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Japanese Macroeconomic Policy and the Current Account Under Alternative International Monetary Regimes

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Empirical estimates of the effect of monetary and fiscal policy on the Japanese current account are provided. To assess the quantitative importance of international monetary factors, these estimates are computed under three different exchange rate regimes: flexible exchange rates, fixed exchange rates with a "yen standard" and fixed exchange rates with a "multi-currency standard." For all exchange rate regimes, monetary policy has a much smaller impact on the current account than fiscal policy, but the impact of fiscal policy on the current account is even larger when exchange rates are fixed than when exchange rates are flexible. The estimates are based on a quarterly multicountry econometric model with rational expectations estimated during the 1972–1986 period.

I. Introduction

The purpose of this paper is to provide numerical estimates of the effect of Japanese macro-economic policy on the Japanese current account. Because of the high degree of international capital mobility in today's financial markets, it is impossible to address this macroeconomic issue without taking account of the international monetary regime. In particular, the effect of Japanese macroeconomic policy depends crucially on the degree to which the Bank of Japan and other central banks attempt to stabilize exchange rates. There is now no clear consensus on whether exchange rate stabilization should take place, or on how it should be accomplished. In this paper, therefore, I consider three alternative exchange rate regimes. Regime I is a flexible exchange rate system, Regime II is a fixed exchange rate system with the Bank of Japan at the center, and Regime III is a

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fixed exchange rate system in which the Bank of Japan shares with other central banks the responsibility for maintaining the fixed rates. These three regimes are described in more detail below. Regime I is meant to approximate the exchange rate system in existence during the late 1970s and early 1980s. Regime II and Regime III are two alternative fixed exchange rate regimes.

To assess the empirical importance of alternative international monetary policy regimes it is necessary to use a structural econometric model that can characterize the operation of the international monetary system explicitly. In this paper I use a seven country rational expectations model that is fit to quarterly data over the last 17 years. The equations incorporate the high degree of international capital mobility mentioned above, as well as particular institutional aspects of the Japanese economy such as the annual *shunto*. The assumption of rational expectations is essential to the workings of the model. Expectations of future exchange rates, interest rates, prices and wages all figure into the effects of monetary and fiscal policy.

The large external imbalances that have existed during the 1980s have motivated many studies of the effect of macroeconomic policy on the current account. Most of these studies have focussed on U.S. macroeconomic policy and the U.S. current account. An extensive tabulation of U.S. results from seven multicountry models (including an earlier version of the model used in this paper) is reported in Bryant, Holtham and Hooper (1988). This paper focusses on Japanese policy and does not address questions about U.S. policy, such as the effect of the U.S. fiscal deficit on the U.S. current account deficit. In a recent paper, Yashiro, *et al* (1987) estimate the effects of changes in Japanese monetary and fiscal policy using the EPA World Economic Model. None of this earlier research addresses the issue of exchange rate regimes. The novelty of the present paper is a quantitive treatment of different international policy regimes.

The paper is organized as follows. The multicountry model is briefly described in section II with special reference to the Japanese equations. The different policy regimes are discussed in section III. The results of the policy simulations are reported in section IV. Although the main emphasis is on the current account, the effects of monetary and fiscal policy on the other key macroeconomic variables are also discussed. Policy implications are drawn in section V.

II. Overview of the Model

The model is a quarterly seven country rational expectations model consisting of Japan along with the U.S., Germany, the U.K., France, Italy and Canada. The entire model is described in the Appendix to the paper. Table A1 defines the variables, Table A2 describes the functional forms of the equations, and Table A3 presents the estimated coefficients. There are 98 stochastic equations in the entire model.

The model is most easily understood as an empirical rational expectations model in

the style of Mundell (1963) and Fleming (1962) with sticky prices, demand-determined output, and perfect international capital mobility. Rational expectations appear not only in the interest rate parity equations as in Dornbusch (1976), but also in most other equations of the model. Wages and prices are assumed to evolve in a forward looking manner over time according to the staggered wage setting approach described in Taylor (1980).

1. Financial Markets

The money demand equations are in the form of a simple Cagan-Goldfeld equation with *logs* of real money balances and income, and the *level* of the short-term interest rate. M_1 is the measure of money. For Japan, the long-run interest rate semi-elasticity is 1.9 and the long-run income elasticity is 0.55. Both of these elasticities are lower than the average of the other six countries in the model. The interest rate in this equation is the call money rate. The call money rate affects the long-term interest rate (measured by the interest rate on long-term government bonds), through a rational expectations term structure equation (equation c in Table A2). According to this equation, the long rate is a geometric distributed *lead* of expected future short-term interest rates. This equation was estimated using quarterly average data from 1971 III through 1984 IV. As discussed above, exchange rates are determined by the arbitrage conditions of perfect international capital mobility. There are 6 bilateral exchange rate equations shown in Table A2 relative to the U.S. dollar.

2. Consumption and Investment

The consumption and investment equations do not incorporate as much explicit structure as the other equations of the model. The aim is simply to capture the average cyclical effect of real interest rates and permanent income (or output) on consumption and investment demand. Note that the consumption equations have total GNP as the income variable; hence the coefficient on this income variable is less than the marginal propensity to consume out of personal disposable income. Note that the interest rate variable in these equations is the *real* interest rate. For Japan there is a high long-run real interest rate semi-elasticity (-0.96) for *durable* consumption. However, since durable consumption is a small fraction of total consumption, and since the other components of consumption have small or zero elasticities, the semi-elasticity for total consumption is only about -0.07. This is a bit below the average of the interest rate semi-elasticities in consumption for the other countries.

There are three investment equations in Japan. The long-run real interest rate semi-elasticity is -4.38 for nonresidential investment, but is essentially zero for residential investment. Averaging over residential plus nonresidential, the semi-elasticity is lower than in Germany and the U.S., but higher than in the other countries. Note that the effect of a change in output in the inventory equations in Japan is opposite to that in

the other countries. This probably reflects more production smoothing in Japan.

3. Imports and Exports

The export and import demand equations are highly aggregated. The export and import totals are those in the GNP accounts and include factor services. The price elasticities should therefore be lower than in merchandise trade equations. The equations are estimated in log linear form. The demand variable in the export equation is a weighted average of output in the other six countries. The long-run "world" income elasticity for Japanese exports is 2.0 which is relatively high and much larger than the U.S. The long-run income elasticity for Japanese imports is 1.1 which is the lowest of all the countries. The price variable for imports is the ratio of import prices to domestic prices. The price variable for exports is the ratio of export prices to import prices. The long-run price elasticity for both imports and exports is about 0.8 (in absolute value), which is relatively high compared to the other countries.

4. Prices and Wages

The export price is assumed to move directly with a weighted average of domestic prices and foreign prices, but with a lag. The import price is assumed to move with a lag to changes in foreign prices measured in domestic currency units. Hence, appreciation of the exchange rate reduces import prices, and raises export prices. It should be noted that the long-run price elasticity in the import price equations is constrained to be one. This constraint tends to lower the short-run elasticity and increase the lag length.

Wages are determined according to the staggered contracting model and incorporate the synchronization of wage setting in the *shunto* in Japan. The coefficients on future and past wages vary according to the quarter of the year. According to these equations, the estimated percentage of workers changing wages in Japan once every quarter is 11.8 percent, once every 2 quarters is 0.7 percent, and once every 4 quarters is 87.5 percent. Of the "once every four quarter" workers, the distribution by quarter is: winter 3 percent, spring 42 percent, summer 26 percent, and fall 16 percent. Hence, according to these estimates, the most common quarter for a wage change is the spring quarter followed by the summer. These estimates accord with general observation about the spring *shunto* in Japan. Note that the flexibility of wages in Japan, according to these estimates, is much greater than in the other countries.

The aggregate price equation is interpreted as a markup equation. The long-run elasticity of wages and import prices is constrained to be one. The equation indicates that prices in Japan react relatively slowly to changes in wages and import prices. This lag is longer than in all the other countries.

5. Solving the Model

The overall workings of the model when these equations are combined can be

explained briefly. Consider an increase in the money supply. Wages are sticky in the short-run, and prices are determined by a markup over wages and import prices. Hence, when the money supply increases, real money balances also increase. This increase in real money balances reduces short interest rates and thereby reduces long rates through the term structure equations. The real interest rate is reduced on this account and also on account of the increase in the expected rate of inflation: with rational expectations people know that prices will begin to increase in the future because the money supply has increased. The decrease in the real interest rate increases both investment and consumption demand, and thereby stimulates output. In addition, the exchange rate immediately depreciates as a result of the expected rise in future prices in Japan. This depreciation stimulates export demand and reduces import demand, and further tends to stimulate the economy. Although wages and prices are sticky in the short-run, they soon begin to adjust upward in response to the increase in demand. As wages and prices rise, the effect of monetary policy on output and employment begins to diminish. Eventually output returns to normal and prices and wages rise by the same amount as the increase in the money supply. Because this is a multicountry model, the impact of monetary policy also depends on the linkages with the other countries through trade, prices, and financial markets. However, as we will see below, the impact of such a change in monetary policy on the other countries depends very much on what exchange rate system is in operation.

Because of the rational expectations assumption, solving the model is a rather computer intensive operation. With rational expectations, the forecasts of the model at every point in time must be consistent with the expectations of people being described by the model. Achieving this expectational consistency in a large nonlinear model requires an iterative procedure. The method of solution used to solve this model is described in Fair and Taylor (1983).

III. Description of the Policy Experiments

The basic policy changes that I consider are an easier monetary policy and an easier fiscal policy. These changes are assumed to occur starting in 1982. They are counterfactual changes, and I examine how different the world would have been if these changes had taken place. Although the model is nonlinear, the effects of these policy changes appear to be close to linear, so that the effect of tighter policies can easily be obtained by reversing the signs of the impacts reported for the easier policies.

The easier monetary policy is an increase in the Japanese money supply, and the easier fiscal policy is an increase in the level of Japanese government purchases. Both shocks are assumed to be unanticipated and permanent. They are assumed to occur in the first quarter of 1982 and we focus on the results through the first quarter of 1987. The money supply increase is 2 percent, and is phased in evenly over 4 quarter. This is an increase in the level, not in the rate of growth of money. The government spending

increase is in real terms and is by an amount equal to 1 percent of historical real GNP. There is no phase-in of the government purchases increase. The size of these monetary and fiscal shocks is such that they have about the same order of magnitude impact on real GNP in the standard experiment with flexible exchange rates. Other research groups in Japan—Economic Planning Agency, Economic Research Institute and the Bank of Japan, Research and Statistics Department—typically characterize an easier monetary policy by a once and for all permanent reduction in interest rates. For comparison purposes such a characterization would be useful in this paper. However, in this model it is not possible to reduce the nominal interest rate permanently below the baseline forever because that would leave the price level indeterminate because of the rational expectations assumption. Hence, it is necessary that easier monetary policy be characterized by an increase in the money supply.

As stated in the introduction, the magnitude of the impact of these policy changes depends on the international policy regime. We consider three alternative policy regimes:

Regime I: **Flexible Exchange Rates**. Under this regime the Bank of Japan and the other central banks hold their money growth rates fixed and let exchange rates fluctuate.

