switzerland, and New Zealand.

⁵ Non-Oil Developing countries are based on the grouping in the IMF Direction of Trade Statistics.

⁶ Oil exporting countries are based on the grouping in the IMF Direction of Trade Statistics.

⁷ These countries are Bulgaria, Czechoslovakia, Eastern Germany, Hungary, Poland, Romania, Yugoslavia, and USSR.

Germany, REMS, Australia and the ROECD. In contrast in Japanese labor markets clear in expected terms based on a one year wage contract.

I. The Theoretical Structure of MSG2

A stylized listing of the model equations are available on request. In this section the theoretical basis of the model is explained.

Each of the regions in the model produces a good which is an imperfect substitute in the production and spending decisions of the other regions. Each OECD country or region and Korea are assumed to produce one final good which is used for investment and consumption purposes in that region and in all of the other regions. The LDC, OPEC and EFSU regions each produce one good which is a primary input in the production processes of the industrial regions. Demands for the outputs of the LDC, OPEC and EFSU regions are therefore derived demands for the production inputs.

In the version of MSG2 model here, only the OECD regions plus Korea are fully modelled with an internal macroeconomic structure. In the LDC, OPEC and EFSU regions, only the foreign trade and external financial aspects are modelled.

Within each country the decisions of households, firms, and governments and their interaction in goods and financial markets are modelled. The following is a stylized overview of a single country template.

a. Firms

The cornerstone of aggregate supply in the model is a representative firm which maximizes its value by producing a single output Q at price P, subject to a multiple-input

production function. All variables are written in terms of per efficiency labor units. Potential long run growth in the model is assumed to be 3 percent and unchanged over time. Gross output is a produced with value added and intermediate inputs. In turn, value added is produced with capital and labor, while intermediate inputs are produced with imports from the LDCs and energy which consists of imports from OPEC and domestic oil production. We assume that domestic oil resources and imports of OPEC oil are perfect substitutes. As already noted above, we also assume that households hold claims over domestic oil resources.

The capital stock changes according to the rate of fixed capital formation and the rate of geometric depreciation. Following the cost of adjustment models of Lucas (1967) and Treadway (1969), we assume that the investment process is subject to rising marginal costs of installation, with total real investment expenditures 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. The investment good is itself a composite good, produced with a Cobb-Douglas technology that has as inputs the domestic goods from the United States and the final goods of the other industrialized regions. The price of the investment good is simply a weighted sum of the prices of the home goods and the dollar import prices.

The goal of the firm is to choose inputs of labour and intermediate goods as well as investment to maximize intertemporal net-of-tax profits. Solving this problem yields a set of derived demands for variable factors of production. These factors are hired to the point where the marginal productivity of these factors equals their prices relative to the output price. We can also use these factor demand equations together with the production function to rewrite the model in

terms of cost functions. In this case the price of the output will be a function of the price of variable inputs and the quantities of available fixed factors (such as capital). This technique also derives a Tobin's q model of investment.

The supply side of each country is completed with the wage equation, which is based on the institutional setting of wages which differs across countries.

b. Households

Households are assumed to consume a basket of goods in every period where the basket is made up of domestic goods (both public and private) and imported goods from each of the industrialized regions. They receive income to purchase the goods through providing labor services for production and receiving a return from holding financial assets. The decision on how consumption expenditure is allocated between the various goods across time is based on a representative consumer who maximizes an intertemporal utility function which is an additively separable function of consumption of the private good and the public good⁸ subject to the constraint that the present value of consumption equals human wealth plus initial financial assets. Human wealth 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 hands of the public, net holding of claims against foreign residents, the value of capital, the value of claims to domestic oil reserves⁹ and the present value of net profit arising from the pricing

⁸ In discounting the future stream of consumption, the rate of time preference (θ) adjusted by the real growth rate (n) is used.

