NBER WORKING PAPER SERIES

OBSTACLES TO INTERNATIONAL MACROECONOMIC POLICY COORDINATION

Jeffrey A. Frankel

Working Paper No. 2505

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
February 1988

his paper was begun when the author was a Consultant in the Research Department of he International Monetary Fund in the Fall of 1986, and an earlier version appears s IMF Working Paper 87/29, April 1987. He would like to thank Katharine Rockett or effective research assistance, and Malcolm Knight for suggestions. Views expressed re the author's. The research reported here is part of the NBER's research program n International Studies. Any opinions expressed are those of the author and not hose of the National Bureau of Economic Research. Support from The Lynde and Harry radley Foundation is gratefully acknowledged.

NBER Working Paper #2505
February 1988

Obstacles to International Macroeconomic Policy Coordination

ABSTRACT

Coordination of macroeconomic policies among countries is not as straightforward in practice as it appears in theory. This paper discusses three obstacles to successful international coordination: (1) uncertainty as to the correct initial position of the economy, (2) uncertainty as to the correct objective, and (3) uncertainty as to the correct model linking policy actions to their effects in the economy. Previous results (NBER Working Paper No. 2059) showed that coordination under conditions of policy-maker disagreement about the correct model could very well reduce national welfare rather than raise it. This paper extends those results to allow for explicit policy-maker recognition of uncertainty regarding the correct model, as well as uncertainty regarding the model to which other policy-makers subscribe. It also shows that the potential gains from coordination, even when positive, are usually small relative to the gains from unilateral policy changes based on improved knowledge of the model.

Jeffrey A. Frankel
Department of Economics
University of California
Berkeley, CA 94720
(415) 642-8084

Obstacles to International Macroeconomic Policy Coordination

Jeffrey A. Frankel

1. Introduction

It is possible to define international macroeconomic cooperation quite broadly, to include for example the exchange of information among policy makers. But it is probably desirable to reserve for the term international policy coordination the more precise definition that is understood in the academic literature: the agreement by two or more countries to a cooperative set of policy changes where neither would wish to undertake the policy change on its own, but where each expects the package to leave it better off, relative to the Nash non-cooperative equilibrium in which each sets its policies taking the other's as given. 1/ The gains are supposed to come specifically from externalities, or "spillover" effects that one country's policies have on other countries' economies but that the first country would have no incentive to take into account in the absence of coordination. If each country has well-defined objectives and

---

1/ Other definitions of coordination are possible as well. For example, under our definition, a switch from a floating exchange rate regime to a fixed exchange rate regime would, if it improved welfare by avoiding competitive appreciation or depreciation, be a practical substitute for coordination; but some authors choose to define such internationally-agreed changes in regime to be a form of coordination (e.g., Melitz (1985)). For a review of definitions of coordination and related concepts, see Masson and Horne (1986), chapter 13 to Corden (1985) or Kenen (1987). For an introduction to the literature, see Oudiz and Sachs (1984), Cooper (1985) or Fischer (1987).

knows the true model of the world macroeconomy, then it follows in general that there will exist cooperative solutions that are Pareto-improving, i.e., that do leave all countries better off. 1/ This theoretical proposition makes successful coordination sound straightforward, even easy. But when we visualize the practical process of coordinated policy-making, we can identify serious obstacles at each of three stages.

At the first stage, each country must decide what specific policy changes it would like to ask the other country, or countries, to undertake, and what it would, for its part, be willing to give up to get them. One can think of this stage as taking place in internal deliberations in advance of a G-5 or Summit Meeting. At the second stage, the two or more countries must negotiate how the gains from coordination are to be distributed. One can think of this stage as constituting the actual bargaining. The negotiations might result in a set of agreed-upon target economic indicators. 2/ At the third stage, the agreement must be enforced, including a clear way of verifying which countries are abiding by the agreement, in addition to a

1/ There are two important qualifications to the generality of the standard proposition that coordination improves welfare. The first is that if policy-makers have enough independent instruments to reach their optimum target goals regardless of each others' actions, then coordination is moot. The second is that Rogoff (1985) has shown that if coordination reduces governments' ability to precommit to anti-inflationary policies, credibly to their own peoples, then it can reduce welfare.

2/ At the Tokyo Summit of May 1986, it was decided that the G-5, or henceforth the G-7, would focus on a set of "objective indicators". At the September 1986 IMF Annual Meetings, the use of these indicators was publicly discussed. The indicators at this time had more the nature of targets that each country hoped to attain using only its own policy instruments, rather than targets that were set cooperatively. Nevertheless, these indicators might be viewed as prototypes for the variables that the countries would bargain over if coordination were to become more serious.

specification as to what should be done if the agreement is violated (for example, whether penalties should be imposed).

From a reading of the existing literature, one might think that the only obstacles to coordination occur at the latter two stages: bargaining over the gains from coordination and then enforcing the agreement. But the premise of this paper is that the problems that occur at the first stage may be more serious. It is not a trivial task to decide what policy changes are in a country's interest. If a country makes requests of its neighbors based on a misperception of the spillover effects, the true effect of coordination may be to reduce welfare, rather than improve it. Furthermore, the gains from convincing trading partners to move their policies in the desired direction, even if they turn out to be positive, may be dwarfed by the potential gains from unilateral domestic changes of policies based on a better understanding of objectives or models.

In this paper we consider difficulties at the first stage, uncertainty as to what changes in foreign policies are in the home country's interest (and what are the costs of domestic policy changes requested by the other country). We leave the later issues of bargaining and enforcement to other authors. There are three things that need to be known before the coordination process can begin: (1) Where does the initial position of the domestic country lie, relative to the optimum values of the target variables? (2) What are the correct weights to put on the various possible target variables? 1/ (3) What effect does each unit change in the domestic

1/ This includes the question of which variables should be excluded from consideration altogether, and which included.

macroeconomic policy variables (or the foreign) have on the target variables; that is, what is the correct model of the economy?

These three elements follow very simply from the algebraic expression for the welfare function. We specify here a function of three target variables, although we could as easily have more or fewer.

$$(1) \quad W = 1/2\ y^2 + 1/2\ \omega_x x^2 + 1/2\ \omega_\pi \pi^2$$

$$(1^*) \quad W^* = 1/2\ y^{*2} + 1/2\ \omega^*_x x^{*2} + 1/2\ \omega^*_\pi \pi^{*2},$$

where W is the quadratic loss to be minimized, y is output (expressed relative to its optimum and in log form), x is the current account (expressed as a percentage of GNP and again relative to its optimum), π is the inflation rate, ω_x is the relative welfare weight placed on the current account, ω_π is the relative weight placed on inflation, and an asterisk (*) denotes the analogous variables for the foreign country. We will refer to two policy instruments: the money supply, m (in log form), and government expenditure, g (as a percentage of GNP). The marginal welfare effects of changes in these policy variables are then given by

$$(2) \quad dW/dm = (y)y_m + \omega_x(x)x_m + \omega_\pi(\pi)\pi_m$$

$$(3) \quad dW/dg = (y)y_g + \omega_x(x)x_g + \omega_\pi(\pi)\pi_g$$

$$(4) \quad dW/dm^* = (y)y_{m^*} + \omega_x(x)x_{m^*} + \omega_\pi(\pi)\pi_m$$

$$(5) \quad dW/dg^* = (y)y_{g^*} + \omega_w(x)s_{g^*} + \omega_\pi(\pi)\pi_g$$

$$(2^*) \quad dW^*/dm = (y^*)y_m + \omega^*_{x^*}(x^*)x^*_m + \omega^*_{\pi^*}(\pi^*)\pi^*_m$$

$$(3^*) \quad dW^*/dg = (y^*)y_g + \omega^*_{x^*}(x^*)x^*_g + \omega^*_{\pi^*}(\pi^*)\pi^*_g$$

$$(4^*) \quad dW^*/dm^* = (y^*)y_{m^*} + \omega^*_{x^*}(x^*)x^*_{m^*} + \omega^*_{\pi^*}(\pi^*)\pi^*_{m^*}$$

$$(5^*) \quad dW^*/dg^* = (y^*)y_{g^*} + \omega^*_{x^*}(x^*)x^*_{g^*} + \omega^*_{\pi^*}(\pi^*)\pi^*_{g^*}$$

where the policy multiplier effect of money on output is given by y_m, the effect of money on the current account by x_m, etc. If we wished to solve for the optimum, we would set these derivatives equal to zero (with the target variables (y), (x), etc., first expressed as linear functions of the policy variables m, g, etc.). In the Nash noncooperative equilibrium, in which each country takes the other's policies as given, we would need only equations (2), (3), (4*) and (5*) for the solution. Each country ignores the effect that its policies have on the other country, so equations (4), (5), (2*) and (3*) do not enter. Indeed this is precisely the standard reason why the noncooperative equilibrium is sub-optimal. These cross-country effects enter only in the determination of the cooperative solution.

The focus here is on the fact that the economy may not be at an optimal point, either the constrained optimum of the Nash noncooperative solution or the Pareto-improving move to the cooperative solution, due to the policy-makers' lack of knowledge regarding the relevant parameters. Equation (2), or any other of the eight equations above, neatly illustrates the three kinds of uncertainty: uncertainty about the initial position, y, x and π, about the welfare weights ω_x and $\omega\pi$, or about the policy multipliers, y_m, x_m and π_*. As we will see, the uncertainty is so great that we typically cannot identify the sign of expressions (4) and (5) with confidence; i.e., the domestic country can't be sure whether it should want to ask the foreign country to expand or contract its monetary and fiscal policies in order to improve its own welfare. Similarly, as we can't be sure of the signs in expressions (2) and (3), the domestic country

doesn't know how to respond to foreign requests for changes in its policies. This uncertainty is a serious stumbling block to any effort at coordination.

One might reasonably argue that this uncertainty is no different from the uncertainty that always plagues policy-making, and that the implication for governments is simply that they should maximize expected welfare. 1/ But international spillover effects, which are the essence of international coordination, are more subject to uncertainty, particularly with respect to their sign, than domestic effects. One can argue in defense of discretionary domestic policy (as opposed to rules of the monetarist type) that a small policy change in the desired direction is better than none. It is more difficult in the face of uncertainty to make the argument that some internationnal coordination is better than none.

Four conclusions emerge from this paper. First, if policy-makers in the 1980s are serious about activist international coordination, they should begin by specifying clearly in what direction they wish their partners to move their policies, and what they are willing to give up for it; otherwise, vague calls for coordination must be considered political. Second, we should recognize that the result from the theoretical literature, that coordination necessarily improves welfare, is overly strong. If policy-makers are mistaken about their initial position, about the appropriate weights on the targets, or about the policy multipliers, then coordination may reduce welfare, instead of increasing it. Third, even when it works out that coordination improves welfare, the magnitude of the gains is so small that it is usually dwarfed by the potential gains from unilateral policy changes, except in the case when the authorities know the initial position, target weights, and policy multipliers precisely. Fourth, gains

---

1/ As in Brainard (1967).

from exchange of information, for example regarding the multipliers, offer an alternative rationale for international cooperation.