Regime II: **Stable Exchange Rates: Yen Standard**. Under this regime, the Bank of Japan keeps its money growth rate fixed, and the other central banks dedicate their money supplies to stabilizing the exchange rate against the Yen. For this regime the Bank of Japan is at the center of the international monetary system, much like the Fed was under Bretton Woods. The regime is called a *yen standard*, because it is much like the dollar standard during the Bretton Woods system.

Regime III: **Stable Exchange Rates: Modified Yen Standard**. Under this regime all central banks, including the Bank of Japan, contribute to maintaining the fixed exchange rates. A weighted average of money growth in all seven countries, rather than Japanese money growth is held fixed. The weighted average puts most weight on Japan, however. The weights on Japan=0.8, U.S.=0.05, Canada=0.025, France=0.025, German=0.05, Italy=0.025 and U.K.=0.025.

A brief technical description of how the model is set up under each of these three regimes will help in understanding the results. In Regime I, the money supplies are treated as exogenous in all seven countries, and the exchange rates are determined according to the 6 interest rate parity equations. The short-term interest rates themselves are determined from the money demand equations in each country, inverted with the short-term interest rate on the left hand side. When the Japanese money supply is increased, the money supplies in all the other countries are held unchanged. When Japanese government spending increases, the money supplies in all 7 countries, including Japan, are held unchanged.

In Regime II, only the money supply in Japan is treated as exogenous. The money supplies in the other 6 countries are made endogenous and evolve according to the money demand equations in those 6 countries. Replacing the 6 money supplies as exogenous variables are the 6 bilateral exchange rates, which are now exogenous and fixed. Hence, the ex ante interest rate parity equations now simply state that the short-term interest rates in each of the 6 countries are equal to the Japanese call money rate.

In Regime III, the Japanese money supply also becomes an exogenous variable. A new variable, "world money" which is a weighted average of money in all 7 countries is now exogenous. The Japanese money supply is determined by the equation that describes this weighted average. The call money rate continues to be determined by the inverted Japanese money demand equation.

IV. The Results

For each of the three regimes we have changes in two policy instruments, money M and government spending G. This makes a total of six experiments. However, as the Japanese money supply is not exogenous in Regime III (where a weighted average of money growth is constant), it makes no sense to increase Japanese money under that regime. Hence, there are effectively 5 experiments. The results of these experiments are reported in the Figures and Tables attached at the end of the paper. All the results are reported in terms of percent deviation from the historical value. To aid in reading these Figures and Tables, the following diagram may be helpful:

Summary of Figures and Tables on Results of Simulations

Regime	Instrument Changed	Figure Number	Table Number
I	M	1	1
I	G	2	2
II	M	3	3
II	G	4	4
III	G	5	5

Regime I: Effects of Monetary Expansion.

Under the flexible exchange rate regime, monetary policy has a positive effect on real output. Real GNP rises by about 1 percent and after 5 quarters begins to fall again, toward the original position. Note that real GNP overshoots before returning to the baseline. In the meantime, prices gradually rise. The money expansion causes the yen to fall. The 2 percent depreciation is the long-run effect because the money supply increases

by 2 percent. Both short-term and long-term interest rates fall, with the short rate falling by more than the long rate.

There are conflicting effects of a monetary expansion on the current account. The expansion of real income increases imports, but the depreciation of the yen tends to decrease imports and increase exports. Theoretically, the net effect on real net exports and the current account is indeterminate. In this model the 2 percent increase in the level of the money supply leads to a reduction in the current account surplus by less than 0.1 percent of GNP. Real net exports are reduced by 0.18 percent as a fraction of real GNP. Note that in Regime I the expansionary monetary policy has a very small effect on the rest of the world. Effectively, the flexible exchange rate insulates the rest of the world from this Japanese monetary policy change.

Regime I: Effect of Fiscal Expansion.

With flexible exchange rates, the fiscal policy shock in Japan has about the same peak effect on Japanese real GNP as the monetary shock. The effect occurs sooner, however. In this case, of course, interest rates and the exchange rate rise. The appreciation of the exchange rate is quite large, about 5 percent. The government spending increase has a much larger effect on the current account than the monetary expansion, even though the effects on output and inflation are similar. This is because the exchange rate and real income both move to reduce the current account. There is a "J-curve" effect with nominal net exports first rising a bit before they begin to drop. Note that real net exports eventually fall by about 80 percent of the amount that government spending increases.

The fiscal expansion has a larger effect abroad than the monetary expansion, but the effect is still comparatively small. The effect on U.S. real output is positive, but only about 0.05 percent at the peak.

Regime II: Effect of a Monetary Expansion.

When exchange rates are fixed, the effects on output, prices and interest rates of a monetary expansion in Japan are not much different than with flexible exchange rates. The Japanese current account, however, behaves differently and in fact improves slightly for two years before deteriorating. This may seem surprising because with exchange rates fixed there is no depreciation of the yen. Such a depreciation tends to reduce imports and increase exports when exchange rates are flexible.

The big difference is the effect abroad. The other central banks in the world must adjust their monetary policy to keep exchange rates fixed in the face of a Japanese monetary expansion. This forces them to expand their own monetary policies. This expansion can be quite large and generally depends on the interest rate elasticities in each country. The impact on Germany is now comparable to the impact on Japan; output increases by about 1 percent. The impact on the U.S. is about half as great but still very

large compared to the flexible case. Because the other countries are also expanding with Japan, the overall effect on the current account can possibly be positive, and in fact, the effect is positive for a while, though very small.

Regime II: Effect of Fiscal Expansion.

The fiscal expansion has about the same effects on output in Japan as in the case of flexible exchange rates. In this case, however, the current account deteriorates by more than in Regime I, especially in the first few years after the expansion. Again this may seem surprising because unlike the case of flexible exchange rates, the yen does not appreciate. But again the big difference is the behavior of the other economies.

The other central banks must adjust their monetary policies in order to keep exchange rates fixed in the face of the Japanese fiscal expansion. Because of the rise in short-term interest rates in Japan, the other central banks must tighten their monetary policies in order that short-term interest rates in those countries increase as well. This tightening of monetary policy abroad causes the other economies to go into recession. Because they thereby import less, exports from Japan fall and the Japanese current account deteriorates more than when exchange rates are flexible.

Real GNP in the U.S. falls by over 2 percent; this fall is larger than the rise in real GNP in Japan. The negative output effect in Germany is even larger than in the U.S.

Regime III: Effect of a Fiscal Expansion.

Consider finally what happens when the Bank of Japan takes on some of the job of keeping exchange rates fixed. Here a particular average of money in different countries is exogenous, and Japanese monetary policy becomes endogenous along with the other countries. Note, however, that with a weight of 0.8 on Japanese money, this regime is still close to Regime II where the weight is 1.0.

Compared to the fixed exchange rate system in Regime II, the impact of the fiscal expansion is larger in Japan. Real GNP in Japan increases by about twice the amount in Regime II. Moreover, output in the other countries does not fall by as much as in Regime II, though the effects are still large.

The reason for these differences between Regime II and Regime III is fairly easy to explain intuitively. Because the Bank of Japan now shares in maintaining fixed exchange rates, the money supply in Japan must increase as Japanese fiscal policy expands. The expansionary fiscal policy tends to push up interest rates. In order to keep interest rates equal in all countries, the Bank of Japan expands, thereby taking off some of the pressure on the other central banks to contract. This implied monetary expansion in Japan leads to a larger increase in Japanese output and prices. The larger expansion is matched by a smaller contraction in the other economies. These effects could be made larger by shifting more of the weight in the weighted average of money to Japan.

The overall effect of the fiscal expansion on the current account is about the same

under Regimes II and III. The main difference in the regimes is that the Japanese economy expands more under Regime III and the other economies contract less. Economic activity in the world as a whole is higher in Regime III, at least until the effect of the policy changes wear off, and both exports and imports are higher. Net exports and the current account are about the same.

V. Policy Implications and Concluding Remarks

1. General Policy Implications

Two general implications about the relation between Japanese macroeconomic policy and the current account emerge from these numerical calculations.

First, **for all exchange rate regimes, monetary policy has a much smaller impact on the current account than fiscal policy**, in the sense that among policy changes that result in the same impact on real GNP, expansionary monetary policy reduces the current account surplus by much less than fiscal policy. However, the reasons differ from regime to regime. With the flexible exchange rate regime, monetary policy is less effective on the current account than fiscal policy, because the yen depreciates with a monetary expansion and appreciates with a fiscal expansion. With stable exchange rates, the behavior of the rest of the world makes all the difference. An expansionary Japanese monetary policy leads to an expansion in the rest of the world with fixed exchange rates, and this diminishes the reduction in the current account surplus. An expansionary fiscal policy with fixed exchange rates leads either to a large contraction in the rest of the world (Regime II), or an extra large expansion in Japan (Regime III); both tend to reduce net exports.

Second, **the effect of an expansionary fiscal policy on the current account is larger when exchange rates are fixed than when exchange rates are flexible**. This difference may also seem surprising in that the appreciation of the exchange rate is supposed to help to reduce the current account surplus. The reason for the result is that a fixed exchange rate system induces a monetary reaction to the fiscal expansion. Under Regime II, the fiscal expansion in Japan causes the other central banks to contract. Under Regime III, the other central banks contract and the Bank of Japan expands. These monetary reactions under fixed exchange rates tend to reduce the current account by more than the change in the exchange rate does under flexible exchange rates.

2. Current Policy Implications

Are there any implications of these results for monetary and fiscal policy in Japan as of the late 1980s? For the sake of discussion let us take as given the consensus, as exemplified in the new and original Maekawa reports, that the current account surplus in Japan should be reduced. According to the results presented above, regardless of exchange rate regimes, the most effective macroeconomic policy in Japan for reducing the current account surplus is an expansionary fiscal policy. If this fiscal policy is matched by

a monetary policy regime that keeps the yen exchange rate from appreciating, then the effect on the current account will be larger than if exchange rates fluctuate. There now seems to be a wide consensus that a fiscal expansion is appropriate. The main issue of debate is what monetary policy to use to prevent the yen from appreciating as fiscal policy is expanded, if exchange rate stabilization is desired.

A maintained assumption of this study is that sterilized foreign exchange market intervention will have no sustained effect on the value of the yen, and that the only way to avoid an appreciation induced by the expansionary fiscal policy is monetary policy. This appreciation could be prevented using either the approach of Regime II, in which the Fed and the other central banks contract by a large amount and the Bank of Japan maintains its basic monetary stance, or by the approach of Regime III, in which the Bank of Japan expands a bit and the Fed and other banks contract by a slightly smaller amount. Both approaches would have about the same impact on the current account according to this study. The choice, therefore, seems to depend on output and inflation conditions in each country. Under conditions in the late 1980s, a Regime III approach seems more attractive, because it would mitigate any contraction in the rest of the world. To be sure, this advantage needs to be weighed against the possible disadvantage that the expansion in Japan might be too large.

Underlying, and perhaps even driving, this analysis of the current account is the behavior of the key macroeconomic variables: output and inflation. As was shown above, the three regimes studied here have large effects on the behavior of output and inflation. In choosing between these regimes, the effect on these variables should be given at least as large a consideration as the effect on the current account.

Finally, it should be emphasized that we have by no means exhausted all possible international monetary regimes in this investigation. Regime II, a yen standard, is one that to my knowledge has not been considered before. It would be useful to compare it to a dollar standard, as seemed to exist under Bretton Woods, or perhaps to a yen-dollar-mark standard. Moreover, it is possible that some feedback from the state of the economy to the policy instruments would improve performance. At the least, the above analysis has demonstrated the practical feasibility of a structural rational expectations approach to these and other monetary and fiscal policy problems.