⁹ The treatment of oil is discussed in more detail in McKibbin and Sachs (1991).

behavior of domestic firms in foreign markets¹⁰. Note that bonds are included as part of financial wealth, but this does not imply that they are part of total wealth because the tax liabilities associated with the stock of bonds are incorporated into the human wealth calculation that adjusts future income streams by anticipated tax liabilities.

The solution to the households optimization 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. By assuming that aggregate consumption is a nesting of domestic and foreign goods we derive equations for expenditure on each good as a function of aggregate expenditure and the price of each good relative to the price of the bundle.

There is a large body of empirical evidence that suggests that aggregate consumption is partly determined along life-cycle lines, with considerable intertemporal consumption smoothing, and partly along simpler Keynesian lines (perhaps because of liquidity constrained households)¹¹. Thus, we specify that consumption spending is a fixed proportion of current net-of-tax labor income, as in standard Keynesian models, and a fixed proportion of wealth, as in standard life-cycle models with infinite-lived individuals. We also introduce an additional term into the equation for human wealth. This is a risk premium that drives a wedge between the rate at which private individuals can borrow in the capital markets and the rate at which governments borrow. These modifications to capture empirical regularities in aggregate consumption are assumed not

¹⁰ It is assumed that exchange rate pass-through into prices by firms operating in foreign markets is not complete in one year. Any losses or profits by exporting firms in undertaking this pricing behavior is attributed to households who own these firms. For more details see McKibbin and Sachs (1991).

¹¹ See for example Hayashi (1982) and Campbell and Mankiw (1987).

to change the lower level demand functions. Note that in this model we assume that the real interest rate exceeds the real growth rate which introduces another source of saddle point stability into the model. This assumption is necessary if human wealth is to be positive in the steady state.¹²

c. Government

The government in each country is assumed to divide spending G among final goods in the same proportion as does the private sector.

The real value of this expenditure relative to GDP is assumed to be exogenous and constant in the future. The government finances this spending (plus interest payments on its debt and transfers to households) by levying sales, corporate and personal income taxes, and by issuing government debt. In addition, there can be an investment tax credit. We impose the constraint that the current level of debt is equal to the present value of future primary budget surpluses.¹³ With an outstanding stock of debt, if a government runs a budget deficit today it must run a budget surplus as some point in the future. Otherwise, the government will be unable to pay interest on the debt so no one will be willing to hold it. For experiments that result in deliberate or inadvertent changes in fiscal policy, it is important that tax and spending policies be consistent with the intertemporal budget constraint of the public sector. In particular, starting from any initial stock of public debt, the discounted value of current and

future taxes must equal the discounted value of government spending plus the initial value of

¹² Steady-state human wealth is (WL/P)(1- τ_1)/(r-n)

¹³ Strictly speaking, 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.

outstanding public debt.

If the tax schedule were not altered after a fiscal shock, the stock of public debt would eventually rise or fall without bound and would do so at an explosive geometric rate. To prevent this, we assume that labor taxes are increased each year by exactly enough to cover the increasing interest costs on the stock of public debt. Other fiscal closure rules are possible, such as always returning to the original ratio of government debt to GDP. These closures have interesting implications but are beyond the scope of this paper.

d. Financial Markets

The ten regions in the model are linked by flows of goods and assets. The goods flows have been outlined above and include import demands for goods and services for consumption, investment and as intermediate goods in production. This is captured in a set of trade matrices which give the flows of each good between exporting and importing countries.

Financial asset flows are more complicated. It is a common dilemma in general equilibrium models to explain why agents desire to hold money balances. A demand for money can only be derived from optimization if one of the following is true: money gives direct utility; money is a factor of production; or through a constraint that money must be used in transactions. In MSG2 it is assumed that households require money balances to purchase final output from firms. The way this is implemented is by adding an additional stage of production. At this stage money and final output are combined in a CES function to produce consumable goods where the money balances are rented to firms by households. Thus money appears in consumers' wealth. The demand for money is then determined as part of firms decisions.¹⁴ This gives a money

¹⁴ See McKibbin and Sachs (1991) for more detail.

demand function in which real demand for money a function of real income and the nominal interest rate. The supply of money is determined by the balance sheet of the central bank and is exogenous.