The paper considers uncertainty regarding the initial position in Section 2 and uncertainty regarding the welfare weights in Section 3. Section 4 reviews some results on the implications of disagreement over the correct model, and section 5 presents new extensions of the analysis to allow for policy-makers' recognition of the uncertainty over the model. Section 6 considers the effects of unilateral policy changes based on the use of better models and draws some conclusions.

2. Uncertainty regarding the initial position

It is clear from the above equations that uncertainty as to the initial values of y, x, and π--output, the current account, and inflation--relative to their optimums, translates into uncertainty as to the desirability of various policy changes. This type of uncertainty can, in turn, be broken into three components.

First is uncertainty as to the current value of the target variable in question. It is well known that GNP and the other variables are measured with a lag, and are often revised subsequent to the initial estimates.

In a recent study of U.S. GNP revisions, Mankiw and Shapiro (1986) find that the standard deviation of the revision from the preliminary estimate of the real growth rate to the final number is 2.2 percentage points. 1/ Some statistics are reported in Table 1. Since the mean of the true growth rate over the sample period was 2.4 percent per year (and the standard deviation 4.6 percent) the revisions are very large. Mankiw and Shapiro

1/ See also Zarnowitz (1982) and Zarnowitz and Moore (1982).

point out that when the preliminary estimate indicates no growth, the probability that the final estimate will exceed 2.0 percent is 18 percent (assuming a normal distribution). Sometimes we don't know whether the economy is currently in a boom or a recession, to within a 90 percent confidence interval. Even the preliminary estimate is available only 60 days after the midpoint of the quarter, not contemporaneously. 1/ Furthermore, there could be large errors in the final GNP numbers, due to both conceptual and measurement problems. The initial estimates of inflation numbers also contain measurement errors, and the trade statistics have been notorious in recent years, both for undergoing large revisions in the case of the United States, and for failing to satisfy "adding-up" constraints across countries, which indicates the existence of large measurement errors.

Table 1. Final Revisions in U.S. GNP Growth Rates

(Estimation period: 1976:I - 1982:IV)

	Nominal (current dollars)	Real (1972 dollars)
Standard deviation of revision from flash estimate	3.1	2.2
Standard deviation of revision from preliminary estimate	2.7	2.2
Mean of final growth rate	9.9	2.4
Standard deviation of final growth rate	5.7	4.6

Source: Mankiw and Shapiro (1986), Tables 2 and 3.

1/ Until 1985, a "flash estimate" was available 30 days after the midpoint of the quarter. Mankiw and Shapiro find that the revision from flash estimate to final number also had a standard deviation of 2.2 percent. Note that the revisions in nominal GNP are larger than in real GNP (because the true variability of nominal GNP is larger).

Table 2. Analysis of IMF Forecasts in Industrial Countries

(Error measured as forecast less actual)

Variable	Statistic	Canada	France	Germany	Italy	Japan	United Kingdom	United States	Summit Seven	All Countries
Real GNP growth current year 1/	Mean actual GNP growth	3.513	2.971	2.233	2.380	4.440	1.907	2.667	3.150	2.833
	Mean algebraic error	0.067	0.164	0.480	-0.253	0.813	-0.160	0.240	0.192	0.247
	Mean absolute error	1.227	0.621	1.107	1.280	1.533	0.880	1.160	0.658	0.647
	Root mean squared error	1.535	0.781	1.319	1.722	2.221	1.143	1.314	0.773	0.767
Real growth one year ahead 3/	Mean absolute error	1.833	1.142	1.508	2.058	2.033	1.442	1.691	0.967	1.217
	Root mean squared error	2.353	1.460	1.889	2.661	3.683	1.911	2.031	1.198	1.629
Inflation (GNP deflator) current year 3/	Mean actual inflation	8.067	9.480	4.580	14.633	5.800	11.680	6.687	6.558	7.200
	Mean algebraic error	-0.900	-0.900	0.153	-1.080	-0.007	-0.640	-0.527	-0.275	-0.293
	Mean absolute error	1.687	1.127	0.513	1.920	1.513	1.573	0.713	0.608	0.573
	Root mean squared error	2.407	1.155	0.687	2.738	2.242	2.016	0.924	0.743	0.776
Inflation one year ahead 2/	Mean absolute error	2.175	1.467	0.800	3.400	2.525	3.258	1.058	1.044	1.167
	Root mean squared error	3.170	1.780	1.077	4.145	3.502	4.069	1.410	1.172	1.634
Current Account Balance (billions of dollars) current year 4/	Mean actual current account	-1.915	-1.400	2.754	-2.246	9.454	1.746	-21.825		
	Mean algebraic error	-0.354	-2.067	-0.785	-0.454	-1.569	-1.531	0.600		
	Mean absolute error	2.308	2.917	4.000	2.592	6.261	2.485	10.667		
	Root mean squared error	3.105	4.009	5.083	2.972	7.967	3.430	13.962		

Source: Kenen and Schwartz (1986), Tables 1, 3, 9 and 13.

1/ 15 annual observations (14 for France and Germany and 12 for Summit Seven).
2/ 12 annual observations (9 for Summit Seven).
3/ 15 annual observations (12 for Summit Seven).
4/ 13 annual observations (12 for France and the United States).

Secondly to uncertainty over the current true values of the variables in question is uncertainty over how they are likely to move during the forthcoming year or more in the absence of policy changes (the "baseline forecast"). This information is relevant on the assumption that any policy changes agreed upon will have their major impact beginning in a year or more, rather than immediately.

Kenen and Schwartz (1986) have studied the accuracy of current-year forecasts by the IMF World Economic Outlook for the last fifteen years (1971-85). These forecasts usually appear in April or May of the year in question, and are based on information available through February or March. His results are summarized in Table 2. The root mean squared error among the Summit Seven countries is 0.773 percentage points for real growth and 0.743 percentage points for inflation. These prediction errors, relatively small, are in themselves large enough to reverse the signs of the derivatives of the welfare function equations (2)-(5). Errors would presumably be much larger for the horizons of two years or more that are probably most relevant for policymaking. Many major international econometric models show the effects of monetary and fiscal policy peaking in the second year in the case of output, and not reaching a peak within six years in the case of the price level or current account.

The forecasting record of other agencies or private sector firms is not noticeably better than that of the Fund. 1/ Such uncertainty need not accrue to the discredit of the economics profession: forecasting future disturbances is by its nature a near-impossible task.

1/ See McNees (1979) and Zarnowitz (1985).

The third component of uncertainty as to the initial position of the economy relative to its optimum is the location of the optimum. The location of full employment and potential output can be given relatively objective-sounding definitions: the nonaccelerating-inflation rate of unemployment, and the level of output when the factors of production are fully employed, respectively. But estimates nevertheless vary widely. 1/ Zero seems an obvious choice for the optimum value of inflation. 2/ Estimates for the optimum current account are much more problematic. Zero again seems a natural choice, under the Polonius Principle of international finance: "Neither a borrower nor a lender be." 3/ But estimates of optimal current account balances can vary widely; theoretical analyses suggest that the optimal rate of borrowing (or lending) can be quite large, to finance either longer-term investment and growth or shorter-term shortfalls in real income.

1/ For example, as of 1986, James Tobin estimates the U.S. natural rate of unemployment at about 5 3/4 percent and Herbert Stein at about 7 percent. Moreover, there is no particular reason why the natural rate of unemployment or potential output should be the optimum value relative to which society measures y in the objective function (1). The official target for U.S. economic policy under the Humphrey-Hawkins Act is 3 percent unemployment.

2/ Though even here, Milton Friedman has argued that the optimum rate of inflation might be less than zero (the negative of the real interest rate, to equate rates of return on money and capital).

3/ Dooley and Isard (1986) argue that whenever one country incurs substantial net indebtedness to another, it runs the risk that the debtor will find irresistible the temptation either to default explicitly or to impose other taxes on foreign holdings; this argument suggests that a zero current account balance might be desirable. Summers (1985) argues that governments, for political reasons, do indeed seek current accounts of zero. (See also Shakespeare.)

The point is clear. The policy-maker's estimates of the current values of y, x and π in his country could easily be off by several percentage points in either direction, which would flip the signs of the three terms --any one of which could change the sign of the derivative of the welfare function -- in equations (2)-(5). Thus coordinated policy changes could move the economy in the wrong direction.[1/]

To take an historical example, 1974 was a year of sharp recession in the United States. But because of misleading initial data (and because of unfamiliarity with the effects of an oil shock) President Ford declared inflation "Public Enemy Number One," even though we know in retrospect that the recession had already begun. He then had to reverse his policy priorities and enact expansionary fiscal policies. If the United States had asked trading partners in 1974, as part of a coordination process, to adopt measures that would have deflationary effects, it would have been precisely the opposite of what the United States wanted soon thereafter.

3. Uncertainty regarding weights on target variables

The issue of what relative weights ω_x and ω_π to put on the target variables in the objective function (1) is even more subjective than the issue of the optimal values of the target variables.

1/ Of course misperception of the baseline position relative to the goal will cause problems for uncoordinated policy-making as well. Hughes Hallett (1987) argues that welfare in the coordinated policy-making equilibrium may be relatively more robust to such "information errors" than in the Nash non-cooperative equilibrium.

Some would argue that the only appropriate objective is to maximize the value of income, or consumption, and that the correct weight on the other variables is zero. To be more correct theoretically, it is the present discounted value of consumption that should be maximized. One can then view the inclusion of the current account in the one-period analysis 1/ as a shorthand for all the future periods: if the country maximized current consumption while running a large current account deficit, it would have to undergo much lower consumption in the future to service the debt incurred. One can view the motivation for including inflation similarly. If higher output could be attained with no welfare costs beyond the

1/ The assumption that governments should seek to attain both "internal balance" (full employment) and "external balance" (trade balance) is part of the venerable Meade-Mundell framework of policy-making. See Obstfeld (1986) regarding the appropriate definition of external balance.

contemporaneous resource loss from higher inflation, then the cost might be viewed as negligible; but the true cost in fact includes a higher level of inflation inherited in the future, which will eventually necessitate a recession to eliminate it. 1/ Thus a one-period objective function that includes inflation and the current account in addition to output seems to capture the relevant elements.

The ultimate argument for putting weight on inflation and the current account deficit comes not from theory but from consideration of the economist's place in the policy-making process. Society views these variables as "bads", and can be said to have a utility function that includes them in the same way as a consumer has a utility function for the goods (and bads) he or she consumes. An economist who maximizes a theoretical welfare function that excludes such variables is not solving a problem to which society wants the answer.

One way to obtain estimates for the weights ω_x and ω_π is to carry one step further the argument of accepting the choices of the political process on its own terms. Oudiz and Sachs (1984) assume that governments not only have the correct objective function but that as of 1984 they were succeeding in optimizing it, in a Nash non-cooperative equilibrium. This allows them to infer what the welfare weights must have been in order to produce the outcomes for output, inflation and the current account actually observed.