Table 1. Effects of Japanese Monetary Expansion under Flexible Exchange Rate Regime I – 1982-1987

The counterfactual increase in money supply is 2 percent, phased-in gradually in equal percentage increments each quarter from 1982 I to 1983 I. Although the model is quarterly, only the first quarter of each year is reported. Figures are in percent difference from historical values (or percentage point difference for interest rates and ratios).

		1982 I	83 I	84 I	85 I	86 I	87 I
Short-term Rates	Japan-Call Money	−0.68	−0.64	0.57	0.70	0.43	−0.01
	U.S.-Fed Funds	0.01	0.02	0.03	0.01	0.00	−0.01
	Germany-Call Money	0.01	0.05	0.06	0.03	−0.01	−0.04
Exchange Rates	Yen	−1.54	−0.91	−1.01	−1.65	−2.23	−2.47
	D-Mark	0.03	0.02	−0.02	−0.05	−0.05	−0.03
Long-term Rates	Japan-Government Bonds	−0.46	0.14	0.62	0.52	0.17	−0.19
	U.S.-Government Bonds	0.02	0.02	0.02	0.01	−0.00	−0.01
	Germany-Government Bonds	0.02	0.05	0.05	0.01	−0.02	−0.04
Real Spending	Japan Consumption	0.30	0.73	0.51	0.04	−0.35	−0.46
	Japan Investment	0.72	3.32	3.16	1.58	−0.13	−1.25
	U.S. Investment	0.02	0.06	0.03	−0.01	−0.03	−0.05
	German Investment	−0.02	−0.06	−0.13	−0.16	−0.12	−0.03
	Japan Exports	0.06	0.27	0.10	−0.17	−0.32	−0.29
	Japan Imports	−0.03	0.15	0.64	0.89	0.77	0.38
	Japan Real GNP	0.35	1.16	0.90	0.22	−0.40	−0.66
	U.S. Real GNP	0.01	0.03	0.03	0.02	0.00	−0.01
	German Real GNP	0.01	0.07	0.06	0.01	−0.03	−0.05
Prices	Japan GNP Deflator	0.02	0.72	1.80	2.70	2.98	2.66
	U.S. GNP Deflator	0.00	0.01	0.03	0.04	0.03	0.02
	German GNP Deflator	0.00	0.01	0.03	0.04	0.03	0.01
	Japan Import Price	0.86	1.04	0.99	1.57	2.19	2.50
	Japan Export Price	0.53	0.80	1.38	2.17	2.63	2.62
Ratio to Real GNP	Japan Real National Saving	0.09	0.46	0.38	0.14	−0.10	−0.23
	Japan Real Investment	0.08	0.46	0.49	0.31	0.06	−0.14
	Japan Real Net Exports	0.01	0.00	−0.11	−0.18	−0.15	−0.09
Ratio to GNP	Japan Net Exports	−0.04	−0.03	−0.05	−0.10	−0.08	−0.03

Table 2. Effects of Japanese Fiscal Expansion under Flexible Exchange Rate Regime I – 1982-1987

The counterfactual increase in real government purchases is equal to 1 percent of real GNP. Although the model is quarterly, only the first quarter of each year is reported. Figures are in percent difference from historical values (or percentage point difference for interest rates and ratios).

		1982 I	83 I	84 I	85 I	86 I	87 I
Short-term Rates	Japan-Call Money	0.27	0.51	0.65	0.56	0.34	0.10
	U.S.-Fed Funds	0.04	0.17	0.18	0.17	0.16	0.15
	Germany-Call Money	0.05	0.18	0.18	0.15	0.12	0.09
Exchange Rates	Yen	5.03	4.75	4.31	3.83	3.50	3.41
	D-Mark	−0.15	−0.16	−0.16	−0.16	−0.13	−0.08
Long-term Rates	Japan-Government Bonds	0.41	0.59	0.59	0.42	0.20	0.06
	U.S.-Government Bonds	0.12	0.18	0.18	0.16	0.15	0.15
	Germany-Government Bonds	0.11	0.18	0.17	0.13	0.11	0.09
Real Spending	Japan Consumption	0.22	0.43	0.18	−0.11	−0.27	−0.24
	Japan Investment	−1.11	0.31	−0.01	−0.88	−1.64	−1.91
	U.S. Investment	0.08	0.04	−0.07	−0.18	−0.24	−0.31
	German Investment	0.10	−0.21	−0.45	−0.61	−0.69	−0.71
	Japan Exports	−0.13	−0.95	−1.45	−1.70	−1.76	−1.70
	Japan Imports	0.31	1.83	2.80	3.19	3.19	3.01
	Japan Real GNP	0.81	0.90	0.41	−0.08	−0.31	−0.36
	U.S. Real GNP	0.03	0.07	0.07	0.05	0.04	0.03
	German Real GNP	0.08	0.15	0.10	0.02	−0.02	−0.03
Prices	Japan GNP Deflator	0.02	0.25	0.70	0.98	0.92	0.63
	U.S. GNP Deflator	0.01	0.12	0.24	0.33	0.40	0.46
	German GNP Deflator	0.00	0.12	0.21	0.26	0.27	0.26
	Japan Import Price	−2.63	−4.38	−3.96	−3.42	−3.02	−2.85
	Japan Export Price	−1.58	−1.93	−1.46	−1.05	−0.88	−0.96
Ratios to Real GNP	Japan Real National Saving	−0.50	−0.55	−0.79	−1.00	−1.08	−1.14
	Japan Real Investment	−0.43	−0.12	−0.09	−0.19	−0.31	−0.36
	Japan Real Net Exports	−0.08	−0.43	−0.70	−0.81	−0.77	−0.78
Ratio to GNP	Japan Net Exports	0.08	−0.09	−0.32	−0.46	−0.43	−0.39

Table 3. Effects of Japanese Monetary Expansion under Fixed Exchange Rate Regime II – 1982-1987

The counterfactual increase in money supply is 2 percent, phase-in gradually in equal percentage increments each quarter from 1982 I to 1983 I. Although the model is quarterly, only the first quarter of each year is reported. Figures are in percent difference from historical values (or percentage point difference for interest rates and ratios).

		1982 I	83 I	84 I	85 I	86 I	87 I
Short-term Rates	Japan-Call Money	–0.68	–0.63	0.62	0.72	0.41	–0.03
	U.S.-Fed Funds	–0.68	–0.63	0.62	0.72	0.41	–0.03
	Germany-Call Money	–0.68	–0.63	0.62	0.72	0.41	–0.03
Long-term Rates	Japan-Government Bonds	–0.46	0.17	0.65	0.52	0.15	–0.19
	U.S.-Government Bonds	–0.45	0.18	0.65	0.51	0.14	–0.19
	Germany-Government Bonds	–0.54	0.04	0.66	0.58	0.21	–0.16
Real Spending	Japan Consumption	0.31	0.77	0.53	0.02	–0.37	–0.45
	Japan Investment	0.69	3.34	3.23	1.58	–0.20	–1.30
	U.S. Investment	1.89	2.63	–0.15	–0.22	0.75	1.74
	German Investment	2.87	4.39	0.84	–0.35	0.20	1.28
	Japan Exports	0.17	0.84	0.56	–0.01	–0.24	–0.04
	Japan Imports	0.04	0.47	0.95	1.19	1.09	0.75
	Japan Real GNP	0.36	1.23	0.96	0.19	–0.46	–0.68
	U.S. Real GNP	0.33	0.42	0.02	0.01	0.20	0.36
	German Real GNP	0.63	1.10	0.36	0.01	0.12	0.36
Prices	Japan GNP Deflator	0.03	0.68	1.82	2.74	3.00	2.64
	U.S. GNP Deflator	0.04	0.45	0.90	1.30	1.67	1.94
	German GNP Deflator	0.04	0.49	1.07	1.57	1.95	2.21
	Japan Import Price	0.02	0.33	0.81	1.24	1.60	1.88
	Japan Export Price	0.02	0.50	1.32	2.03	2.36	2.33
Ratios to Real GNP	Japan Real National Saving	0.09	0.49	0.42	0.13	–0.13	–0.25
	Japan Real Investment	0.07	0.44	0.49	0.32	0.06	–0.15
	Japan Real Net Exports	0.02	0.05	–0.07	–0.19	–0.18	–0.10
Ratio to GNP	Japan Net Exports	0.02	0.07	–0.01	–0.09	–0.08	–0.01

Table 4. Effects of Japanese Fiscal Expansion under Fixed Exchange Rate Regime II – 1982-1987

The counterfactual increase in real government purchases is equal to 1 percent of real GNP. Although the model is quarterly, only the first quarter of each year is reported. Figures are in percent difference from historical values (or percentage point difference for interest rates and ratios).

		1982 I	83 I	84 I	85 I	86 I	87 I
Short-term Rates	Japan-Call Money	0.24	0.35	0.14	-0.10	-0.12	0.05
	U.S.-Fed Funds	0.24	0.35	0.14	-0.10	-0.12	0.05
	Germany-Call Money	0.24	0.35	0.14	-0.10	-0.12	0.05
Long-term Rates	Japan-Government Bonds	0.30	0.23	0.01	-0.10	-0.02	0.19
	U.S.-Government Bonds	0.30	0.23	0.00	-0.10	-0.01	0.20
	Germany-Government Bonds	0.30	0.27	0.03	-0.11	-0.05	0.16
Real Spending	Japan Consumption	0.15	0.15	-0.10	-0.16	-0.02	0.14
	Japan Investment	-1.03	0.21	-0.15	-0.54	-0.44	-0.12
	U.S. Investment	-5.28	-12.90	-6.55	-4.07	-2.28	-1.78
	German Investment	-5.91	-14.90	-11.40	-5.22	-0.02	2.63
	Japan Exports	-0.42	-3.04	-4.59	-4.54	-3.58	-2.51
	Japan Imports	0.09	0.57	1.14	1.72	2.29	2.74
	Japan Real GNP	0.77	0.56	-0.10	-0.35	-0.12	0.14
	U.S. Real GNP	-1.02	-2.30	-1.65	-1.04	-0.59	-0.36
	German Real GNP	-1.44	-3.90	-3.32	-1.53	0.07	0.85
Prices	Japan GNP Deflator	0.01	0.21	0.30	0.15	-0.04	-0.04
	U.S. GNP Deflator	-0.14	-1.58	-2.93	-3.69	-4.01	-4.04
	German GNP Deflator	-0.12	-1.62	-3.52	-4.68	-4.89	-4.43
	Japan Import Price	-0.06	-1.17	-2.77	-3.90	-4.30	-4.14
	Japan Export Price	-0.03	-0.50	-1.20	-1.77	-2.02	-1.93
Ratios to Real GNP	Japan Real National Saving	-0.49	-0.66	-1.02	-1.17	-1.08	-0.97
	Japan Real Investment	-0.40	-0.07	-0.01	-0.04	-0.07	-0.06
	Japan Real Net Exports	-0.09	-0.58	-1.01	-1.13	-1.00	-0.91
Ratio to GNP	Japan Net Exports	-0.09	-0.46	-0.71	-0.77	-0.61	-0.49

Table 5. Effects of Japanese Fiscal Expansion under Fixed Exchange Rate Regime III – 1982-1987

The counterfactual increase in real government purchases is equal to 1 percent of real GNP. Although the model is quarterly, only the first quarter of each year is reported. Figures are in percent difference from historical values (or percentage point difference for interest rates and ratios).