Asset markets are assumed to be perfectly integrated across the OECD regions. With free mobility of capital, expected returns on loans denominated in the currencies of the various regions are equalized period to period according to a set of interest arbitrage relations in which interest rate differentials are equal to the ex-ante expected exchange rate change.

Any trade imbalances are financed by flows of assets between countries. To determine net asset positions we make several simplifying assumptions. Some external financing will be exogenously determined by creditors. The remaining will be private capital for either portfolio or direct investment. Because all domestic assets are assumed perfect substitutes, the returns to these activities will be equalized. This implies that the composition of capital flows can be assumed to be in fixed proportions of portfolio investment, direct investment and other capital flows. These proportions can be obtained from the allocation of assets in the model's base year database. All other net capital flows are restricted to be consistent by imposing the constraint that current account balances and trade account balances sum to zero for the world as a whole. For the major industrialized economies, the current account is determined under the assumption that domestic agents have free un-rationed access to international borrowing and lending at the international interest rate. For simplicity we assume that all international borrowing and lending takes place in the currency in which debt is denominated in the MSG database.

For the non-OECD regions it is not reasonable to assume that exchange rates are free to float or that capital is freely mobile both within the regions and between the regions and the rest

of the world. Instead we assume that these three regions peg their exchange rates to the US dollar. In addition, we assume that OPEC chooses its foreign lending in order to maintain a desired ratio of income to wealth. The EFSU and LDC regions are assumed to be constrained in what they can borrow from the rest of the world. Given their exogenously determined borrowing and endogenously determined exports and debt servicing costs, these regions then allocate any remaining funds to imports.

e. Model Closure

The model is completed by assuming market clearing conditions except in labor markets. Prices in each country or region are fully flexible within each annual period, so that demand for a country's output (domestic demand plus export demand) equals output supply. Short term nominal interest rates adjust to clear the money market.

f. Model Parameterization and Solution

In fitting the model to macroeconomic data, a mix of standard CGE calibration techniques and econometric time series estimates are adopted. In CGE models, the parameters of production and consumption decisions are determined by assuming a particular functional form for utility functions and production functions and by assuming that ex post data from an expenditure share matrix or an input-output table represent an equilibrium of the model. For example, if utility is assumed to be a Cobb-Douglas nesting of the consumption of different goods, then the parameters of the utility function and therefore the demand functions for different goods are given by the expenditure shares found in actual historical data. The demand function for each good in the system will have price and income elasticities of unity. In most cases the data will determine the parameters of the model, although in some cases additional econometric analysis is required.

As mentioned, in most CGE models, both the data and the model parameters are manipulated to replicate an equilibrium of the model. In a dynamic model such as the MSG2 model, a corresponding procedure would be to choose a steady state of the model around which to calibrate. In principle, this is reasonable for a theoretical model because we could assume we start at a steady state since we were not concerned with recreating any actual year of data. To replicate an actual data set is more problematic since we are trying to keep within the bounds consistent with this data set¹⁵. For example a positive stock of outstanding debt for a country in the steady state, should be associated with a trade balance surplus, because the stock of debt needs to be serviced in the steady state. Yet during a period of adjustment away from the steady state, positive debt is usually associated with a trade account deficit during the early stages of debt accumulation. It is important to ensure the date replicates the trade position as well as the initial debt position which is not always possible by assuming steady relationships.

Our technique is to choose a set of behavioral parameters which fall within the range found in the many empirical studies of time series relations (e.g. factor shares and elasticities of substitution). Given this set of parameters and data for macro aggregates (e.g. output, consumption expenditure) which are based on data for 1987, we can use steady state relations in the model to generate other data (e.g. human wealth). A summary of the key features of this procedure can be found in McKibbin and Sachs (1991).