Table 3 reports weights ω_x and ω_π estimated by Oudiz and Sachs for three countries' objective functions. Some further assumptions, beyond the

---

1/ One could make an analogous argument for doing what McKibbon and Sachs (1986) do: include the budget deficit as a fourth target variable.

strong assumption on which the methodology is based, are necessary to get a specific answer; their calculations feature two alternative sets of weights. 1/ Other assumptions could give very different estimates.

Table 3. Welfare Weights Estimated at Nash Equilibrium

Country	Economic Planning Agency Model		Multicountry Model	
	Inflation ω_π	Current Account Ratio ω_x	Inflation ω_π	Current Account Ratio ω_x
United States	-5.9	2.9	-4.5	0.0
Japan	-2.9	4.6	-3.6	5.9
West Germany	-4.9	1.0	-3.0	1.9

Weights show the inflation and current account deviations that give the same marginal utility as a GNP increase (relative to baseline) sustained for three years. The Nash equilibrium is taken as the baseline in the Multicountry model.

Source: Oudiz and Sachs (1984), Table 9.

1/ Depending on which of two econometric models the governments are assumed to have been using.

The preferences of different actors vary widely. Political conservatives tend to put heavy weight on inflation; their ω_π might be close to infinite. Political liberals tend to put higher weight on output; their ω_π might be close to zero. Although it is difficult to generalize, it might be said that a central bank tends to have higher values of ω_π than the finance ministry or the rest of the government. (Similarly, Germany, Japan, and in the early 1980s the United States, seem to have higher values of ω_π than do most smaller countries.) The question of how varying preferences of actors within a country should be aggregated is one that is as difficult as it is wellknown, and it is not addressed here. The point here is only that, in a society where the weights of individual actors vary from zero to infinite, the likelihood must be judged very high that any given government is using weights that differ from the "correct" ones that would follow from any given criterion. One can see from the equations that putting insufficient weight on fighting inflation, for example, can have the same effect as overestimating the baseline inflation rate: the policy maker in coordination exercises may ask his trading partners to adopt expansionary policies when contractionary policies are in fact called for. Indeed by 1980 many had concluded that precisely this mistake had been made by the United States in the late 1970s.

4. Uncertainty regarding the policy multipliers

The policy multipliers, the derivatives in $\ddot{y}_m$, $\ddot{y}_q$, etc., in equations (2)-(5*) telling the effect of changes in the money supply and government expenditure on the target variables, should in theory be more susceptible to measurement than subjective factors considered so far. But in fact,

any given government is likely to be using policy multipliers that differ substantially from the "true" ones, and that may even be incorrect in sign. One way of seeing this is to note the tremendous variation in multipliers according to different schools of thought, or even according to different estimates in models of "mainstream" macro-economists. They cannot all be correct, and it seems highly probable that no single model is in fact exactly right.

It is possible to illustrate the potential range of multiplier estimates in some detail. In a recent exercise conducted at the Brookings Institute, 12 leading econometric models of the international macroeconomy simulated the effects of specific policy changes in the United States and in the rest of the OECD. 1/ The models participating were the Federal Reserve's Multi-Country model (MCM), the European Economic Community's Compact model (EEC), the Japanese Economic Planning Agency model (EPA), Project Link (LINK), Patrick Minford's Liverpool model (LIVPL), the McKibbon-Sachs Global model (MSG), the Haas-Masson smaller approximation of the MCM model (MINIMOD), the Sims-Litterman Vector Auto Regression model (VAR), the OECD Interlink model (OECD), John Taylor's model (Taylor), the Wharton Econometrics model (Wharton), and the Data Resources, Inc., model (DRI). Table 4 summarizes the results for a change in government

---

1/ See the volume edited by Bryant and Henderson (forthcoming), for example Frankel (1986).

expenditure and Table 5 for a change in the money supply. All effects are reported for the second year after the policy change.

The range of estimates is large. The effect of fiscal or monetary expansion on domestic output and inflation is usually at least of the positive sign that one would expect. Even here there are exceptions as regards inflation: the VAR, Wharton and Link models sometimes show expansion causing a reduction in the CPI, probably due to effects via mark-up pricing. But disagreement among the models becomes much more common when we turn to the international effects.

The areas of greatest disagreement among the econometric models are not the same as one might expect from the theoretical literature. In the literature there are two very common ambiguities. (1) The effects of a fiscal expansion on the exchange rate: is the incipient capital inflow attracted by higher interest rates enough to offset the trade deficit due to higher income, and cause the currency to appreciate? (2) The effects of a change in the exchange rate on income: is the expansionary effect of a depreciation on the trade balance enough to offset any contractionary effects--via real income, the real money supply, real wealth, imported-input prices, or indexed wages--and cause income to rise? A negative answer to either of these questions could reverse, for example, the well-known Mundell-Fleming conclusion that a domestic fiscal expansion is transmitted positively to other countries via a shift in the trade balance.

There is relatively little disagreement in the econometric models on these questions, as is suggested by Table 4. A U.S. fiscal expansion is

transmitted positively to the rest of the OECD in 10 out of 12 models, and an expansion in the other countries is transmitted positively to the United States in 10 out of 11 models.

The greatest amount of disagreement occurs, rather, on a subject where the standard theoretical literature is mostly unanimous: the effect of a monetary expansion on the domestic current account, and therefore on the foreign current account and output level. There are two conflicting effects. On the one hand, the monetary expansion raises income and therefore imports. On the other hand, it depreciates the currency, which tends to improve the trade balance. In the Mundell-Fleming model the net effect must be positive: a reduction in interest rates causes a net capital outflow which, under a floating exchange rate, implies an increase in the current account balance. (For example, many believe that the U.S. trade deficit began to deteriorate as early as 1982 because a monetary contraction had raised real interest rates and the real value of the dollar after 1980.) It would then follow that the foreign current account, and therefore foreign income, move in the opposite direction: monetary policy is transmitted inversely in Mundell-Fleming. But Table 5 shows a U.S. monetary expansion worsening the current account in 8 out of 11 models, and a monetary expansion in the other OECD countries worsening their current accounts in 5 out of 10 models. In most models the rest of the Mundell-Fleming transmission mechanism is reversed as well: the foreign current account and foreign income rise rather than fall.

Differing perceptions of policy multipliers imply differing perceptions of what policy changes are desirable, even in those cases where there is no disagreement over objective functions or initial positions. Perhaps the most enduring disagreement in OECD policy-making is the perception by other countries that there is room for demand expansion in the German economy (and often in the Japanese economy as well), in contrast to the perception by the responsible policy-makers in those countries that there is not.

One could interpret the disagreement in terms of initial position as in section 2 (the Germans seeing themselves as closer to the natural rate of unemployment than others see them) or in terms of the objective function as in section 3 (the Germans putting more weight on inflation and less on output than others); but it is perhaps most interesting to interpret the disagreement in terms of models. The Germans may believe that their inflation-output tradeoff is steeper than others believe it to be. This could happen, for example, if the German tradeoff is indeed steeper than the U.S. tradeoff due to a greater degree of wage indexation, and Americans lacking familiarity with other economies tend to project from their own economy. 1/ In the case of proposals for German or Japanese expansion via monetary policy, in particular as was urged in 1986-87 by U.S.

1/ Branson and Rotemberg (1980), attributing the idea to Herbert Giersch, suggest that the difference in real wage rigidity, and therefore in the slope of the Aggregate Supply curve, between the United States and Germany may explain Germany's reluctance to accept U.S. urgings in 1977 to expand under the "locomotive theory". However, there is nothing in that paper to suggest that the Americans would not have been as aware of the difference in structure as the Germans, in which case in urging German expansion they would simply be making the sort of selfinterested proposal that is a common part of any bargaining process. This is different from the situation that can arise when the policy-makers disagree about the model and therefore about whether the proposed policy change is in Germany's interest.

Treasury Secretary James Baker, we have just seen how reasonable models disagree about the implications for the U.S. trade balance and output, three of eleven econometric models and the Mundell-Fleming theory implying a negative transmission because the trade balance is dominated by the exchange rate effect rather than the income effect, but eight of the eleven (and many alternative theoretical models) implying positive transmission. The ambiguity about the sign of the transmission of monetary policy is particularly damaging for international coordination, because it means that even if the United States succeds in getting Germany to agree that it should take measures that would stimulate the U.S. trade balance and output, the two countries could still disagree over whether this requires that German policy be more expansionary or less.1/

What happens if United States, European and Japanese policy-makers proceed with coordination efforts despite disagreements such as these? We can use the Brookings simulations to consider the possibilities when they use conflicting models. In the analysis that follows, the optimal values of the target variables and the weights in the objective function are taken from Oudiz and Sachs. 2/

1/ Almost all models would agree that if all countries expand monetary policy simultaneously, the effect will be expansionary. Thus Baker's 1986 proposal for simultaneous reductions in discount rates could be beneficial even if the international transmission is negative (or, in any case, close to zero) as in some of the models. But the implication would be that the United States could reap the full benefits by reducing interest rates unilaterally. Thus the proposal would not be an example of coordination, precisely defined. It is possible that international fora provide a means for generating necessary political momentum for policy changes, such as changes in the monetary/fiscal mix to reduce real interest rates, that could in theory be done unilaterally.

2/ The remainder of this section draws on Frankel and Rockett (1988).

It turns out that the countries will in general be able to find a package of coordinated policy changes that each believes will leave it better off, even though each has a different view of the effects and thus may not understand why the other is willing to go along with the package. To take a typical outcome, if the United States monetary authority believes in the MCM model and other countries' monetary authorities believe in the OECD model, then it turns out that they will find the Nash noncooperative equilibrium to be overly contractionary, each country afraid of expanding on its own for fear of worsening its current account balance. They will consider a coordinated package under which each undertakes monetary expansion to be mutually beneficial, and will agree to do so (provided any problems of bargaining and enforcement can be overcome). This is the kind of coordination urged by the United States. But whether a joint monetary expansion actually succeeds in improving their objective functions depends on the true model. If the true model is the MCM, then the United States will indeed be better off; otherwise it would not have agreed to the change. Similarly, if the true model is the OECD, then the other countries will be better off. But it turns out that if the LIVPL, VAR or MSG models are the correct ones, then the coordinated monetary expansion will not have the effects anticipated and will actually leave both countries worse off.