		1982 I	83 I	84 I	85 I	86 I	87 I
Short-term Rates	Japan-Call Money	0.14	0.30	0.34	0.23	0.09	0.00
	U.S.-Fed Funds	0.14	0.30	0.34	0.23	0.09	0.00
	Germany-Call Money	0.14	0.30	0.34	0.23	0.09	0.00
Long-term Rates	Japan-Government Bonds	0.25	0.33	0.27	0.14	0.04	0.04
	U.S.-Government Bonds	0.25	0.33	0.27	0.14	0.04	0.04
	Germany-Government Bonds	0.23	0.33	0.29	0.16	0.04	0.03
Real Spending	Japan Consumption	0.32	0.63	0.28	−0.14	−0.33	−0.26
	Japan Investment	−0.77	1.97	1.99	0.61	−0.71	−1.42
	U.S. Investment	−4.47	−11.40	−6.17	−3.89	−1.75	−0.70
	German Investment	−4.88	−12.80	−10.50	−5.24	−0.11	3.03
	Japan Exports	−0.35	−2.62	−4.17	−4.39	−3.63	−2.52
	Japan Imports	0.11	0.82	1.71	2.47	2.95	3.11
	Japan Real GNP	0.93	1.24	0.57	−0.16	−0.46	−0.44
	U.S. Real GNP	−0.88	−2.03	−1.52	−0.95	−0.43	−0.12
	German Real GNP	−1.19	−3.32	−2.97	−1.44	0.11	0.97
Prices	Japan GNP Deflator	0.02	0.61	1.39	1.79	1.67	1.28
	U.S. GNP Deflator	−0.11	−1.31	−2.40	−2.96	−3.11	−3.05
	German GNP Deflator	−0.10	−1.35	−2.92	−3.84	−3.90	−3.38
	Japan Import Price	−0.05	−0.96	−2.27	−3.16	−3.40	−3.15
	Japan Export Price	−0.02	−0.21	−0.41	−0.56	−0.68	−0.73
Ratios to Real GNP	Japan Real National Saving	−0.46	−0.41	−0.73	−1.04	−1.15	−1.18
	Japan Real Investment	−0.38	0.15	0.31	0.18	−0.06	−0.23
	Japan Real Net Exports	−0.08	−0.56	−1.03	−1.22	−1.09	−0.95
Ratio to GNP	Japan Net Exports	−0.08	−0.43	−0.70	−0.80	−0.64	−0.48