For any equation in which adjustment occurs according to some share formulation, we

¹⁵ The dynamics from an initial condition which is away from a steady state is a more interesting question for short run policy than the adjustment between steady states.

assume the shares are those prevailing in 1987. For example, the use of US goods in Australian investment is assumed to be equal to the 1987 ratio of imports of US investment goods to total investment expenditure in Australia.

We select the long run potential growth rates (n) of each region at 3 percent per year and the steady state value for the real interest rate at 5 percent. We also assume that the rate of time preference is equal to the real rate of interest. The choice of equal rates of time preference for the residents of each country is dictated by the problem that in infinite horizon multi-country models, one country would dominate the world eventually.

Solving a model such as the MSG2 model which assumes rational expectations in different markets is not a straightforward exercise. Forward looking variables such as asset prices, consumption and investment decisions are conditioned on the entire future path of all variables in the model. We are presented with a two-point, boundary value problem; values for inherited variables (state variables) are known and the expected paths of exogenous variables are assumed to be known. But for forward looking variables, we can only assume some terminal conditions.

Details on the solution technique followed here can be found in McKibbin and Sachs (1991) Appendix C.

This section has given an overview of the MSG2 model. The properties and tracking performance of the model, are examined in detail in McKibbin and Sachs (1991). In that book it is shown that a dynamic simulation of the model, imposing identifiable shocks that occurred during the period, is able to replicate many of the features of the world economy during the 1980s.

3. Changes in US and Japanese Fiscal Policies

In this section we present macroeconomic results for two simulations of current policy relevance. The first simulation is a sustained cut in the US fiscal deficit. We compare the impacts of an unanticipated cut in government spending of 1 percent of GDP, to a cut that is phased in as 0.25% of GDP in 1993, 0.5% of GDP in 1994, 0.75% of GDP in 1995 and then 1.0% of GDP from 1996 forever. The first policy for which there is no announcement before it is implemented, we label an unanticipated policy. The second policy is announced before it is implemented and we label this an anticipated policy. We then consider the impact on countries in the Pacific region of an increase of 1 percent of GDP in Japanese fiscal spending. This analysis is useful because of the current relevance for economic policy but also in order to understand the macroeconomic adjustment within the model.

As with any policy change in a model containing rational expectations, we must specify either the entire future path of the policy or the policy rule. In the case of fiscal policy we must also be careful to specify the method of financing to be used. In this case we assume that spending cuts lead to permanently smaller budget deficit and therefore lead to a reduction in government debt. We then assume that any changes in <u>servicing</u> a smaller deficit are eventually funded through lump sum tax changes on consumers. For example, a fiscal contraction today that cuts the deficit by 1 percent of GDP must be met at some stage in the future by a tax reduction to cover the reduced cost of servicing a smaller stock of debt, if the fall in the deficit is to remain at permanently 1% of GDP. Alternative assumptions about financing are not considered in this paper but are considered in McKibbin and Bagnoli (1993). We show in that paper that the assumptions about "fiscal closure" are crucial to the results. In particular our assumption of spending cuts leading to a permanent reduction in the fiscal deficit, implies that the spending cuts will be more contractionary in the short run and more expansionary in the long run, relative to the case where the changes in spending are matched by a reduction in taxes. In the short run the reduction in government spending removes direct demand from the economy whereas a tax cut would be partially spent by the private sector and therefore directly raise aggregate demand offsetting the negative effect of the reduction in government spending. In the longer run the permanent reduction in the fiscal deficit permanently raises economy wide saving in this model and therefore raises the long run capital stock. This implies a higher long run level of potential output relative to the case where the revenue saved by the cut in spending is given back to the private sector as a tax cut. These issues are dealt with further below.

The simulations are run over an horizon of 100 years beginning in 1993. We only present results for the period from 1993 to 2022 because most of the interesting dynamics occurs over this period and the long run convergent solution of the model can be gauged from these charts.