If we consider eight possible models, there are 512 combinations of models that can be used to represent the beliefs of the U.S. policy-makers, the beliefs of non-U.S. policy-makers, and reality. We find that coordination results in gains for the United States in 289 cases and no effect on the objective functions (to four significant digits) in 17 cases; this is an improvement 56 percent of the time. Coordination results in gains for the

rest of the OECD countries in 297 cases, as against losses in 198 and no effect in 17, for a 58 percent improvement rate. (The statistics are reported in row 1 of Table 6.) 1/

If the countries are able to include fiscal policy along with monetary policy in the bargaining package, the odds turn out to improve a little (for this particular combination of starting point and welfare weights). To take an example, if the United States subscribes to LINK and the other countries to LIVPL, the resulting package of coordinated policy changes takes the form urged by many economists in the 1980s: a U.S. fiscal contraction, accompanied by a fiscal expansion in Europe and Japan, and monetary expansion all around. The usual argument is that this will reduce the value of the dollar, and therefore the U.S. trade deficit, without causing a world recession. Again, if the true model is different from the one to which the policy-maker subscribes, this change in monetary/fiscal mix often turns out to reduce welfare rather than improve it. Out of all 512 combinations, coordination turns out to raise U.S. welfare 55 percent of the time and to raise non-U.S. welfare also 55 percent of the time.

5. Extensions of the analysis of disagreement regarding multipliers

Some readers have suggested that, in a world in which different models abound, it is not sensible to assume that each policy-maker acts as if he knows with certainty what model his opponent subscribes to (the opponent having no incentive to reveal his beliefs in the absence of cooperation),

1/ These statistics in a sense are biased in favor of gains from coordination, because they include the one-eighth cases in which the policy-maker turns out to have had the correct model so that coordination necessarily improves his welfare. Statistics that count only cases where the policy-makers' models are different from the true one are reported in Frankel and Rockett (1988).

or even what model he himself considers to be the correct one.[1] We now consider extensions in each of these two directions, in turn.

To begin with, we retain the assumption that each policy-maker believes in his own model with certainty, but we allow for uncertainty regarding the other's model. The policy-maker will set his policies so as to maximize expected welfare, a weighted average of the economic consequences of each of the policy-settings that the foreign government would choose under each of the possible models to which it might subscribe. [2]

Tables 7 to 9 report the effects on the United States and the rest of the OECD, respectively, of allowing for uncertainty regarding each other's models, still under the Nash noncooperative equilibrium of monetary policies. Each country is assumed to give equal weight to all of the possible models to which the opponent can subscribe. Table 7 reports the movement from the baseline specified in the Brookings simulations to the Nash noncooperative equilibrium, under 36 combinations (6 models subscribed to by the United States and 6 by the other player). The changes in money supplies to get to the equilibrium are usually quite close to what they were in the earlier case where each knew the other's model. The effect of this movement, depending on the true model, is reported in Table 8 for U.S. welfare and in Table 9 for non-U.S. welfare.

The interesting question is the effect of coordination, under the assumption that each player averages to estimate the other's model. Table 10

1/ E.g. Holtham and Hughes Hallett (1987).

2/ The algebra is spelled out in Section 4 of Frankel and Rockett (1986). The numerical results reported here are new.

reports how money supplies change, and with them perceived values of the target variable and welfare, in the movement from the Nash noncooperative point under averaging to the Nash cooperative point. It is assumed that part of the cooperation is that each reveals his model to the other. One country or the other may lose bargaining power by having both their models revealed. For this reason, the "perceived gain" reported in the last two lines of each cell in Table 10 is sometimes negative, even though the perceived gain from coordination with no change in information must necessarily be positive.

The actual effect of coordination depends on the true model, as usual. Table 11 reports the change in welfare for the United States and Table 12 for the non-U.S. countries, under each of the six alternative candidates for the true model. If we include all eight models, coordination under averaging improves U.S. welfare in 265 cases or 52 percent of the time, out of the total of 512 combinations, as against losses in 245, and improves non-U.S. welfare in 264 cases, again 52 percent of the time as against losses in 246. As Table 6 shows, these odds are slightly worse than the case where each knows the other's model with certainty. This may be because, once the policy-makers find out each other's models in the Nash non-cooperative equilibrium, there is less left to gain by coordinating.

In the second extension, we relax the assumption that each policy-maker acts as if he or she is certain as to the correct model. We assume rather that they assign weight to each of the possible models. To preserve some disagreement about models, we could assume that each puts primary weight on a favorite model of his own, but is reasonable enough to put some weight also in the other models (perhaps with larger weight on the favorite model of the other player on the theory that he must have access to some independent information. Here we consider, instead, the simple case of

uniform weights. As a result, each will be playing by the same "compromise" model.

When policy-makers act as if they believe in the "compromise" model based on averaging the multipliers in the eight equilibrium models, the Nash non-cooperative equilibrium implies a 6.97 percent U.S. monetary expansion relative to the baseline, and a 3.81 percent contraction of the money supplies in other countries. According to most of the models (though not the VAR, MSG or LIVPL), this would raise U.S. income and lower non-U.S. income. The welfare effects of averaging models, as compared to the same Nash noncooperative equilibrium when each policymaker acts upon a single model held with certainty, are reported in Table 13 for U.S. welfare and Table 14 for non-U.S. welfare. The six possibilities shown each for the "model subscribed to by the U.S." and "model subscribed to by Europe" are those that the respective policy-makers give up if they move to the compromise model. The move raises welfare relatively often. When all eight models are used, averaging raises U.S. welfare in 334 cases, as against losses in 178, and raises non-U.S. welfare in 301, as against losses in 211.

The probable reason that averaging usually raises welfare is the simple statistical principle that the average of eight numbers is closer to the individual numbers, on average, than the individual numbers are to each

other. The principle does not apply directly, because each policy-maker having a better estimate of the "true" parameters does not necessarily imply that the Nash equilibrium will be better. But it seems to work here.

The next step is the move from the noncooperative equilibrium to the cooperative equilibrium, while maintaining the assumption that each policy-maker averages multiplier estimates. Based on the compromise model, a move to the Nash bargaining point consists of a 3.87 percent reduction of the U.S. money supply and a 5.71 percent increase in the non-U.S. money supply. The consequence, according to most of the models, is to lower U.S. output and to raise non-U.S. output (with more divergence regarding the current accounts, as noted earlier). According to the compromise model, the policy change lowers U.S. output by .60 percent, raises the U.S. current account by .10 percent of GNP, raises non-U.S. output by 1.03 percent, and raises the non-U.S. current account by 0.11 percent of GNP. 1/ The key question is whether this coordinated policy change improves welfare under various candidates for the true model. If the OECD or LINK models are correct, then coordination does turn out to improve welfare for both countries. But some models give negative results. Out of the eight, five show increases in U.S. welfare and three show losses. The same odds hold for non-U.S. welfare. 2/ This represents a better case for coordination than prevailed when each had his own model (63 percent against 56 or 58 percent), as can be seen in Table 6. 3/

1/ One could attempt to rationalize the compromise model's prediction that both the U.S. and non-U.S. OECD current accounts improve, by positing a decline in prices of imports of oil and other commodities from less developed countries. But the magnitudes of the current account effects are in any case very small.

2/ Note that when the policy-makers have the same compromise model, there are only 8 possible outcomes, rather than 8^3.

3/ Holtham and Hughes Hallett (1987, p. 24), on the other hand, find that "There is no advantage in using a synthetic model, which averages the properties of competing models; they generate nearly as many losses as the worst of the 'named' models."

An alternative interpretation of the results on averaging is that the two policy makers retain their beliefs in one model or another, but that in the interest of improving on the non-cooperative equilibrium, they agree to an alternative kind of cooperation: they bargain directly over the correct model rather than just over policy-settings, and then they maximize joint welfare gains, as in the Nash bargaining solution but using the compromise model. Line 6 in Table 6 reports the count for welfare gains from this kind of cooperation: 317 or .62 percent for U.S. welfare and 296 or .58 percent for non U.S. welfare. 1/ As the results in Tables 13-16--or the overall counts in lines 4 or 7 of Table 6--show, most of these gains can be reaped by averaging to get better model estimates alone, without a simultaneous move from the noncooperative to the cooperative solution.

The results reported here suggest the possibility that a type of cooperation that includes compromises on the model might raise true welfare more often than simply trying to maximize perceived joint gains with each going by his own model. It offers some support for the conjecture that ministers in G-5 and Summit Meetings might do better to discuss their beliefs directly, rather than simply telling each other how they should adjust their policies. 2/

1/ Recall that in the experiment where each policy-maker believes in a model with certainty, the statistics included the one-eighth cases in which the policy-maker turned out to have had exactly the correct model, so that the odds were biased in favor of coordination improving welfare. That is not the case here. In the experiment where the models are averaged, as in each of the three last experiments in Table 6, none of the cases of gains represent cases where policy-making is based on exactly the correct model, under our method of counting the possible outcomes.

2/ Kenen (1987, p. 8-9) argues that the gains from consultation, swapping information -- as opposed to coordination, defined in the first paragraph of this paper -- have not been sufficiently often emphasized by academic economists.

6. The gains from better information on the model

We have already established the perils of cooperative policy-making when using the wrong model. One might wonder about similar perils of policy-making even without cooperation. If the policy-maker is wrong about the initial position, or about the welfare weights, or about the multipliers, then he will not necessarily be able to attain the optimum Nash non-cooperative equilibrium. How much could policy-makers improve welfare simply by discovering the true model?

The last four tables show the effects, staying within the Nash non-cooperative equilibrium, if one policy-maker, who may previously have had the incorrect model, discovers the correct model. Table 17 shows the effects on U.S. welfare of a model switch, for six possible true models. If the United States already has the correct model, the gains of course are zero. Otherwise, the gains are often substantial. For example, when the United States believes the MCM and the true model is the Liverpool model, the gain to switching is 2.4091 (assuming the other country is playing by the Liverpool model), which translated from the terms of the quadratic welfare function, is worth 1.55 per cent ($= \sqrt{2.4091}$) of GNP. Similarly when the United States believes the Liverpool model and the true model is MCM, the gain to switching is 8.0902 (assuming the other country is playing by MCM), which is worth 2.84 per cent of GNP. In occasional cases, the U.S. gains from switching to the correct model are negative, because there is a loss of bargaining power and the other country moves in an undesirable direction. But the gains are usually positive and often large.

One sense in which the gains from unilateral moves can be seen to be "large" is to compare them to the potential gains from coordination. In sections 4 and 5 we saw that the effect of a move from the Nash non-cooperative equilibrium to the cooperative equilibrium could easily have a negative effect on welfare if the policy-makers are using the wrong models. But we now give coordination the benefit of the doubt. We report in the first column of Table 17, for each of the six possible models, the effect on U.S. welfare from coordination under the assumption that both countries know the true model. These six numbers are thus a sort of upper bound on the gains from coordination. In three cases (the Liverpool, OECD and LINK models) the potential gain is about .013, worth only 0.1 per cent of GNP. The gain is even more negligible in the case of the MCM, and is substantial only in the case of the MSG model.

Table 18 reports the effects on non-U.S. welfare of switching to the correct model, as compared to the potential gains from coordination. Tables 19 and 20 report the same statistics, U.S. and non-U.S. welfare effects respectively, for the experiment where the countries are free to vary their level of government expenditure as well as their money supplies. 1/ It remains true that the gains from unilaterally switching to the correct model are usually positive and often quite large, in contrast to the potential gains from coordination, which are always small.