Figure 1. Monetary Expansion in Regime 1

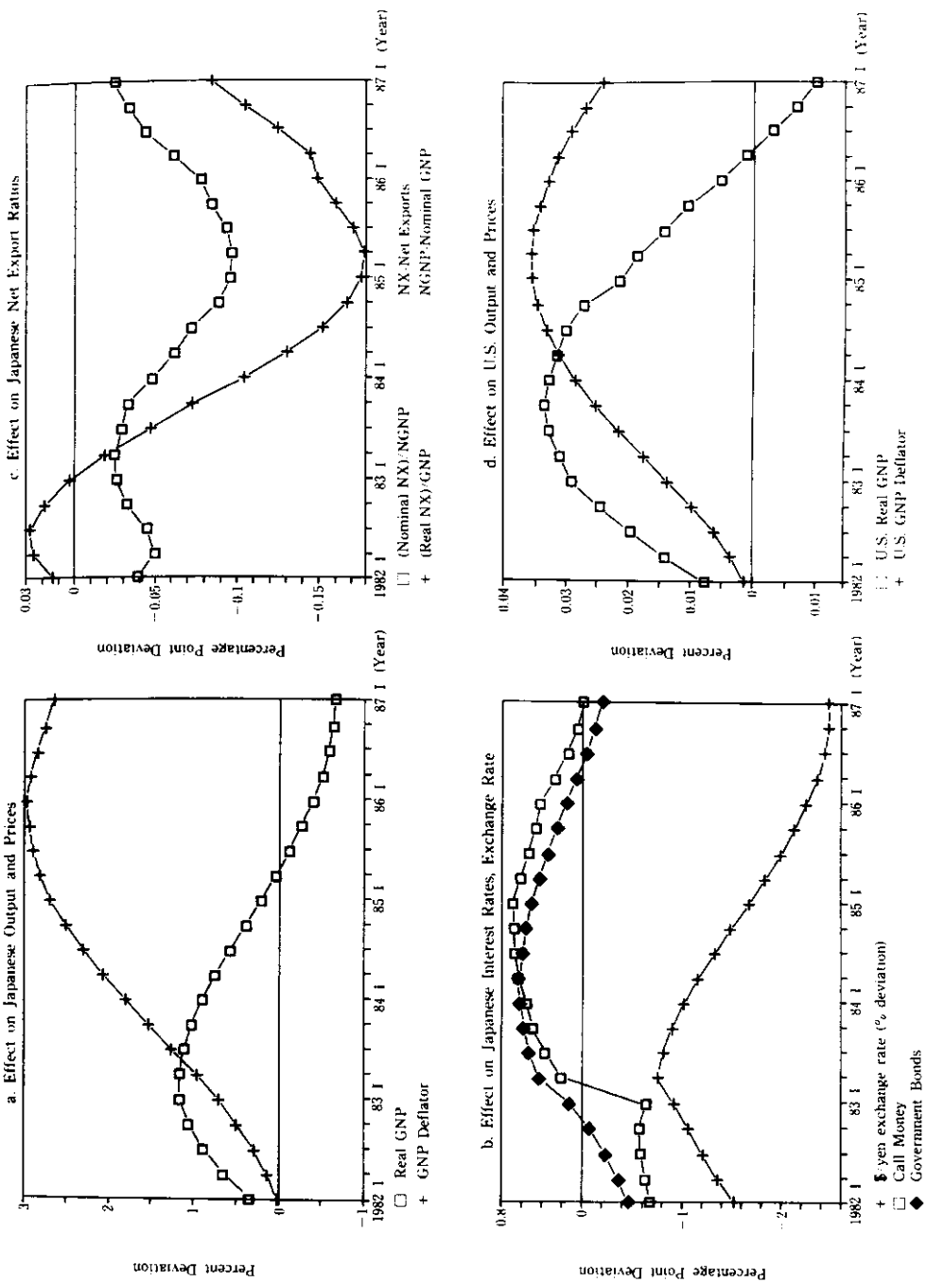


Figure 2. Fiscal Expansion in Regime I

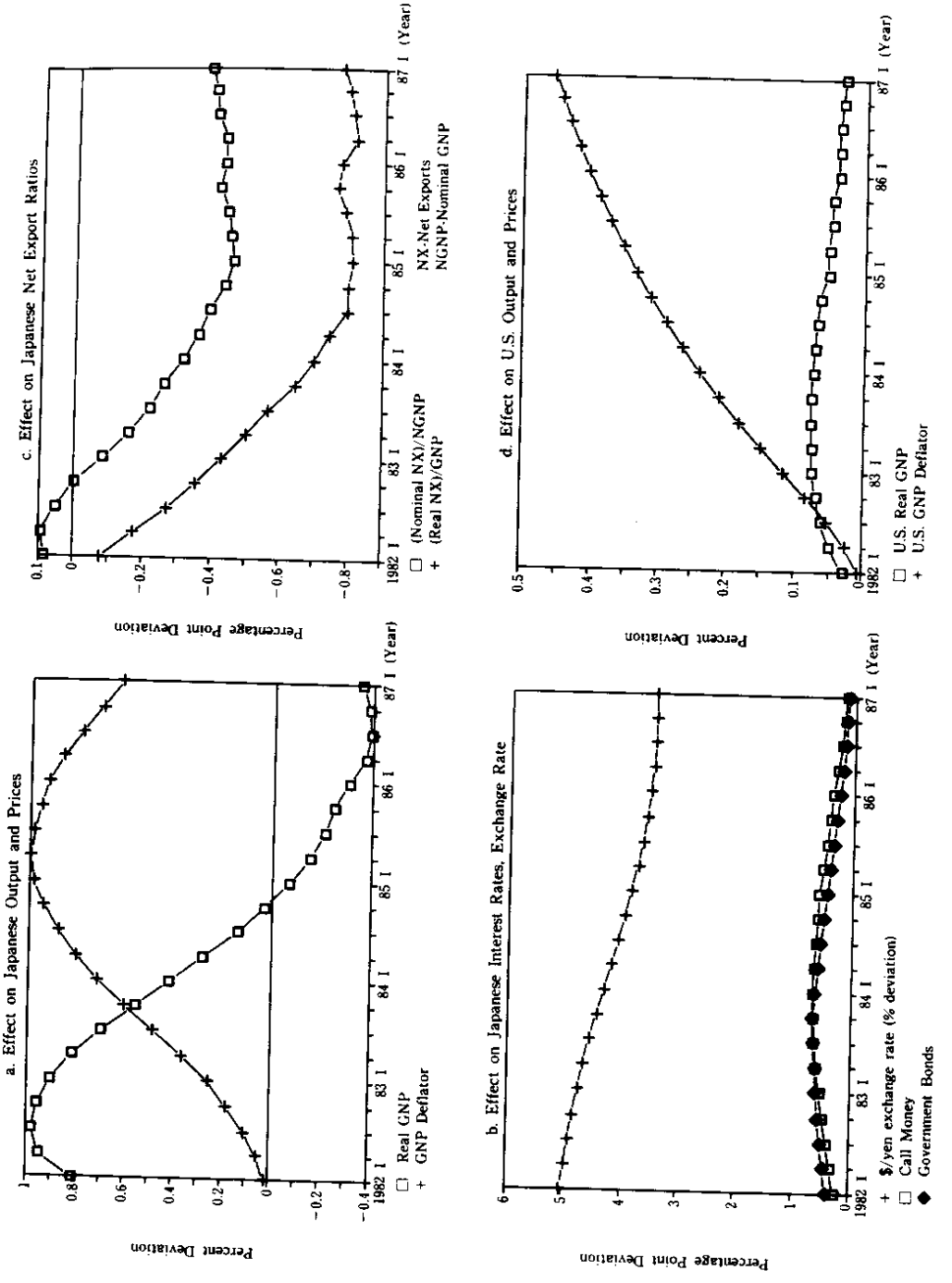


Figure 3. Monetary Expansion in Regime II

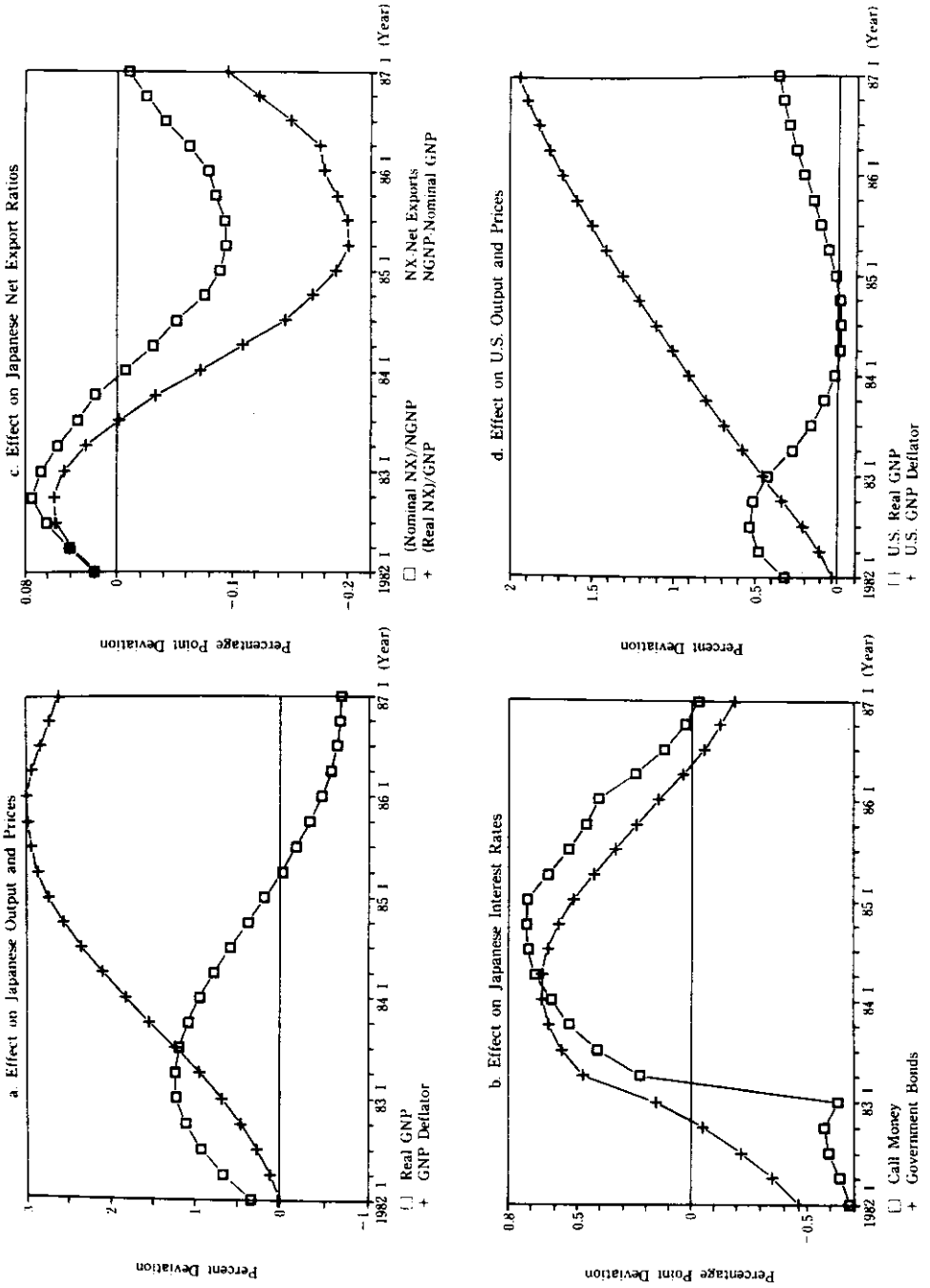


Figure 4. Fiscal Expansion in Regime II

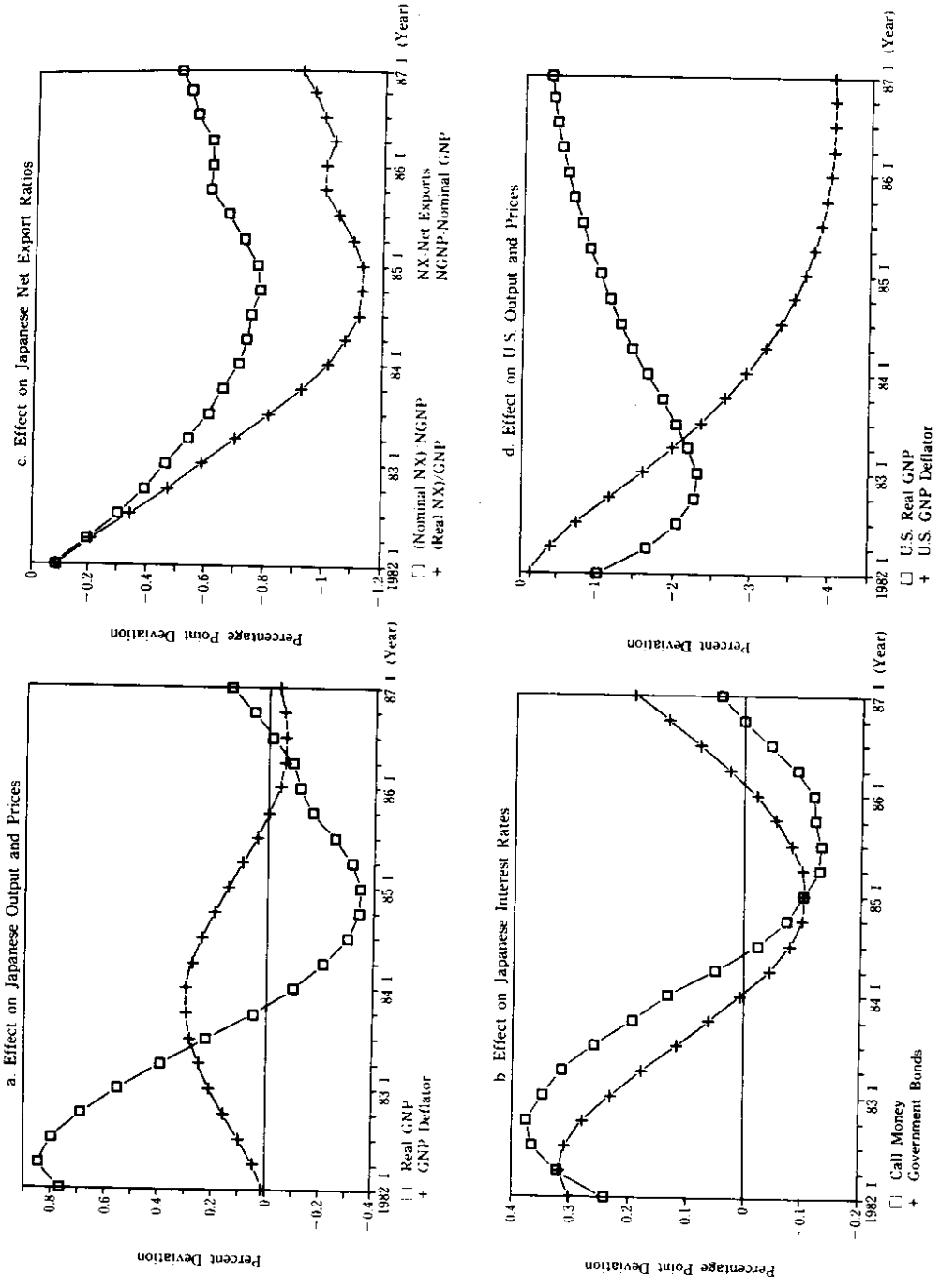
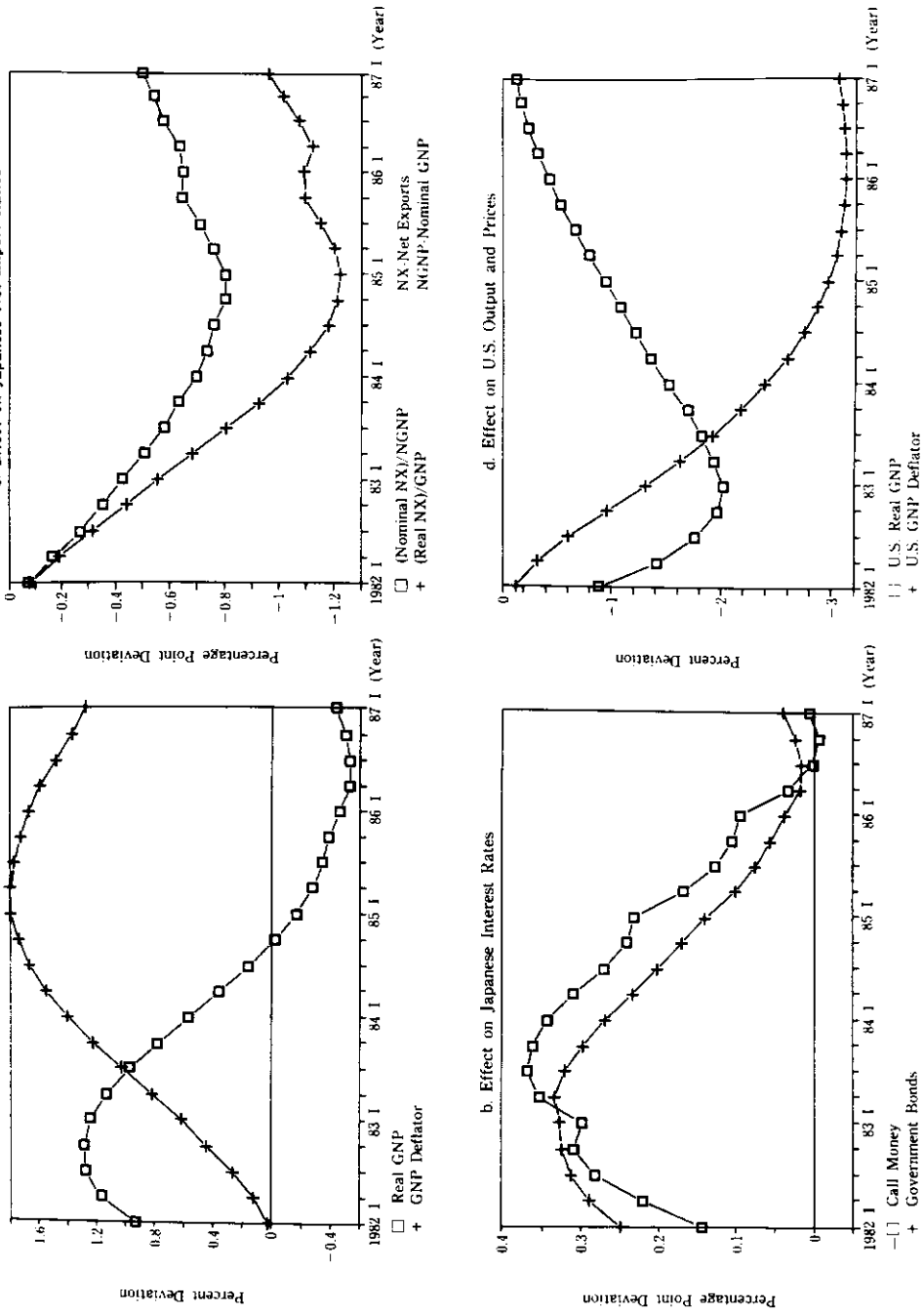


Figure 5. Fiscal Expansion in Regime III



Appendix

Table A1. Notation and Definition of Model Variables

a. Variable Name Conventions
   (1) An "L" at the beginning of a variable name indicates the logarithm.
   (2) The numerical subscript indicates the country:
      0 = U.S.
      1 = Canada
      2 = France
      3 = Germany
      4 = Italy
      5 = Japan
      6 = U.K.
   (3) Lags are indicated by a negative number in parentheses.
   (4) Leads are indicated by a positive number in parentheses.

b. Financial Variables
   RS : short-term interest rate measured as a fraction, that is, 0.06 is 6 percent. (U.S.: Fed Funds, Canada: call money, France: call money, Germany: call money, Italy: 6-month T-bills, Japan: call money, UK: call money)
   RL : long-term (Lt) interest rate (U.S.: Lt-Government (10 year composite), Canada: Lt-Government, France: Lt-Government guarantee, Germany: Lt-Government, Italy: Lt-Government, Japan: Lt-Government, U.K.: Lt-Government)
   RRL : real interest rate—RL less expected growth of GNP deflator over next four quarters (scaled by the trend in income growth)
   Ei : exchange rates U.S. cents per unit of each currency)
      E1: Canada/dollar,
      E2: France/franc,
      E3: Germany/deutsche mark,
      E4: Italy/lira,
      E5: Japan/yen,
      E6: U.K./pound.
   M : money supply (billions of local currency, M1 definition)

c. Real GNP (or GDP) and Spending Components
   Billions of local currency units; base years are as follows: US: 1982, Canada: 1981, France: 1970, Germany: 1980, Italy: 1970, Japan: 1980, U.K.: 1980. The output measure is GNP for the U.S., Canada, Germany, and Japan; GDP for France, Italy

and the U.K.