For each policy change we present the deviation from baseline of a number of key macroeconomic variables. The variables presented are: real gross domestic product, the trade balance, the current account, inflation, short term nominal interest rates, real and nominal interest rates on 10 year bonds, and nominal bilateral exchange rates to the \$US (except for the US in which we use a nominal effective exchange rate).

Some care is needed in reading the figures. They show the deviation from a baseline either as a percent (e.g. GDP, exchange rates, prices) or in percentage points (e.g. inflation, interest rates), or as a percent of baseline GDP(trade balance, current account). For example,

the top left hand panel of Figure 1 presents the results for US real GDP as percent deviation from baseline for an anticipated and an unanticipated cut in the US fiscal deficit. The shock is announced to occur in 1993. Real GDP falls by 0.35 percent upon impact. By 1998 real GDP has risen above the value that it would otherwise have had in that year. This indicates that although the economy is growing at the rate of the baseline path, the level of real GDP is above where it otherwise would have been.

a. US Fiscal Contraction

Figure 1 and 2 present summary results for the United States for a cut in government spending under the two alternative assumptions about the policy. The reduction in government spending is on current consumption rather than infrastructure spending (which is also in the model) results in a permanently smaller fiscal deficit which is 1 percent of baseline GDP below baseline, forever. First consider the case of the unanticipated permanent cut in government spending. The process of adjustment follows the familiar results of the theoretical Mundell-Fleming-Dornbusch models but in this case the imposition of long run stock equilibrium and wealth constraints and the assumption of rational expectations gives a dynamic story that extends the standard insight from the theoretical Mundell-Fleming model . The reduction in demand and the fall in government borrowing lead to a fall in interest rates in the United States (real and nominal, short and long) (figure 2). The fall in interest rates reflects the increase in current and expected saving in the US economy. The fall in interest rates leads to a capital outflow which depreciates the US dollar by around 5 percent relative to the Yen and by 8 percent relative to the Australian dollar. The large size of the US economy in world capital markets leads to a global fall in interest rates. In small economies such as Australia or Korea this model a change in real interest rates within the economy are only temporary departures from a given world interest rate. The fall in US domestic demand has a negative impact on world output in the first year but this is more than offset by the stimulative effects of lower world interest rates in subsequent periods.

The capital outflow from the United States is reflected in an improvement in the US current account of around 0.3 percent of GDP in 1993 (figure 1). The US trade balance also improves in the first few years but gradually deteriorates over time. The difference between the trade balance and the current account are the interest and dividend payments on assets held by foreigners. Thus the servicing of foreigner assets can drive a wedge between the current account and the trade balance which cumulates over time. This deterioration in the trade balance over time (relative to baseline not necessarily relative to 1993) reflects the intertemporal budget constraint: with a permanently smaller stock of external debt, the future US trade surpluses that otherwise would be required to service the stock of external debt are now reduced. This is accomplished by a gradual appreciation of the US dollar relative to baseline after the initial depreciation. Thus the US dollar depreciates instantly and then gradually appreciates over time at the same time as the trade balance improves and then worsens over time relative to where it otherwise would have been. The long run improvement in the next external asset position is reflected in a long run appreciation of the real exchange rate. This long run appreciation of the real exchange rate is also reflected in the short run change in the exchange rate, however it is more than offset by the change in the short run differential between US and foreign interest rates

which causes a jump depreciation.

Inflation initially rises despite a fall in some domestic prices. This is due to number of important factors. Firstly the definition of inflation used in this model is a consumer price inflation which includes a rise in the price of imported goods reflecting the depreciation of the US dollar. In addition some domestic goods require imported inputs into the production process. As the US dollar depreciates, the costs of imported inputs rise. This leads to a rise in output prices.