1/ Although equations (2)-(5*) were presented in terms of two policy instruments for each country, the preceding tables reported here have referred to monetary policy alone. Frankel and Rockett (1986) report further effects of coordination when both monetary and fiscal policies are used.

It is not a new finding that the potential quantitative gains from coordination, even under the conventional assumption that they are necessarily positive because the true model is known, are small. Oudiz and Sachs, among others, found the same result, and attributed it primarily to the small trade multipliers that in practice link the United States with the rest of the OECD, let alone with individual countries.1/ But it is interesting to see the magnitude of these gains compared side-by-side with the gains from unilateral improvements in policy-making.

In the context of U.S. policy in the 1980s, a commonly proposed policy coordination package is a reduction in the U.S. budget deficit, accommodated by a monetary policy of allowing interest rates to drop so as to maintain nominal GNP growth, accompanied by expansion in Europe and Japan. Some economists have argued that most, if not all, of the gains from this policy package could be accomplished if the United States policy-makers were to do their part unilaterally. In 1983 and 1984, it seemed to some that the obstacle was precisely the one on which we have focussed here, that the U.S. Treasury was operating with the wrong model. But one could alternatively interpret the U.S. Administration as having failed as yet to propose measures that would reduce the structural budget deficit for reasons other than having an incorrect model. One possibility is a misperception of the initial conditions as in Section 2; official forecasts of the rate of growth have been too high and official forecasts of the trade and budget deficits have been too low. Another possibility is the

1/ Carlozzi and Taylor (1985), Oudiz (1985), and Canzoneri and Minford (1986) also find that the quantitative gains are small.

weights in the objective function; many businessmen think the Administration has put insufficient weight on the trade deficit, for example. 1/

A more sympathetic interpretation is that political constraints prevent the Administration from convincing the Congress or the Federal Reserve to adopt the right policies. Indeed, it is possible, as suggested in an earlier footnote, that the real purpose behind Secretary Baker's efforts to gather momentum in international meetings for worldwide interest rate cuts is to overcome political obstacles to a switch in the monetary/fiscal policy mix at home. Another example of this phenomenon would be when finance ministers of other countries, meeting at the OECD and elsewhere in the late 1970s, "psyched themselves up" to return home and push through measures to reduce their countries' budget deficits.

While the results reported in this and preceding sections appear to argue against coordination in the more precise definition of the term given at the outset of this paper, from another perspective they provide evidence in favor of coordination, or "cooperation", defined more broadly to include the exchange of information. First, there are sometimes gains simply from each country telling the other what model it is playing by, as compared to the non-cooperative equilibrium in which each must guess the other's model (Tables 7 and 8). Secondly, there are often gains from countries pooling estimates as to the correct models (Tables 13 and 14), particularly if done at the same time as coordinating to maximize joint perceived

---

1/ The spirit of this paper is that it could alternatively be true that the objective function, forecast, and model used by the Administration could be correct and those of its critics incorrect.

welfare gains (e.g., Tables 15 and 16). Thirdly, if cooperative research efforts could produce better estimates of the true model, the gains might be very large (Tables 17-20). Finally, if discussions in international fora allow finance ministers to gather political momentum behind measures that they already know to be desirable, then the gains could again be large. Thus the scope for useful international cooperation remains wide, provided it is defined more broadly than in the precise academic sense.

Table 4: Estimates of Fiscal Policy Multipliers

Simulation Effect in Second Year of Increase in Government Expenditure (1 Percent of GNP)

	Y	CPI	i (pts.)	Currency Value	CA ($b)	CA* ($b)	i* (pts.)	CPI*	Y*
Fiscal Expansion in U.S. (-Sim. B)	Effect in U.S.					Effect in Non-U.S.			
MCM	+1.8%	+0.4%	+1.7	+2.8%	-16.5	+8.9	+0.4	+0.4%	+0.7%
EEC 1/	+1.2%	+0.6%	+1.5	+0.6%	-11.6	+6.6	+0.3	+0.2%	+0.3%
EPA 2/	+1.7%	+0.9%	+2.2	+1.9%	-20.5	+9.3	+0.5	+0.3%	+0.9%
LINK	+1.2%	+0.5%	+0.2	-0.1%	-6.4	+1.9	NA	-0.0%	+0.1%
Liverpool	+0.6%	+0.2%	+0.4	+1.0%	-7.0	+3.4	+0.1	+0.6%	-0.0%
MSG	+0.9%	-0.1%	+0.9	+3.2%	-21.6	+22.7	+1.0	+0.5%	+0.3%
MINIMOD	+1.0%	+0.3%	+1.1	+1.0%	-8.5	+5.5	+0.2	+0.1%	+0.3%
VAR 3/	+0.4%	-0.9%	+0.1	+1.2%	-0.5	-0.2	-0.0	-0.0%	-0.0%
OECD	+1.1%	+0.6%	+1.7	+0.4%	-14.2	+11.4	+0.7	+0.3%	+0.4%
Taylor 3/	+0.6%	+0.5%	+0.3	+4.0%	NA	NA	+0.2	+0.4%	+0.4%
Wharton	+1.47	+0.3%	+1.1	-2.1%	-15.4	+5.3	+0.6	-0.1%	+0.2%
DRI	+2.1%	+0.4%	+1.6	+3.2%	-22.0	+0.8	+0.4	+0.3%	+0.7%
Fiscal Expansion in Non-U.S. OECD (Sim. G)	Effect in Non-U.S.					Effect in U.S.			
MCM	+1.4%	+0.3%	+0.6	+0.3%	-7.2	+7.9	+0.5	+0.2%	+0.5%
EEC 1/	+1.3%	+0.8%	+0.4	-0.6%	-9.3	+3.0	+0.0	+0.1%	+0.2%
EPA 2/	+2.3%	+0.7%	+0.3	-0.7%	-13.1	+4.7	+0.6	+0.3%	+0.3%
Link	+1.2%	+0.1%	NA	-0.1%	-6.1	+6.3	+0.0	+0.0%	+0.2%
Liverpool	+0.3%	+0.8%	+0.0	+3.3%	-17.2	+11.9	+0.8	+3.1%	-0.5%
MSG	+1.1%	+0.1%	+1.4	+2.9%	-5.3	+10.5	+1.3	+0.6%	+0.4%
MINIMOD	+1.6%	+0.2%	+0.9	+0.6%	-2.2	+3.2	+0.3	+0.2%	+0.1%
VAR 3/	+0.5%	-0.3%	-0.2	-2.4%	+1.7	-2.6	+0.2	-0.1%	+0.3%
OECD	+1.5%	+0.7%	+1.9	+0.9%	-6.9	+3.3	+0.3	+0.2%	+0.1%
Taylor 3/	+1.6%	+1.2%	+0.6	+2.7%	NA	NA	+0.4	+0.9%	+0.6%
Wharton	+3.2%	-0.8%	+0.8	-2.4%	-5.5	+4.7	+0.1	-0.0%	+0.0%
DRI	NA	NA	NA	NA	NA	NA	NA	NA	NA

1/ Non-U.S. short-term interest rate NA; long-term reported instead.

2/ Non-U.S. current account is Japan, Germany, the United Kingdom, and Canada.

3/ CPI NA. GNP deflator reported instead.

Source: Frankel (1986)

Table 5: Estimates of Monetary Policy Multipliers

Simulation Effect in Second Year of Increase in Money Supply (4 Percent)

	Y	CPI	i (pts.)	Currency Value	CA ($b)	CA* ($b)	i* (pts.)	CPI*	Y*
Monetary Expansion in U.S. (Sim. D)	Effect in U.S.					Effect in Non-U.S.			
MCM	+1.5%	+0.4%	-2.2	-6.0%	-3.1	-3.5	-0.5	-0.6%	-0.7%
EEC 1/	+1.0%	+0.8%	-2.4	-4.0%	-2.8	+1.2	-0.5	-0.4%	+0.2%
EPA 2/	+1.2%	+1.0%	-2.2	-6.4%	-1.6	-10.1	-0.6	-0.5%	-0.4%
LINK	+1.0%	-0.4%	-1.4	-2.3%	-5.9	+1.5	NA	-0.1%	-0.1%
Liverpool	+0.1%	+3.7%	-0.3	-3.9%	-13.0	+0.1	-0.1	-0.0%	-0.0%
MSG	+0.3%	+1.5%	-0.8	-2.0%	+2.6	-4.4	-1.2	-0.7%	+0.4%
MINIMOD	+1.0%	+0.8%	-1.8	-5.7%	+2.8	-4.7	-0.1	-0.2%	-0.2%
VAR 3/	+3.0%	+0.4%	-1.9	-22.9%	+4.9	+5.1	+0.3	+0.1%	+0.4%
OECD	+1.6%	+0.7%	-0.8	-2.6%	-8.4	+3.1	-0.1	-0.1%	+0.3%
Taylor 3/	+0.6%	+1.2%	-0.4	-4.9%	NA	NA	-0.1	-0.2%	-0.2%
Wharton	+0.7%	+0.0%	-2.1	-1.0%	-5.1	+5.3	-1.3	-0.1%	+0.4%
DRI	+1.8%	+0.4%	-2.3	-14.6%	-1.4	+14.5	-1.1	-1.3%	-0.6%
Monetary Expansion in Non-U.S. OECD (Sim. H)	Effect in Non-U.S.					Effect in U.S.			
MCM	+1.5%	+0.6%	-2.1	-5.4%	+3.5	+0.1	-0.2	-0.2%	-0.0%
EEC 1/	+0.8%	+1.0%	-1.0	-2.3%	-5.2	+1.9	+0.0	+0.1%	+0.1%
EPA 2/	+0.0%	+0.0%	-0.1	-0.1%	-0.1	+0.1	-0.0	-0.0%	+0.0%
Link 4/	+0.8%	-0.6%	NA	-2.3%	-1.4	+3.5	+0.0	-0.0%	+0.1%
Liverpool	+0.4%	+2.8%	-0.9	-8.4%	+7.1	-8.2	-1.1	-3.4%	+1.6%
MSG	+0.2%	+1.5%	-0.7	-1.4%	-15.9	+12.0	-1.2	-0.6%	+0.3%
MINIMOD	+0.8%	+0.2%	-1.8	-4.8%	+3.6	-1.4	-0.6	-0.5%	-0.3%
VAR 3/	+0.7%	-0.5%	-3.0	-5.5%	+5.2	-10.0	+0.6	-0.7%	+1.2%
OECD	+0.8%	+0.3%	-1.3	-2.1%	-1.6	+2.3	-0.2	-0.1%	+0.1%
Taylor 3/	+0.8%	+0.7%	-0.3	-3.5%	NA	NA	-0.2	-0.5%	-0.1%
Wharton	+0.2%	-0.1%	-0.8	+0.2%	+2.6	+0.5	+0.0	+0.0%	+0.0%
DRI	NA	NA	NA	NA	NA	NA	NA	NA	NA

1/ Non-U.S. short-term interest rate NA; long-term reported instead.