Y : real GNP (or GDP)
C : consumption (total)
CD : durable consumption
CS : services consumption
CN : non-durables consumption
INS : non-residential structures investment
INE : non-residential equipment investment
IR : residential investment
II : inventory investment
IF : fixed investment (total)
IN : non-residential investment (total)
IR : residential investment (total)
EX : exports in income-expenditure identity
IM : imports in income-expenditure identity
G : government purchases of goods and services

d. Variables relating to GNP and its Expenditure Components

YP : permanent income, a geometric distributed lead of Y over 8 future quarters with a decay factor of 0.9
YW : weighted foreign output (of other six countries)
YT : trend or potential output
T : time trend (T=1 in 1971 I)
YG : percentage gap between real GNP and trend GNP (defined as YG=LY-LYT and coded as a fraction)

e. Wages and Prices

W : average wage rate
U.S.: average hourly earnings index, adjusted for overtime and interindustry shifts, nonfarm, 1977=1;
Canada: hourly earnings, manufacturing, 1980=1;
France: hourly rates, manufacturing, 1980=1;
Germany: hourly earnings, industry, 1980=1;
Italy: hourly rates, industry, 1980=1;
Japan: average monthly contractural cash earnings, 1980=1;
UK: average monthly earnings, all industries, 1980=1
X : "contract" wage rate (constructed from average wage index)
P : GNP (or GDP) deflator (see above GNP for base year)
PIM : import price deflator (see above GNP base year)
PEX : export price deflator (see above GNP base year)

PW : trade weighted foreign price (foreign currency units)
EW : trade weighted exchange rate (foreign currency/domestic currency)
FP : trade weighted foreign price (domestic currency units)

Table A2. Listing of the Model Equations

This table shows the functional form of the estimated equations and identities. The numerical values of the estimated coefficients and their statistical properties are shown in Table A3. The notation and variable definitions are found in Table A1.

a. Money Demand

$$L(M_i/P_i) = a_{i0}+a_{i1}L(M_i(-1)/P_i(-1))+a_{i2}RS_i+a_{i3}LY_i,$$
$$i = 0, 1, \ldots, 6$$

b. Ex Ante Interest Rate Parity

$$LE_i = LE_i(+1)+.25*(RS_i-RS), \quad i = 1, \ldots,6$$

c. Term Structure Relations

$$RL_i = b_{i0}+(1-b_i)/(1-b_i^9)\Sigma_{s=0}b_i^sRS_i(+s), \quad i = 0, 1, \ldots, 6$$

d. Consumption Demand

Consumption is disaggregated by durables, nondurables, and services in the U.S., Canada, France, Japan, and Italy. Only an aggregate consumption equation is estimated for Germany and Italy. The general form for all the consumption equations is:

$$CX_i = c_{i0}+c_{i1}CX_i(-1)+c_{i2}YP_i+c_{i3}RRL_i$$

where $CX_i = \begin{matrix} CD_i \\ CN_i \\ CS_i \end{matrix}$ for U.S., Canada, France, Japan, U.K.,

and $CX_i = C_i$ for Germany and Italy.

e. Fixed Investment Demand

Fixed investment expenditures are disaggregated into nonresidential equipment, nonresidential structures, and residential structures in the U.S., and into total nonresidential, and residential in France, Japan, and the U.K. Only total aggregate fixed investment is estimated for Canada, Germany and Italy. The general form for all the fixed investment equations is as follows:

$$IX_i = d_{i0}+d_{i1}IX_i(-1)+d_{i2}YP_i+d_{i3}RRL_i$$

where $IX_i = \begin{matrix} INE_0 \\ INS_0 \\ IR_0 \end{matrix}$ in the U.S. (i = 0),

$$IX_i = \frac{IN_i}{IR_i} \quad \text{in France, Japan and the U.K.,}$$

and $IX_i = IF_i$ in Canada, Germany and Italy.

f. Inventory Investment

$$II_i = e_{i0}+e_{i1}II_i(-1)+e_{i2}Y_i+e_{i3}Y_i(-1)+e_{i4}RRL_i \qquad i = 0, 1, \ldots, 6$$

g. Real Exports

$$LEX_i = f_{i0}+f_{i1}LEX_i(-1)+f_{i2}(LPEX_i-LPIM_i)+f_{i3}LYW_i \qquad i = 0, 1, \ldots, 6$$

h. Real Imports

$$LIM_i = g_{i0}+g_{i1}LIM_i(-1)+g_{i2}(LPIM_i-LP_i)+g_{i3}LY_i \qquad i = 0, 1, \ldots, 6$$

i. Income-Expenditure Identities

$$\begin{aligned}
Y_0 &= CD_0+CN_0+CS_0+INE_0+INS_0+IR_0+II_0+G_0+EX_0-IM_0\\
Y_1 &= CD_1+CN_1+CS_1+IF_1+II_1+G_1+EX_1-IM_1\\
Y_2 &= CD_2+CN_2+CS_2+IN_2+IR_2+II_2+G_2+EX_2-IM_2\\
Y_3 &= C_3+IF_3+II_3+G_3+EX_3-IM_3\\
Y_4 &= C_4+IF_4+II_4+G_4+EX_4-IM_4\\
Y_5 &= CD_5+CN_5+CS_5+IN_5+IR_5+II_5+G_5+EX_5-IM_5\\
Y_6 &= CD_6+CN_6+CS_6+INE_6+INS_6+IR_6+II_6+G_6+EX_6-IM_6
\end{aligned}$$

j. Wage Determination Equations

$$\begin{aligned}
LX_i &= \pi_{i0}LW_i+\pi_{i1}LW_i(+1)+\pi_{i2}LW_i(+2)+\pi_{i3}LW_i(+3)\\
&\quad +\alpha_i(\pi_{i0}YG_i+\pi_{i1}YG_i(+1)+\pi_{i2}YG_i(+2)+\pi_{i3}YG_i(+3))\\
&\quad i = 0, 1, \ldots, 6 \quad (\pi\text{-weights vary by quarter in Japan})
\end{aligned}$$

k. Aggregate Wage Identities

$$\begin{aligned}
LW_i &= \pi_{i0}LX_i+\pi_{i1}LX_i(-1)+\pi_{i2}LX_i(-2)+\pi_{i3}LX_i(-3)\\
&\quad i = 0, 1, \ldots, 6 \quad (\pi\text{-weights vary by quarter in Japan})
\end{aligned}$$

l. Aggregate Price Determination Equations

$$\begin{aligned}
LP_i &= h_{i0}+h_{i1}LP_i(-1)+h_{i2}LW_i+h_{i3}LPIM_i(-1)+h_{i4}YG_i+h_{i5}T+U_{pi}\\
U_{pi} &= \delta_{pi}U_{pi}(-1)+V_{pi}\\
i &= 0, 1, \ldots, 6
\end{aligned}$$

m. Import Price Equations

$$\begin{aligned}
LPIM_i &= k_{i0}+k_{i1}LPIM_i(-1)+k_{i2}LFP_i+U_{mi}\\
U_{mi} &= \delta_{mi}U_{mi}(-1)+V_{mi}\\
i &= 0, 1, \ldots, 6
\end{aligned}$$

n. Export Price Equations

$$LPEX_i = \beta_{i0}+\beta_{i1}LPEX_i(-1)+\beta_{i2}LP_i+\beta_{i3}LFP_i+\beta_{i4}T+U_{xi}$$
$$U_{xi} = \delta_{xi}U_{xi}(-1)+V_{xi}$$
$$i = 0, 1, \ldots, 6$$

o. Weighted Price of Other Six Countries (Foreign Currency Units)

$$LPW_0 = .09LP_1+.18LP_2+.26LP_3+.12LP_4+.19LP_5+.16LP_6$$
$$LPW_1 = .27LP_0+.14LP_2+.21LP_3+.10LP_4+.15LP_5+.13LP_6$$
$$LPW_2 = .29LP_0+.08LP_1+.23LP_3+.11LP_4+.16LP_5+.13LP_6$$
$$LPW_3 = .31LP_0+.08LP_1+.16LP_2+.12LP_4+.18LP_5+.15LP_6$$
$$LPW_4 = .27LP_0+.07LP_1+.15LP_2+.22LP_3+.16LP_5+.13LP_6$$
$$LPW_5 = .29LP_0+.08LP_1+.15LP_2+.23LP_3+.11LP_4+.14LP_6$$
$$LPW_6 = .28LP_0+.08LP_1+.15LP_2+.22LP_3+.11LP_4+.16LP_5$$

p. Weighted Exchange Rate (Foreign Currency/Domestic Currency)

$$LEW_0 = -.09LE_1-.18LE_2-.26LE_3-.12LE_4-.19LE_5-.16LE_6$$
$$LEW_1 = LE_1-.14LE_2-.21LE_3-.10LE_4-.15LE_5-.13LE_6$$
$$LEW_2 = -.08LE_1+LE_2-.23LE_3-.11LE_4-.16LE_5-.13LE_6$$
$$LEW_3 = -.08LE_1-.16LE_2+LE_3-.12LE_4-.18LE_5-.15LE_6$$
$$LEW_4 = -.07LE_1-.15LE_2-.22LE_3+LE_4-.16LE_5-.13LE_6$$
$$LEW_5 = -.08LE_1-.15LE_2-.23LE_3-.11LE_4+LE_5-.14LE_6$$
$$LEW_6 = -.08LE_1-.15LE_2-.22LE_3-.11LE_4-.16LE_5+LE_6$$

q. Weighted Price of Other Six Countries (Domestic Currency Units)

$$LEP_0 = LPW_0 - LEW_0$$
$$LEP_1 = LPW_1 - LEW_1$$
$$LEP_2 = LPW_2 - LEW_2$$
$$LEP_3 = LPW_3 - LEW_3$$
$$LEP_4 = LPW_4 - LEW_4$$
$$LEP_5 = LPW_5 - LEW_5$$
$$LEP_6 = LPW_6 - LEW_6$$

r. Weighted Output of Other Six Countries

$$LPW_0 = .09LY_1+.18LY_2+.26LY_3+.12LY_4+.19LY_5+.16LY_6$$
$$LPW_1 = .27LY_0+.14LY_2+.21LY_3+.10LY_4+.15LY_5+.13LY_6$$
$$LPW_2 = .29LY_0+.08LY_1+.23LY_3+.11LY_4+.16LY_5+.13LY_6$$
$$LPW_3 = .31LY_0+.08LY_1+.16LY_2+.12LY_4+.18LY_5+.15LY_6$$
$$LPW_4 = .27LY_0+.07LY_1+.15LY_2+.22LY_3+.16LY_5+.13LY_6$$
$$LPW_5 = .29LY_0+.08LY_1+.15LY_2+.23LY_3+.11LY_4+.14LY_6$$
$$LPW_6 = .28LY_0+.08LY_1+.15LY_2+.22LY_3+.11LY_4+.16LY_5$$

s. Trend Output Paths

		(annual % growth rate)
$LYT_0 =$	7.82 + .00602T	2.4
$LYT_1 =$	5.51 + .00795T	3.2
$LYT_2 =$	6.76 + .00607T	2.5