Figures 1 and 2 also show the longer run consequences of the reduction in government spending. Higher government saving in the United States lowers the long term real interest rate which is sustained. The real interest rate in this model is determined by the rate of time preference of households plus and endogenous term which is a function of the various market imperfections assumed in the model. These imperfections include households and firms that use a higher discount rate for discounting future income streams than the risk free government bond rate. The lower real interest rate implies a lower marginal product of capital which implies a higher capital labor ratio. Since the economies in each region are assumed to return to full employment in the long run, the level of output is permanently higher in the long run. It is also clear from these figures that the asset adjustment process is quite drawn out so it takes much longer than the period shown for the ultimate achievement of the new long run stock equilibrium. This long period of adjustment is due to the assumption that the spending changes lead to permanent change in the fiscal deficit. Given our assumption of a 3 percent potential growth rate, a permanent 1 percent reduction in the fiscal deficit would lower the long run debt to GDP ratio by 33.3 percent (i.e. 100*1/0.03). Thus the dynamics to the new stock equilibrium with the

supply of asset adjusting gradually takes place over a long period.

Now consider the results when the policy is announced in advance as a gradual (and credible) phasing in of the spending cuts. These results show that a policy of cutting the budget deficit through spending cuts can actually stimulate demand slightly in the first few years. This occurs because the cuts are announced in 1993 but the actual reduction in spending does not significantly reduce demand in the economy until 1995¹⁶. Three factors explain this outcome: a fall in long-term real interest rates stimulates private investment; a realization of lower future tax burdens stimulates private consumption; and a depreciation of the US dollar in anticipation of lower future interest rates stimulates net exports. Over time as the cuts in spending are implemented, there is a contraction in aggregate demand which is larger than the indirect stimulus due to changes in asset prices inducing a rise in spending by the private sector.

By the year 2000, GDP rises above baseline because the permanent increase in public saving leads to a rise in economy-wide saving. Consumption rises much more after 1995 because it is dependent on GNP rather than GDP. GNP grows strongly primarily due to lower payments on foreign debt and as a result of the considerable trade balance surplus that results. Note that short term interest rates actually rise in the first year when the policy is phased in. This reflect our assumption about monetary policy. With a given stock of money balances, the initial rise in demand leads to a rise in short term market interest rates, even while the long term rate falls (reflecting falling future short rates). Thus the yield curve inverts initially for the anticipated shock but not for the unanticipated shock.

During the process of adjustment to a lower fiscal deficit, short-run demand is first

¹⁶ See McKibbin and Bagnoli (1993) for a similar result using the MSG model.

stimulated, then is followed by a medium-term slowdown and finally, towards the end of the decade, leads to an eventual rise in GDP. This latter effect is the outcome of absorbing resources into the private sector, that were dislocated from the cuts in government spending. The implication that a credible deficit reduction package can be used for a mild short-run stimulus and long run deficit reduction with resulting permanent increases in real GDP depends crucially on the credibility of the package in the first 2 years. These results also show that the short run dynamics are importantly affected by the expectations assumption surrounding policy changes.

The results for Australia, Japan and Korea are summarized in figures 3 through 8. In each country the unanticipated cut in the US deficit lowers real GDP because US demand for exports from each region falls. This fall in GDP is quickly offset through the stimulus to domestic demand initiated by falling real interest rates within these economies. When the fiscal cut is phased in, the interest rate effects overwhelm the income effect from a decline in US demand for non-US goods, and output rises in each country in the region. The fiscal consolidation in the US also has similar effects on the trade and current account balances in each of the three Asia-Pacific countries. The US trade balance improves by 0.3 percent of GDP. This is mirrored by a decline in trade balance of Australia, Japan and Korea of 0.5% of GDP, 0.5% GDP 0.6% of GDP respectively. The results for interest rates and exchange rates also follow from the discussion of adjustments within the United States. As US interest rates fall capital flows into global capital markets which lowers interest rates throughout the region. For the anticipated spending cuts the yield curve inverts in each country because the short run interest rates rise initially as aggregate demand rises in response to a reduction in long term interest rates.