2/ Non-U.S. current account is Japan, Germany, the United Kingdom, and Canada.

3/ CPI NA. GNP deflator reported instead

4/ Appreciation of non-U.S. currency NA; depreciation of dollar reported instead

Source: Frankel (1986)

Table 6. Effects of Welfare of Changes in Monetary Policy

	U.S. Welfare				Non-U.S. Welfare			
	gains	losses	no effect	frequency of gains	gains	losses	no effect	frequency of gains
1. Cooperative solution compared to non-cooperative solution	289	206	17	.56	297	198	17	.58
2. Averaging to estimate opponent's model, compared to knowing it with certainty under the non-cooperative solution	261	251	0	.51	282	230	0	.55
3. Cooperative solution, compared to non-cooperative solution, while averaging to estimate opponent's model.	265	245	2	.52	264	246	2	.52
4. Averaging to estimate own model, compared to believing one with certainty under non-cooperative solution	334	178	0	.65	301	211	0	.59
5. Cooperative solution compared to non-cooperative solution, while averaging to estimate own model	320	192	0	.63	320	192	0	.63
6. Cooperative solution with averaging to estimate own model compared to noncooperative solution with model certainty.	317	195	0	.62	296	216	0	.58
7. Averaging to estimate own model, compared to believing one with certainty, under cooperative solution	313	199	0	.62	297	221	0	.58

(Welfare gains are expressed in squared percentage points of GNP. All other numbers are in percentage points.)

Model Subscribed ro by the Unired States		Model Subscribed to by Europe					
		MCM	LIVPOOL	VAR	OECD	LINK	MSG
MCM							
Deviation from baseline							
M_{EUR}		32.357	-6.083	-54.887	47.588	52.077	-8.410
M_{US}		10.536	10.536	10.536	10.536	10.536	10.536
Perceived deviation of target from baseline							
OECD	Y	10.290	-0.608	-8.552	10.308	10.152	0.633
	CA	0.196	-1.415	-5.312	-0.246	-0.316	0.409
U.S.	Y	3.951	3.951	3.951	3.951	3.951	3.951
	CA	-0.188	-0.213	-0.244	-0.178	-0.175	-0.214
Perceived deviation of target from goal							
OECD	Y	-0.410	-11.308	-19.252	-0.392	-0.548	-10.067
	CA	-1.417	0.372	2.740	-1.165	-0.787	-0.632
U.S.	Y	-1.019	-1.019	-1.019	-1.019	-1.019	-1.019
	CA	-2.864	-2.889	-2.920	-2.854	-2.851	-2.890
Perceived gain for:							
OECD		1.2222	0.2732	5.0793	1.0749	1.0889	0.2226
U.S.		0.1667	0.1572	0.1451	0.1705	0.1716	0.1567
LIVPOOL							
Deviation from baseline							
M_{EUR}		32.357	-6.083	-54.887	47.588	52.077	-8.410
M_{US}		-78.579	-78.579	-78.579	-78.579	-78.579	-78.579
Perceived deviation of target from baseline							
OECD	Y	25.885	-0.608	-17.463	3.624	12.380	-8.278
	CA	0.994	-1.714	-15.732	-1.811	-1.055	2.242
U.S.	Y	10.978	-4.398	-23.919	17.071	18.866	-5.329
	CA	4.838	6.854	9.414	4.039	3.803	6.976
Perceived deviation of target from goal							
OECD	Y	15.185	-11.308	-28.163	-7.076	1.680	-18.978
	CA	-0.619	0.073	-7.681	-2.730	-1.526	1.201
U.S.	Y	6.008	-9.368	-28.889	12.101	13.896	-10.299
	CA	-0.879	1.139	3.698	-1.678	-1.913	1.260
Perceived gain for:							
OECD		-0.8653	0.2910	-6.0092	-0.2370	0.8357	-2.5050
U.S.		2.0270	1.4754	-6.8234	0.7866	0.2631	1.2728
VAR							
Deviation from baseline							
M_{EUR}		32.357	-6.083	-54.887	47.588	52.077	-8.410
M_{US}		1.585	1.585	1.585	1.585	1.585	1.585
Perceived deviation of target from baseline							
OECD	Y	11.856	-0.608	-9.447	9.637	10.376	-0.262
	CA	0.276	-1.445	-6.358	-0.404	-0.390	0.593
U.S.	Y	10.896	-0.636	-15.277	15.465	16.812	-1.334
	CA	-2.002	0.435	3.528	-2.967	-3.251	0.582
Perceived deviation of target from goal							
OECD	Y	1.156	-11.308	-20.147	-1.063	-0.324	-10.962
	CA	-1.337	0.342	1.693	-1.323	-0.861	-0.448
U.S.	Y	5.926	-5.606	-20.247	10.495	11.842	-6.304
	CA	-4.747	-2.311	0.782	-5.712	-5.997	-2.163
Perceived gain for:							
OECD		1.2400	0.2761	5.3450	1.0130	1.0745	0.0608
U.S.		-1.1104	0.0802	-3.3878	-2.5383	-3.0626	0.0414

Model Subscribed to by the United States		Model Subscribed to by Europe					
		MCM	LIVPOOL	VAR	OECD	LINK	MSG
OECD							
Deviation from baseline							
M_{EUR}		32.357	-6.083	-54.887	47.588	52.077	-8.410
M_{US}		4.525	4.525	4.525	4.525	4.525	4.525
Perceived deviation of target from baseline							
OECD	Y	11.342	-0.608	-9.153	9.857	10.302	0.032
	CA	0.249	-1.435	-6.015	-0.352	-0.366	0.532
U.S.	Y	2.619	1.658	0.438	3.000	3.112	1.600
	CA	0.233	-0.332	-1.049	0.456	0.522	-0.366
Perceived deviation of target from goal							
OECD	Y	0.642	-11.308	-19.853	-0.843	-0.398	-10.668
	CA	-1.363	0.352	2.037	-1.271	-0.837	-0.508
U.S.	Y	-2.351	-3.312	-4.532	-1.970	-1.858	-3.370
	CA	-2.826	-3.390	-4.107	-2.602	-2.536	-3.425
Perceived gain for:							
OECD		1.2397	0.2752	5.2917	1.0351	1.0795	0.1167
U.S.		0.2836	-0.0064	-0.4629	0.3815	0.4085	-0.0259
LINK							
Deviation from baseline							
M_{EUR}		32.357	-6.083	-54.887	47.588	52.077	-8.410
M_{US}		5.332	5.332	5.332	5.332	5.332	5.332
Perceived deviation of target from baseline							
OECD	Y	11.201	-0.608	-9.072	9.918	10.282	0.113
	CA	0.242	-1.432	-5.920	-0.338	-0.359	0.516
U.S.	Y	2.142	1.181	-0.039	2.523	2.635	1.123
	CA	0.526	-0.339	-1.438	0.869	0.970	-0.392
Perceived deviation of target from goal							
OECD	Y	0.501	-11.308	-19.772	-0.782	-0.418	-10.587
	CA	-1.371	0.355	2.131	-1.257	-0.830	-0.525
U.S.	Y	-2.828	-3.789	-5.009	-2.447	-2.335	-3.847
	CA	-2.809	-3.674	-4.773	-2.466	-2.365	-3.727
Perceived gain for:							
OECD		1.2387	0.2749	5.2713	1.0408	1.0809	0.1316
U.S.		0.3840	-0.0562	-0.7864	0.5254	0.5636	-0.0866
MSG							
Deviation from baseline							
M_{EUR}		32.357	-6.083	-54.887	47.588	52.077	-8.410
M_{US}		62.681	62.681	62.681	62.681	62.681	62.681
Perceived deviation of target from baseline							
OECD	Y	1.165	-0.608	-3.337	14.219	8.848	5.848
	CA	-0.272	-1.240	0.786	0.669	0.117	-0.664
U.S.	Y	7.128	4.245	0.585	8.270	8.607	4.070
	CA	3.534	0.577	-3.178	4.706	5.052	0.398
Perceived deviation of target from goal							
OECD	Y	-9.535	-11.308	-14.037	3.519	-1.852	-4.852
	CA	-1.885	0.547	8.837	-0.250	-0.355	-1.705
U.S.	Y	2.158	-0.725	-4.385	3.300	3.637	-0.900
	CA	0.629	-2.329	-6.084	1.801	2.146	-2.508
Perceived gain for:							
OECD		0.1090	0.2518	-2.5940	1.1254	1.1235	0.6663
U.S.		0.7405	0.4444	-1.8623	0.4871	0.3723	0.3824

Table 8. Effect of Averaging to Estimate Opponent's Model under Nash Noncooperative Solution
True Gain for United States of Moving from Nash Noncooperative with Certainty
(All gains expressed in squared percentage points of GNP)

Model Subscribed to by the United States	Model Subscribed to by Europe					
	MCM	LIVPOOL	VAR	OECD	LINK	MSG
MCM						
Model representing reality:						
MCM	-0.00	0.00	0.00	0.00	-0.00	0.00
LIVPOOL	0.29	0.00	0.86	-0.27	0.14	0.04
VAR	0.27	-0.00	0.43	-0.22	0.12	-0.03
OECD	-0.01	0.00	0.04	0.01	-0.00	0.01
LINK	-0.02	0.00	0.08	0.01	-0.01	0.07
MSG	-0.01	0.00	0.38	-0.01	0.01	0.07
LIVPOOL						
Model representing reality:						
MCM	-3.29	-4.07	7.36	22.89	5.02	1.10
LIVPOOL	0.07	-0.22	-8.05	7.01	-1.59	-1.15
VAR	-2.65	-16.28	-11.90	54.31	19.92	-5.72
OECD	-3.34	-4.76	6.98	26.14	6.06	0.82
LINK	-1.16	-1.93	2.13	10.63	2.53	0.14
MSG	1.16	-0.52	-6.08	0.46	0.58	-1.51
VAR						
Model representing reality:						
MCM	0.15	-0.11	1.12	0.63	0.58	-0.11
LIVPOOL	-0.83	0.51	8.35	-0.34	-1.64	0.64
VAR	-0.41	-0.39	-3.08	-0.42	-1.18	-0.51
OECD	0.11	0.02	2.19	0.41	0.39	0.06
LINK	0.08	0.00	1.37	0.16	0.20	-0.07
MSG	0.07	-0.12	1.82	0.04	-0.02	-0.07
OECD						
Model representing reality:						
MCM	0.01	-0.01	-0.03	0.02	0.02	-0.01
LIVPOOL	-0.12	0.04	0.17	0.02	-0.16	0.03
VAR	-0.10	-0.03	-0.41	-0.06	-0.21	-0.04
OECD	0.00	-0.00	0.00	-0.01	0.00	-0.00
LINK	0.01	-0.00	0.01	-0.00	0.00	-0.00
MSG	0.01	-0.01	0.00	0.00	-0.00	-0.02
LINK						
Model representing reality:						
MCM	0.00	-0.00	-0.01	0.00	0.00	-0.00
LIVPOOL	-0.04	0.01	0.04	0.01	-0.04	0.01
VAR	-0.03	-0.01	-0.11	-0.02	-0.06	-0.01
OECD	0.00	0.00	-0.00	-0.00	0.00	-0.00
LINK	0.00	-0.00	0.00	-0.00	0.00	-0.00
MSG	0.00	-0.00	-0.00	0.00	-0.00	-0.01
MSG						
Model representing reality:						
MCM	-3.78	9.55	92.01	-3.68	-3.62	106.30
LIVPOOL	-4.50	6.02	28.08	-7.80	-8.83	46.72
VAR	-21.39	37.68	213.26	-29.54	-31.31	319.68
OECD	-5.77	12.82	103.65	-6.20	-6.17	135.76
LINK	-2.30	5.15	41.87	-2.38	-2.33	56.47
MSG	-0.06	-0.11	1.43	-0.25	-0.36	2.77