$LYT_3 = 7.07 + .00508T$ 2.0
$LYT_4 = 11.1 + .00557T$ 2.2
$LYT_5 = 12.0 + .01026T$ 4.2
$LYT_6 = 5.30 + .00373T$ 1.5

Table A3. Estimated Coefficients and Statistical Properties*

a. Money Demand

Dependent Variable: LMP
Estimation Method: 2SLS
Instruments: LM(-1), LM(-2), LP(-1), LP(-2), LY(-1), LY(-2), RS(-1), G

Country	Constant	LMP (-1)	RS	LY	SE	RSQ	DW	Sample
U.S.	−0.009 (0.413)	0.953 (0.036)	−0.224 (0.055)	0.040 (0.031)	0.009	0.98	1.6	1971 III 86 IV
Canada	0.060 (0.225)	0.937 (0.039)	−0.511 (0.106)	0.033 (0.026)	0.019	0.93	2.1	71 III 86 III
France	0.671 (0.544)	0.683 (0.116)	−0.316 (0.097)	0.167 (0.080)	0.010	0.87	1.7	78 III 86 II
Germany	−1.241 (0.497)	0.697 (0.090)	−0.646 (0.120)	0.403 (0.133)	0.020	0.98	2.5	71 III 86 III
Italy	0.289 (0.386)	0.895 (0.037)	−0.387 (0.068)	0.077 (0.030)	0.016	0.93	1.2	71 III 86 III
Japan	1.107 (0.194)	0.750 (0.059)	−0.479 (0.090)	0.139 (0.043)	0.016	0.99	1.8	71 III 86 III
U.K.	−0.778 (0.662)	0.916 (0.034)	−0.778 (0.173)	0.212 (0.116)	0.020	0.97	1.9	71 III 86 II

Note: TT (a linear treand starting in 1982 I) is included in the U.S. (.0012, (.0006)) and U.K. (.0023, (.0012)) equations.

*: Standard errors are reported in parentheses below estimated coefficients. Unless otherwise stated, a constant was included as an instrument in all equations estimated by 2SLS and GMM. The variables are defined as in Table A1 and the functional form of the equations are as in Table A2. In general the country subscript is omitted from the variables and the equations are listed by country. Other symbols are defined as follows:

SE = standard error of the residual where the residual is computed using the actual right hand side variables.
DW = Durbin Watson Statistics
GMM = Generalized Method of Moment (see Hansen 1982)
AR(1) = First order autoregressive error estimated by Cochrane-Orcutt iterative procedure.
RHO = Estimate first order autoregressive coefficient.

b. Term Structure

Dependent Variable: RL
Estimation Method: Nonlinear 2SLS
Instruments: RL(-1), RL(-2), RS(-1), RS(-2), LY(-1), LY(-2), LMP(-1), LMP(-2), G

Country	Constant	b	SE	RSQ	DW	Sample
U.S.	-0.005 (0.003)	0.753 (0.097)	0.023	0.47	0.1	1971 III 84 IV
Canada	0.011 (0.002)	0.464 (0.154)	0.017	0.78	0.4	71 III 84 IV
France	0.015 (0.002)	0.514 (0.087)	0.014	0.78	0.3	71 III 84 IV
Germany	0.015 (0.002)	0.641 (0.084)	0.018	0.49	0.2	71 III 84 IV
Italy	-0.006 (0.003)	-0.182 (0.512)	0.019	0.82	0.4	71 III 84 IV
Japan	0.004 (0.002)	0.738 (0.062)	0.016	0.37	0.2	71 III 84 IV
U.K.	0.023 (0.004)	0.895 (0.133)	0.029	0.01	0.1	71 III 84 IV

Note: The equation estimated is of the form
RL = A + [(1-b)/(1-b**9)]*[(RS+b*RS(+1) + . . . + (b**8)*RS(+8)].
The parameter b is set to zero for Italy in the model simulations.

c. Durables Consumption

Dependent Variable: CD
Estimation Method: GMM
Instruments: CD(-1), Y(-1), Y(-2), RL(-1), LP(-1), LP(-2), YT(-1), G

Country	Constant	CD(-1)	YP	RRL	SE	RSQ	DW	Sample
U.S.	-45.4 (23.7)	0.698 (0.072)	0.040 (0.013)	-29.3 (41.2)	8.37	0.95	1.8	1971 III 84 IV
Canada	-5.79 (1.56)	0.632 (0.054)	0.047 (0.008)	-7.53 (2.74)	0.79	0.97	2.1	71 III 84 III
France	-41.6 (5.9)	0.344 (0.077)	0.079 (0.010)	-34.5 (9.1)	1.51	0.98	1.4	71 III 80 IV
Japan	-4279 (459)	0.356 (0.065)	0.041 (0.004)	-4098 (636)	284.8	0.98	1.6	71 III 84 III
U.K.	-10.2 (3.5)	0.516 (0.118)	0.073 (0.021)		1.04	0.72	2.1	71 III 84 III

d. Nondurables Consumption

Dependent Variable: CN
Estimation Method: GMM
Instruments: CN(-1), Y(-1), Y(-2), RL(-1), LP(-1), LP(-2), YT(-1), G

Country	Constant	CN(-1)	YP	RRL	SE	RSQ	DW	Sample
U.S.	63.2 (8.4)	0.508 (0.055)	0.098 (0.012)	-24.8 (13.1)	4.66	0.99	1.4	1971 III 84 IV
Canada	3.19 (0.84)	0.899 (0.037)	0.015 (0.008)	-3.27 (2.24)	0.67	0.99	2.2	71 III 84 III
France	25.09 (4.66)	0.330 (0.091)	0.196 (0.028)		2.45	0.99	2.1	71 III 80 IV
Japan	5180 (1,019)	0.822 (0.043)	0.026 (0.007)		821.5	0.98	2.5	71 III 84 III
U.K.	3.44 (1.57)	0.666 (0.072)	0.090 (0.020)	-5.00 (2.00)	0.708	0.95	1.9	71 III 84 III

e. Services Consumption

Dependent Variable: CS
Estimation Method: GMM
Instruments: CS(-1), Y(-1), Y(-2), RL(-1), LP(-1), LP(-2), YT(-1), G

Country	Constant	CS(-1)	YP	SE	RSQ	DW	Sample
U.S.	-24.1 (4.4)	0.906 (0.011)	0.038 (0.005)	4.08	0.99	2.7	1971 III 84 IV
Canada	-1.2 (1.2)	0.912 (0.037)	0.026 (0.012)	0.449	0.99	2.2	71 III 84 III
France	-31.4 (4.9)	0.810 (0.026)	0.076 (0.010)	1.33	0.99	2.8	71 III 80 IV
Japan	-1725 (424)	0.692 (0.072)	0.093 (0.020)	809.3	0.99	2.4	71 III 84 III
U.K.	-2.8 (1.0)	0.913 (0.027)	0.032 (0.008)	0.433	0.99	1.8	71 III 84 III

f. Aggregate Consumption

Dependent Variable: C
Estimation Method: GMM
Instruments: C(-1), Y(-1), Y(-2), RL(-1), LP(-1), LP(-2), YT(-1), G

Country	Constant	C(-1)	YP	RRL	SE	RSQ	DW	Sample
Germany	-34.8 (14.7)	0.733 (0.057)	0.177 (0.039)	-95.0 (41.3)	9.19	0.98	2.5	1971 III 84 III
Italy	-388 (655)	0.877 (0.037)	0.085 (0.028)	-1204 (609)	260.3	0.99	1.1	71 III 84 III

g. Nonresidential Equipment Investment

Dependent Variable: INE
Estimation Method: GMM
Instruments: INE(-1), INE(-2), Y(-1), Y(-2), RL(-1), LP(-1), LP(-2), G

Country	Constant	INE(-1)	YP	RRL	SE	RSQ	DW	Sample
U.S.	-73.6 (15.3)	0.759 (0.052)	0.043 (0.007)	-98.7 (23.6)	7.05	0.96	1.1	1971 III 84 IV

h. Nonresidential Structures Investment

Dependent Variable: INS
Estimation Method: GMM
Instruments: INS(-1), INS(-2), Y(-1), Y(-2), RL(-1), LP(-1), LP(-2), G

Country	Constant	INS(-1)	YP	RRL	SE	RSQ	DW	Sample
U.S.	-16.2 (6.8)	0.963 -0.026	0.007 -0.002	-25.0 (12.2)	3.72	0.95	1.2	1971 III 84 IV

i. Total Nonresidential Investment

Dependent Variable: IN
Estimation Method: GMM
Instruments: IN(-1), IN(-2), Y(-1), Y(-2), RL(-1), LP(-1), LP(-2), G

Country	Constant	IN(-1)	YP	RRL	SE	RSQ	DW	Sample
France	11.9 (3.6)	0.812 (0.045)	0.020 (0.007)		3.10	0.95	1.7	1971 III 84 II
Japan	–4755 (454)	0.899 (0.046)	0.041 (0.007)	–13454 (1,060)	538.6	0.99	1.5	71 III 84 III
U.K.	1.5 (4.1)	0.726 (0.142)	0.034 (0.012)	–4.0 (3.3)	0.921	0.65	2.1	71 III 84 III

j. Residential Investment

Dependent Variable: IR
Estimation Method: GMM
Instruments: IR(-1), IR(-2), Y(-1), Y(-2), RL(-1), LP(-1), LP(-2), G

Country	Constant	IR(-1)	YP	RRL	SE	RSQ	DW	Sample
U.S.	–132.0 (32.5)	0.614 (0.062)	0.063 (0.013)	–269.5 (62.8)	9.61	0.87	0.9	1971 III 84 IV
France	9.2 (1.4))	0.858 (0.022)		–21.5 (2.5)	0.665	0.98	2.2	71 III 84 II
Japan	2835 (590)	0.823 (0.038)		–2578 (865)	733.9	0.72	2.1	71 III 84 III
U.K.	2.4 (0.7)	0.728 (0.075)		–1.33 (1.03)	0.429	0.71	2.0	71 III 84 III

k. Total Fixed Investment

Dependent Variable: IF
Estimation Method: GMM
Instruments: IF(-1), IF(-2), Y(-1), Y(-2), RL(-1), LP(-1), LP(-2), G