In the case of Australia, the interest rate effect more than dominates the impact of lower

US demand for Australian exports. With a large external debt, a permanent fall in real world interest rates permanently raises income in Australia which has induces a larger short run stimulus that in Japan or Korea. In the Korean case the importance of trade with the United States shows in the fall in Korean GDP for the first few years of the shock.

b. Japanese Fiscal Expansion

The second policy we consider is a Japanese fiscal expansion. As with the US policy, it is important to specify the future path of policy. We assume that the Japanese fiscal deficit is permanently increased as a result of the increase in government spending. In other words the spending increase is funded by issuing government bonds. This assumption contrasts with the eventual outcome from the Y13 trillion fiscal package, announced in 1994. In that case as with many recent fiscal packages announced in Japan, the increases in spending are quickly funded by increases in taxes so that the fiscal deficit does not appreciably change as a result of the spending increase. Nonetheless it serves as a useful benchmark with which to compare the US policy which leads to a permanent change in the US fiscal deficit. The major different to keep in mind is the Japanese policy is a fiscal expansion whereas the US policy was a fiscal contraction.

The results for this simulation are presented in figures 9 and 10. In contrast to the US policy we group four countries into each figure. Many of the mechanisms already discussed for the US simulations apply to the Japanese results with the sign changed to reflect the asymmetry in policy. Both countries are large economies with importance effects on both trade and global capital markets.

The rise in government spending in Japan raises aggregate demand inside the Japanese economy although the stimulus is crowded out more quickly than an equivalent US fiscal

expansion is crowded out in the United States. This occurs because the rise in demand paid for by issuing bonds raises interest rates inside Japan and appreciates the Japanese exchange rate. Both higher interest rates and a stronger Yen tend to crowd out private investment and net exports. This financial adjustment to the policy change also happens in the US case discussed above. In addition to these factors, we assume that Japan has a more flexible labor market with the labor market assumed to clear in an annual wage cycle. The greater degree on real wage flexibility in Japan substantially reduces the ability of changes in government spending, paid for by issuing bonds, to stimulate the Japanese economy for a long period. This affects the size of the short run Keynesian multiplier in Japan but has no effect on the long run negative supply side effect of a reduction in economy-wide saving.

In the short run, the spillover of the rise in Japanese fiscal spending to other countries is ambiguous. The rise in demand in Japan, together with the stronger yen that accompanies it, stimulates the demand for imports of goods from other countries. This positive spillover to other countries is offset by the rise in Japanese interest rates which raises world interest rates because Japan is large in world capital markets. As interest rates rise in Japan capital flows into the Japanese economy. This appreciates the exchange rate. The appreciations leads to a deterioration in the current account balance which is the flip side of the improvement in capital account balance. Countries such as Korea and Australia that have significant shares of output exported to the Japanese market benefit more from the demand stimulus inside Japan than countries such as the United States that depend less on the Japanese market for exports. The stimulus for other countries exports from higher Japanese demand is offset by rising world interest rates due to the reduction in Japanese economy-wide saving. These higher interest rates

reduce investment through the world as well as reducing the expected income of economies with large external debts. Whether the increase in fiscal spending in Japan is transmitted positively or negatively is therefore an empirical issue. Countries with less significant trade flows to Japan but large external debts experience a negative demand shock. The US economy actually experiences very little stimulus from the Japanese spending package and the results for the United States are dominated by the rises in world interest rates. A country such as Korea gains in the short run from the increase in demand which dominates the interest rate effects. The effects on Australia are different again in that Australia gains from the demand shock because Japan is an important export market for Australian products, but also loses disproportionately because of the reliance on external borrowing through a large current account deficit. These two factors tend to cancel.

The Japanese trade balance and current account balance deteriorate relative to baseline as a result of the rise in Japanese demand increasing imports and the stronger Yen crowding out net exports. The other part of this story is also that total saving in Japan declines which is consistent with the worsening of the current account balance (which is the difference between total saving and investment in Japan). In the short run, the permanent rise in government consumption spending helps to reduce the large Japanese current account surplus and temporarily stimulates aggregate demand in Japan. However the fiscal expansion also reduces global saving which leads to a rise in world interest rates.