Table 9. Effect of Averaging to Estimate Opponent's Model Under Nash Noncooperative Solution
True Gain for Europe of Moving from Nash Noncooperative with Certainty
(Gains expressed in squared percentage points of GNP)

Model Subscribed to by the United States	Model Subscribed to by Europe					
	MCM	LIVPOOL	VAR	OECD	LINK	MSG
MCM						
Model representing reality:						
MCM	-0.01	0.01	1.15	-0.05	0.03	0.20
LIVPOOL	1.93	-0.00	3.47	-1.24	0.63	0.08
VAR	0.94	-0.02	-0.05	-0.70	0.35	-0.36
OECD	-0.02	0.00	0.38	-0.00	0.00	0.07
LINK	-0.04	0.00	0.40	0.01	-0.00	0.08
MSG	0.15	-0.00	0.32	-0.13	0.07	-0.00
LIVPOOL						
Model representing reality:						
MCM	-2.21	0.07	2.85	20.61	-1.02	1.30
LIVPOOL	-10.51	-0.00	0.69	53.33	-11.34	5.06
VAR	0.36	-1.17	-13.84	-2.24	-2.21	-2.18
OECD	1.10	-0.68	-5.85	1.05	0.85	-1.51
LINK	0.68	0.01	-3.56	1.86	-0.01	-0.81
MSG	-0.34	-0.75	-3.17	3.84	-0.13	-0.47
VAR						
Model representing reality:						
MCM	-0.01	0.44	15.44	0.78	0.21	0.79
LIVPOOL	-2.31	0.00	30.46	4.69	-2.24	0.09
VAR	-3.02	1.86	1.10	-3.37	-6.25	1.74
OECD	0.12	-0.17	1.61	0.11	0.10	-0.12
LINK	0.07	0.05	3.70	0.02	0.02	0.15
MSG	-0.23	-0.14	1.02	0.36	-0.31	-0.18
OECD						
Model representing reality:						
MCM	-0.00	0.03	0.39	0.05	0.01	0.02
LIVPOOL	-0.44	0.00	0.48	0.51	-0.28	-0.01
VAR	-0.43	0.13	0.05	-0.09	-0.57	0.17
OECD	0.01	-0.01	-0.01	0.01	0.00	-0.02
LINK	0.01	0.00	0.08	-0.00	0.00	-0.01
MSG	-0.05	-0.01	-0.03	0.05	-0.04	-0.01
LINK						
Model representing reality:						
MCM	-0.00	0.01	0.09	0.01	0.00	0.00
LIVPOOL	-0.13	0.00	0.10	0.15	-0.08	-0.00
VAR	-0.13	0.04	0.01	-0.02	-0.16	0.05
OECD	0.00	-0.00	-0.01	0.00	0.00	-0.01
LINK	0.00	0.00	0.02	-0.00	0.00	-0.00
MSG	-0.01	-0.00	-0.01	0.01	-0.01	-0.00
MSG						
Model representing reality:						
MCM	-1.10	4.97	83.06	0.31	0.53	95.59
LIVPOOL	3.78	0.01	236.94	1.16	-1.98	65.60
VAR	-19.52	22.91	-12.19	-33.77	-37.22	88.02
OECD	0.13	-0.21	3.85	0.14	0.08	3.74
LINK	-0.17	0.43	6.50	0.02	0.06	13.76
MSG	-0.11	0.27	17.62	-0.97	-1.43	1.11

Table 10. Effect of Coordination, While Averaging to Estimate Opponent's Model

(Welfare gains expressed in squared percentage points of GNP. All other numbers are percentage points.)

Model Subscribed to by the United States	Model Subscribed to by Europe					
	MCM	LIVPOOL	VAR	OECD	LINK	MSG
MCM						
Bargaining change in policy						
M_{EUR}	2.513	-0.067	-2.431	0.070	1.426	0.465
M_{US}	-0.131	-0.013	-0.478	-0.382	0.268	0.405
Perceived change in targets						
EUR. Y	0.965	-0.007	-0.473	0.043	0.278	0.064
CA	0.024	-0.016	-0.346	0.006	-0.009	-0.043
U.S. Y	-0.049	-0.005	-0.179	0.143	0.101	0.152
CA	0.004	0.000	0.008	-0.008	-0.004	-0.008
Perceived gain for:						
EUR.	0.0075	0.0000	0.0521	0.0022	0.0004	0.0053
U.S.	0.0006	-0.0000	-0.0009	-0.0002	0.0003	-0.0001
LIVPOOL						
Bargaining change in policy						
M_{EUR}	-32.815	1.343	100.020	-19.499	-20.472	25.819
M_{US}	12.551	11.859	-28.607	56.675	1.249	-1.149
Perceived change in targets						
EUR. Y	-14.502	0.134	14.643	0.351	-4.126	1.176
CA	-0.407	0.360	8.580	1.172	0.169	-1.896
U.S. Y	-12.812	0.834	-39.293	-6.383	-8.157	10.299
CA	0.678	-1.057	-2.868	-3.690	0.970	-1.259
Perceived gain for:						
EUR.	2.2122	0.0059	13.8595	0.7185	0.0333	0.5607
U.S.	-0.0528	0.2356	8.1347	-0.6076	1.7877	1.1671
VAR						
Bargaining change in policy						
M_{EUR}	-6.116	-0.140	-6.087	-10.724	-5.091	-13.057
M_{US}	-6.996	7.909	20.950	0.691	-8.102	16.939
Perceived change in targets						
EUR. Y	-1.069	-0.014	1.030	-2.093	-0.816	1.041
CA	0.008	-0.007	1.724	0.109	-0.028	0.622
U.S. Y	-7.082	5.890	13.886	-2.699	-7.604	8.787
CA	0.170	0.254	1.036	0.701	0.071	1.354
Perceived gain for:						
EUR.	0.0161	-0.0026	-0.7699	-0.0514	-0.0184	0.2401
U.S.	0.4444	0.3881	3.5140	0.9982	1.2795	0.6059

Model Subscribed to by the United States	Model Subscribed to by Europe					
	MCM	LIVPOOL	VAR	OECD	LINK	MSG
OECD						
Bargaining change in policy						
MS	-0.393	0.114	10.606	4.507	1.863	5.329
M	-1.173	0.059	-4.424	1.505	0.916	3.876
Perceived change in targets						
EUR. Y	0.058	0.011	1.414	1.014	0.350	0.654
CA	0.007	0.027	0.747	-0.014	-0.007	-0.476
U.S. Y	-0.479	0.026	-1.504	0.715	0.413	1.684
CA	0.057	-0.001	0.393	-0.015	-0.022	-0.130
Perceived gain for:						
EUR.	0.0018	-0.0001	0.0612	0.0019	0.0000	0.0406
U.S.	-0.0034	0.0011	0.0474	0.0180	0.0062	0.0244
LINK						
Bargaining change in policy						
MS	0.146	0.164	24.381	5.190	3.376	7.186
M	-1.340	-1.290	-16.971	4.779	4.282	7.465
Perceived change in targets						
EUR. Y	0.289	0.016	2.570	1.396	0.568	1.106
CA	0.013	0.035	0.922	0.037	0.009	-0.688
U.S. Y	-0.331	-0.318	-3.633	1.325	1.155	2.046
CA	0.054	0.053	1.193	-0.065	-0.087	-0.122
Perceived gain for:						
EUR.	0.0011	0.0003	0.3126	0.0145	0.0036	0.0626
U.S.	0.0004	0.0006	0.1728	0.0256	0.0126	0.0538
MSG						
Bargaining change in policy						
MS	4.484	-0.909	234.161	-17.695	-5.098	-20.981
M	-46.403	36.845	-311.983	-26.352	-49.487	47.126
Perceived change in targets						
EUR. Y	9.802	-0.091	9.780	-5.515	0.218	3.664
CA	0.456	-0.093	-8.563	-0.302	-0.371	0.590
U.S. Y	-3.144	2.695	-5.837	-3.303	-4.094	1.961
CA	-0.429	0.544	12.815	-1.801	-1.217	-0.829
Perceived gain for:						
EUR.	1.1099	-0.0082	12.1887	0.0516	-0.0458	0.4432
U.S.	0.0607	0.1167	-1.4096	0.3265	0.3813	-0.3281

M_{EUR} = Money supply of non-U.S. OECD ("Europe").
M_{US} = Money supply of United States.