Country	Constant	IF(-1)	YP	RRL	SE	RSQ	DW	Sample
Canada	–2.9 (2.5)	0.933 (0.049)	0.026 (0.015)	–9.70 (5.53)	1.61	0.98	1.4	1971 III 84 III
Germany	–1.3 (13.4)	0.816 (0.038)	0.049 (0.016)	–213.8 (80.4)	10.4	0.74	2.2	71 III 84 III
Italy	–1128 (820)	0.907 (0.029)	0.030 (0.012)	–3016 (848)	299.8	0.89	1.1	71 III 84 III

l. Inventory Investment

Dependent Variable: II
Estimation Method: GMM
Instruments: II(-1), II(-2), Y(-1), Y(-2), RL(-1), LP(-1), LP(-2), G

Country	Constant	II(-1)	Y	Y(-1)	RRL	SE	RSQ	DW
U.S.	-15.4 (23.6)	0.656 (0.047)	0.207 (0.083)	-0.201 (0.084)	-86.3 (59.2)	17.3	0.59	2.1
Canada	-8.4 (3.3)	0.715 (0.043)	0.632 (0.107)	-0.605 (0.104)	-24.3 (7.6)	2.7	0.67	2.2
France	-0.7 (13.2)	0.699 (0.099)	0.156 (0.195)	-0.151 (0.187)	-45.0 (21.5)	6.8	0.53	1.8
Germany	7.7 (19.0)	0.326 (0.138)	0.178 (0.181)	-0.171 (0.193)	-261 (156)	13.5	0.30	1.9
Italy	-3462 (1,089)	0.543 (0.147)	0.561 (0.191)	-0.515 (0.200)	-7551 (2,309)	752.0	0.65	1.9
Japan	-1064 (1,559)	0.296 (0.129)	0.306 (0.139)	0.323 (0.141)	-16349 (4,994)	1270	0.31	1.6
U.K.	0.65 (2.6)	0.639 (0.123)	0.034 (0.144)	-0.036 (0.144)	-2.52 (7.6)	2.06	0.45	1.9

Note: For Sample periods see IF & IR tables.

m. Export Demand

Dependent Variable: LEX
Estimation Method: OLSQ

Country	Constant	LEX(-1)	LPEXPIM	LYW	SE	RSQ	DW	Sample
U.S.	-0.70 (0.63)	0.794 (0.094)	-0.151 (0.129)	0.230 (0.125)	0.034	0.98	1.7	1971 II 86 II
Canada	-6.63 (1.34)	0.581 (0.088)	-0.325 (0.104)	1.015 (0.205)	0.033	0.98	2.0	71 II 86 II
France	-5.69 (0.91)	0.509 (0.071)	-0.376 (0.071)	0.999 (0.154)	0.016	0.99	1.9	71 II 86 II
Germany	-2.94 (0.66)	0.532 (0.080)	-0.340 (0.103)	0.684 (0.129)	0.024	0.99	2.0	71 II 86 II
Italy	-1.79 (0.68)	0.704 (0.084)	-0.080 (0.070)	0.595 (0.184)	0.032	0.98	1.8	71 II 86 II
Japan	-0.82 (0.72)	0.814 (0.043)	-0.153 (0.039)	0.372 (0.139)	0.029	0.99	1.5	71 II 86 II
U.K.	-6.12 (0.86)	0.131 (0.112)	-0.370 (0.076)	1.129 (0.151)	0.031	0.96	2.1	71 II 86 II

n. Import Demand

Dependent Variable: LIM
Estimation Method: OLSQ

Country	Constant	LIM(-1)	LPIMP	LY	SE	RSQ	DW	Sample
U.S.	-7.00 (0.97)	0.440 (0.080)	-0.216 (0.036)	1.275 (0.177)	0.032	0.98	1.7	1971 II 86 IV
Canada	-1.48 (0.46)	0.679 (0.076)	-0.100 (0.075)	0.498 (0.134)	0.032	0.98	1.4	71 II 86 III
France	-3.16 (0.94)	0.688 (0.079)	-0.148 (0.044)	0.698 (0.196)	0.024	0.99	1.6	71 II 86 II
Germany	-5.39 (0.81)	0.291 (0.100)		1.325 (0.191)	0.024	0.98	2.2	71 II 86 III
Italy	-7.57 (1.24)	0.414 (0.093)	-0.190 (0.039)	1.177 (0.187)	0.034	0.98	1.5	71 II 86 III
Japan	-0.35 (0.32)	0.902 (0.059)	-0.081 (0.026)	0.111 (0.051)	0.032	0.97	1.7	86 II 86 III
U.K.	-2.14 (0.70)	0.651 (0.097)	-0.061 (0.041)	0.657 (0.194)	0.036	0.94	2.0	71 II 86 III

o. Estimated coefficients of Wage Equations

	U.S.	Canada	France	Germany	Italy	Japan	U.K.
α	0.0298 (.015)	0.0541 (.128)	0.0368 (.073)	0.0393 (.112)	0.1084 (.108)	0.2965 (.105)	0.0310 (.052)
π (0)	0.3270	0.4499	0.5117	0.5024	0.4991	*	0.5272
π (1)	0.2744	0.3173	0.2883	0.2892	0.3009	*	0.2728
π (2)	0.1993	0.1164	0.1000	0.1042	0.1000	*	0.1000
π (3)	0.1993	0.1164	0.1000	0.1042	0.1000	*	0.1000
% annual	79.7 (5.2)	46.6 (18.2)	40.0	41.7 (16.6)	40.0	87.5	40.0
% semi-annual	15.0	40.2	37.7	37.0	40.2	0.7	34.6
% quarter	5.3	13.3	22.4	21.3	19.8	11.8	25.4
SE	.0027	.0091	.0083	.0061	.0170	.0160	.0160
DW	1.39	1.9	1.7	2.1	1.9	1.9	1.9
Sample	1971 IV 86 IV	76 IV 86 IV	71 IV 86 II	71 IV 86 III	71 IV 86 III	71 IV 86 III	71 IV 86 III
Target Shift	1983 I	82 IV	81 III	77 III	82 III	76 III	81 II
Initial Conditions							
X (-1)	-0.4541	-0.4684	-1.2406	-0.7687	-1.3675	-0.8793	-1.3188
X (-2)	-0.4031	-0.3628	-1.2491	-0.5475	-1.6123	-1.1033	-1.3935
X (-3)	-0.3821	-0.2811	-1.1870	-0.6528	-1.7719	-1.0157	-1.3128

* Japanese estimates of π's by quarter allowing for synchronization.

Quarter	I	II	III	IV
π (0)	0.1533	0.5414	0.3857	0.2815
π (1)	0.1633	0.0351	0.4232	0.2675
π (2)	0.2638	0.1597	0.0314	0.4196
π (3)	0.4196	0.2638	0.1597	0.0314
% of workers in quarter	3	42	26	16

Notes: All equations were estimated with maximum likelihood. In France, Italy, and the U.K. the number of annual contracts was constrained to equal 40 percent, which is not significantly different than the unconstrained likelihood for these countries. The target shift is the quarter in which it is assumed that the central banks reduce their "target" for wage inflation.

p. Aggregate Price

Dependent Variable: LP

Estimation Method: AR(1) for all countries except Germany.
OLSQ for Germany.

Country	Constant	LP(-1)	LW	LPIM(-1)	T	RHO	SE	DW
U.S	–0.163 (0.039)	0.518 (0.098)	0.455 (0.091)	0.027 (0.007)	–0.016 (0.007)	0.57	0.003	2.1
Canada	0.017 (0.003)	0.913 (0.106)	0.009 (0.072)	0.078 (0.034)	–0.003 (0.072)	0.60	0.006	2.3
France	0.147 (0.038)	0.862 (0.049)	0.102 (0.032)	0.036 (0.017)	–0.077 (0.024)	0.26	0.006	2.0
Germany	0.085 (0.045)	0.848 (0.078)	0.132 (0.063)	0.019 (0.015)	–0.074 (0.030)		0.007	2.5
Italy	0.210 (0.072)	0.856 (0.064)	0.111 (0.042)	0.033 (0.022)	–0.086 (0.042)	0.33	0.009	2.0
Japan	0.033 (0.019)	0.932 (0.069)	0.053 (0.053)	0.015 (0.016)	–0.046 (0.053)	0.85	0.007	2.3
U.K.	0.037 (0.010)	0.752 (0.101)	0.160 (0.072)	0.088 (0.029)	–0.072 (0.033)	0.65	0.010	2.2

Notes:
1. For Germany, LFP3(-1) replaces LPIM3(-1).
2. The T coefficients are E-02 times those shown.
3. The Sample is 1971 II to 86 III for all countries save the U.S. (86 IV) and France (86 II).
4. RSQ = .99 for all seven countries.

q. Import Price

Dependent Variable: LPIM
Estimation Method: AR(1)

Country	Constant	LPIM(-1)	LFP	RHO	SE	RSQ	DW	Sample
U.S.	−0.284 (0.118)	0.894 (0.042)	0.106 (0.042)	0.59	0.023	0.99	1.9	1971 II 86 II
Canada	0.050 (0.087)	0.987 (0.033)	0.013 (0.033)	0.51	0.016	0.99	2.1	71 II 86 II
France	1.243 (0.288)	0.318 (0.078)	0.682 (0.078)	0.99	0.026	0.99	1.9	71 II 86 II
Germany	0.422 (0.160)	0.820 (0.069)	0.180 (0.069)	0.83	0.020	0.99	2.2	71 II 86 II
Italy	−1.241 (0.268)	0.581 (0.088)	0.419 (0.088)	0.91	0.027	0.99	1.6	71 II 86 II
Japan	−1.890 (0.364)	0.454 (0.106)	0.546 (0.106)	0.91	0.040	0.99	1.5	71 II 86 II
U.K.	1.655 (0.204)	0.553 (0.055)	0.447 (0.055)	0.92	0.021	0.99	1.8	71 II 86 II

r. Export Price

Dependent Variable: LPEX
Estimation Method: AR(1)

Country	Constant	LPEX(-1)	LP	LFP	T	RHO	SE	DW
U.S.	0.122 (0.050)	0.566 (0.098)	0.434 (0.098)		−0.265 (0.104)	0.93	0.009	1.8
Canada	0.111 (0.070)	0.411 (0.117)	0.589 (0.117)		−0.312 (0.150)	0.92	0.015	2.0
France	0.011 (0.014)	0.704 (0.117)	0.296 (0.117)		−0.058 (0.034)	0.62	0.016	2.1
Germany	0.170 (0.068)	0.798 (0.117)	0.143 (0.091)	0.059 (0.026)	−0.069 (0.032)	0.82	0.007	1.8
Italy	−1.324 (0.351)	0.275 (0.267)	0.277 (0.161)	0.448 (0.107)	−0.273 (0.133)	0.88	0.020	2.0
Japan	−0.918 (0.187)	0.287 (0.145)	0.386 (0.087)	0.327 (0.058)	−0.431 (0.105)	0.88	0.015	1.5
U.K.	0.798 (0.162)	0.601 (0.139)	0.221 (0.099)	0.178 (0.040)	−0.309 (0.158)	0.94	0.013	1.8

Note:
1. The T coefficients are E-02 times those shown.
2. The Sample is 1971 I to 86 II for all countries.
3. RSQ = .99 for all seven countries.

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