In the longer term the results of the Japanese policy is clearly negative for world output. The mechanism here is similar to that outlined for the US above. With a reduction in saving in an economy as large as Japan, there is a reduction in global saving which implies a higher world interest rate and lower global investment and therefore lower private capital accumulation. The

higher interest rate equates to a higher marginal product of capital in the longer run which is consistent with a lower capital stock. Thus output falls in all countries with open capital markets.

There are several other interesting aspects of the transmission of the shock in Japan to other countries in the region. Inflation rises initially in the US and Korea but falls slightly in Australia. Initially the yen appreciates against all currencies which implies Japanese goods imported into other countries become more expensive. I the case of Australia there is slight twist because of the relative changes in exchange rates and the composition of Australia's trade with Japan and other countries. Although the Australian dollar depreciates relative to the Yen, it appreciates relative to the US dollar and European currencies partly reflecting the increase in demand for Australian goods. This appreciation makes US and European goods cheaper in the Australian market. In particular capital goods imports become cheaper which is enough to initially reduce inflation in Australia.

Just as for the US change in spending, the Japanese spending increase has a significant effect on world interest rates which are an important aspect of the transmission of the Japanese shock to the Asia-Pacific region.

4. Conclusion

We have presented a framework for analyzing macroeconomic linkages in the Asia-Pacific region and the global economy. It is shown that macroeconomic adjustments within the Asia-Pacific region in response to shocks in countries within the region are importantly determined by the adjustment of capital flows as well as the direct impacts of spending changes

on flows of goods and services between economies. Importantly, the adjustment of trade flows are in part determined by the flows of financial assets that respond to changes in long run stock equilibrium as result of the policy changes. The mechanism of adjustment is through the response of asset prices. These changes in asset prices, especially nominal exchange rates but also share markets and interest rates, impact directly on the adjustment of trade flows through changes in the real exchange rate between countries. The stimulus to economies from a rise in demand in countries undertaking a fiscal expansion are offset by the rise in global interest rates that accompany a bond financed fiscal expansion. Whether a country experiences a rise in income as a result of the fiscal stimulus abroad depends on the sensitivity of that economy to changes in interest rates, the extent of dependence on external borrowing to satisfy the gap between income and expenditure in the economy, and the extent of trade in goods between these economies. As a result of these factors, fiscal policy changes in the United States and Japan are shown to have differential effects on the Asia Pacific economies modelled. For example in the short run, a reduction in US government spending raises Australian output because the fall in world interest rates stimulates private demand in Australia but more importantly the policy raises income in Australia because lower world interest rates reduce the burden of servicing the large Australian external debt. In contrast a fiscal expansion by Japan is beneficial for Australia in the short to medium term because the Japanese economy is relatively more important for Australian exports than the interest rate implications of larger Japanese budget deficits.

Finally we have shown that in a model with capital flows reacting to changes in expected rates of return on financial assets, the announcement effects of fiscal policy can have very different effects on economies in the short term. The announcement effects operate through

adjustment in financial markets that precede the adjustment in goods markets. The dynamic adjustment is shown to be very different whether a policy is implemented upon announcement or gradually implemented over time.

In analyzing the consequences of macroeconomic policy changes, it is important to model both the trade linkages between economies as well as the capital flow linkages between economies. We have shown in this paper that the interdependence of trade and capital flows are important for the adjustment of countries in the Asia pacific region to changes in policies within that region. The current approach is being extended to modelling the sectoral linkages between economies in the region using the AP-Gcubed model outlined in McKibbin and Bok (1994).

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Figure 2: Financial Consequences for the United States of a 1% U.S. Fiscal Contraction



Figure 3: Real Consequences for Australia of a 1% U.S. Fiscal Contraction



Figure 4: Financial Consequences for Australia of a 1% U.S. Fiscal Contraction



















Figure 9: Real Consequences for Pacific Countries of a 1% Japanese Fiscal Expansion



Figure 10: Financial Consequences for Pacific Countries of a 1% japanese Fiscal Expansion

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