Table 11. Effect of Coordination, Compared to Noncooperative Solution with Averaging: True Gains from Coordination for the United States (Gains expressed in squared percentage points of GNP)

Model Subscribed to by the United States	Model Subscribed to by Europe					
	MCM	LIVPOOL	VAR	OECD	LINK	MSG
MCM						
Model representing reality:						
MCM	0.00	-0.00	-0.00	-0.00	0.00	-0.00
LIVPOOL	-0.31	-0.00	-0.45	-0.05	-0.31	-0.02
VAR	-0.27	0.00	-0.33	-0.10	-0.30	-0.01
OECD	0.02	-0.00	-0.02	-0.01	0.00	-0.00
LINK	0.03	-0.00	-0.04	-0.00	0.01	0.00
MSG	0.01	-0.00	-0.22	-0.00	-0.02	0.03
LIVPOOL						
Model representing reality:						
MCM	2.98	2.83	-8.47	9.87	0.31	-0.29
LIVPOOL	-0.05	0.24	8.13	-0.61	1.79	1.17
VAR	1.52	11.53	7.85	25.64	-3.89	7.44
OECD	2.98	3.33	-8.30	10.79	0.08	0.06
LINK	1.01	1.36	-2.67	4.34	-0.05	0.20
MSG	-1.18	0.40	6.00	0.27	-0.43	1.42
VAR						
Model representing reality:						
MCM	-0.25	0.11	-0.10	0.01	-0.30	0.02
LIVPOOL	1.21	-0.49	-1.77	1.57	1.69	-1.60
VAR	0.44	0.39	3.51	1.00	1.28	0.61
OECD	-0.20	-0.01	-0.48	-0.07	-0.21	-0.39
LINK	-0.13	-0.00	-0.29	-0.09	-0.13	-0.29
MSG	-0.11	0.11	0.07	0.02	0.03	-0.35
OECD						
Model representing reality:						
MCM	-0.02	0.00	-0.10	0.02	0.02	0.05
LIVPOOL	0.15	-0.00	1.96	-0.98	-0.46	-0.16
VAR	0.15	0.00	0.00	-0.88	-0.44	0.10
OECD	-0.00	0.00	0.05	0.02	0.01	0.02
LINK	-0.01	0.00	0.15	0.04	0.02	0.06
MSG	-0.01	0.01	0.74	-0.04	-0.02	0.27
LINK						
Model representing reality:						
MCM	-0.02	-0.02	-0.66	0.04	0.04	0.03
LIVPOOL	0.10	0.08	4.19	-1.48	-1.14	-0.42
VAR	0.13	-0.07	-2.22	-1.77	-1.48	-0.12
OECD	0.00	-0.00	-0.30	-0.04	-0.04	-0.05
LINK	0.00	0.00	0.17	0.03	0.01	0.05
MSG	-0.00	-0.01	1.43	-0.06	-0.06	0.39
MSG						
Model representing reality:						
MCM	3.85	-7.45	-92.83	2.94	3.88	-10.23
LIVPOOL	5.13	-4.84	-27.95	6.79	7.78	-6.00
VAR	22.57	-29.52	-215.91	22.10	28.87	-31.82
OECD	5.91	-10.04	-104.66	4.27	6.07	-13.68
LINK	2.34	-4.03	-42.28	1.53	2.30	-5.76
MSG	0.06	0.12	-1.41	0.33	0.38	-0.33

Table 12. Effect of Coordination, Compared to Noncooperative Solution with Averaging: True Gains from Coordination for Europe (Gains expressed in squared percentage points of GNP)

Model Subscribed to by the United States	Model Subscribed to by Europe					
	MCM	LIVPOOL	VAR	OECD	LINK	MSG
MCM						
Model representing reality:						
MCM	0.01	-0.01	-0.57	0.00	-0.07	0.03
LIVPOOL	1.53	0.00	-1.87	-0.06	-1.29	0.01
VAR	-0.97	0.02	0.05	-0.21	-0.83	-0.20
OECD	0.02	-0.00	-0.22	0.00	-0.01	0.03
LINK	0.04	-0.00	-0.21	0.00	0.00	0.02
MSG	-0.17	0.00	-0.19	-0.01	-0.14	0.01
LIVPOOL						
Model representing reality:						
MCM	2.21	-0.03	-2.91	4.08	2.91	-0.90
LIVPOOL	10.49	0.01	0.26	12.37	14.68	-3.72
VAR	-0.38	0.99	13.86	-7.26	1.63	2.09
OECD	-1.13	0.51	5.72	0.72	-0.51	1.44
LINK	-0.67	0.02	3.55	-0.00	0.03	0.75
MSG	0.30	0.54	3.12	1.51	0.72	0.56
VAR						
Model representing reality:						
MCM	0.02	-0.43	-4.25	0.36	0.09	-2.97
LIVPOOL	3.37	-0.00	-4.61	7.93	4.43	-1.74
VAR	4.47	-1.76	-0.77	4.14	5.59	-0.99
OECD	-0.20	0.16	0.17	-0.05	-0.07	-0.28
LINK	-0.10	-0.05	-0.79	-0.08	-0.02	-0.83
MSG	0.32	0.14	0.43	0.80	0.50	0.24
OECD						
Model representing reality:						
MCM	0.00	0.01	2.90	-0.19	-0.09	0.38
LIVPOOL	0.24	-0.00	7.05	-3.89	-1.70	-0.03
VAR	0.59	-0.04	0.06	-2.75	-1.30	-2.06
OECD	-0.02	0.01	0.71	0.00	-0.00	0.31
LINK	-0.01	0.01	0.92	0.01	0.00	0.23
MSG	0.03	0.00	0.51	-0.42	-0.19	0.04
LINK						
Model representing reality:						
MCM	0.00	0.09	6.53	-0.15	-0.09	0.39
LIVPOOL	-0.08	0.00	13.62	-4.54	-3.16	-0.15
VAR	0.45	0.25	0.31	-4.66	-3.68	-3.51
OECD	-0.01	-0.02	1.32	0.01	0.00	0.45
LINK	0.00	0.01	2.02	0.02	0.00	0.30
MSG	-0.01	-0.02	0.73	-0.53	-0.38	0.06
MSG						
Model representing reality:						
MCM	1.11	-3.93	-82.17	-0.16	-0.01	-11.01
LIVPOOL	-2.41	-0.01	-235.85	12.60	4.99	-3.66
VAR	21.84	-18.50	12.19	25.66	31.56	-12.63
OECD	-0.17	0.21	-3.86	0.05	0.04	-0.31
LINK	0.15	-0.33	-6.48	-0.25	-0.05	-1.85
MSG	0.29	-0.20	-17.57	2.18	1.59	0.44

Table 13. Effect of Averaging to Estimate Own Model, While Under Noncooperative Solution: True Gains for the United States (Gains expressed in squared percentage points of GNP)

Model Subscribed to by the United States	Model Subscribed to by Europe					
	MCM	LIVPOOL	VAR	OECD	LINK	MSG
MCM						
Model representing reality:						
MCM	-0.03	-0.02	-0.00	-0.03	-0.03	-0.02
LIVPOOL	2.69	0.26	6.00	4.44	5.68	0.34
VAR	2.85	-0.07	1.98	4.36	5.40	-0.15
OECD	-0.22	0.07	0.54	-0.28	-0.32	0.10
LINK	-0.41	0.05	0.85	-0.52	-0.58	0.10
MSG	-0.84	0.04	3.45	-0.81	-0.74	0.20
LIVPOOL						
Model representing reality:						
MCM	8.06	7.29	18.72	34.24	16.37	12.45
LIVPOOL	-2.41	-2.15	-1.68	5.77	-2.31	-2.87
VAR	29.88	28.11	52.53	83.10	47.70	39.50
OECD	8.64	7.81	20.39	37.90	17.76	13.43
LINK	3.50	3.19	8.03	15.13	6.99	5.30
MSG	1.21	1.37	0.08	0.15	0.20	0.54
VAR						
Model representing reality:						
MCM	0.24	-0.02	1.22	0.71	0.63	-0.02
LIVPOOL	0.74	0.21	13.27	3.43	2.94	0.40
VAR	1.10	-0.07	0.70	2.51	2.28	-0.15
OECD	-0.16	0.05	2.69	0.04	-0.01	0.12
LINK	-0.32	0.04	2.14	-0.38	-0.39	0.11
MSG	-0.73	0.05	5.15	-0.76	-0.78	0.20
OECD						
Model representing reality:						
MCM	0.03	0.02	0.02	0.04	0.04	0.02
LIVPOOL	1.71	-0.09	5.16	4.09	4.73	-0.04
VAR	1.65	0.05	2.54	3.31	3.75	0.05
OECD	-0.27	0.01	0.47	-0.38	-0.40	0.03
LINK	-0.40	0.03	0.77	-0.56	-0.59	0.06
MSG	-0.80	0.12	3.24	-0.80	0.77	0.21
LINK						
Model representing reality:						
MCM	0.01	0.02	0.03	0.01	0.01	0.02
LIVPOOL	1.87	-0.07	5.04	4.16	4.93	-0.02
VAR	1.81	0.03	2.62	3.50	4.05	0.03
OECD	-0.27	0.01	0.46	-0.37	-0.40	0.03
LINK	-0.41	0.03	0.76	-0.56	-0.59	0.06
MSG	-0.81	0.11	3.22	-0.80	-0.76	0.21
MSG						
Model representing reality:						
MCM	0.08	13.43	95.90	0.18	0.24	110.18
LIVPOOL	4.21	11.02	35.96	3.85	3.84	51.67
VAR	5.57	53.50	219.92	2.79	2.71	334.94
OECD	0.11	18.78	109.80	-0.34	-0.31	141.72
LINK	-0.33	7.54	44.96	-0.54	-0.53	58.88
MSG	-0.85	-0.61	3.24	-0.79	-0.78	2.34

Table 14. Effect of Averaging to Estimate Own Model, While Under Noncooperative Solution: True Gains for Europe
(Gains expressed in squared percentage points of GNP)

Model Subscribed to by the United States	Model Subscribed to by Europe					
	MCM	LIVPOOL	VAR	OECD	LINK	MSG
MCM						
Model representing reality:						
MCM	-1.91	0.45	10.59	-1.72	-1.44	0.92
LIVPOOL	12.73	-0.04	21.65	20.88	26.60	0.08
VAR	13.54	0.32	-5.91	18.56	21.78	-0.56
OECD	-1.04	0.03	3.47	-1.09	-1.07	0.20
LINK	-1.15	0.13	3.84	-1.27	-1.29	0.32
MSG	1.44	-0.07	1.77	2.31	2.92	-0.08
LIVPOOL						
Model representing reality:						
MCM	-2.03	-1.97	4.01	22.84	1.93	-0.74
LIVPOOL	0.08	-0.06	19.79	74.41	13.52	5.09
VAR	-7.56	-7.43	-8.62	-9.03	-8.47	-8.13
OECD	1.75	1.88	0.91	1.27	0.98	1.21
LINK	-0.39	-0.21	-0.98	0.79	-1.04	-0.95
MSG	1.82	1.81	3.11	6.48	2.72	2.17
VAR						
Model representing reality:						
MCM	-1.93	0.41	23.83	-0.73	-1.05	1.01
LIVPOOL	8.95	-0.04	48.74	26.70	23.62	0.09
VAR	6.14	0.15	-5.04	11.89	11.01	-0.42
OECD	-0.80	0.04	5.01	-0.92	-0.92	0.20
LINK	-1.06	0.12	7.04	-1.24	-1.25	0.34
MSG	1.04	-0.06	2.84	2.71	2.43	-0.10
OECD						
Model representing reality:						
MCM	-1.92	0.14	9.12	-1.52	-1.33	0.39
LIVPOOL	10.85	-0.04	18.72	22.56	25.62	-0.01
VAR	9.83	-0.94	-6.03	16.46	18.03	-1.37
OECD	-0.94	0.14	3.29	-1.05	-1.04	0.23
LINK	-1.11	0.10	3.45	-1.27	-1.28	0.20
MSG	1.22	0.02	1.67	2.43	2.74	0.01
LINK						
Model representing reality:						
MCM	-1.92	0.17	8.92	-1.57	-1.36	0.42
LIVPOOL	11.16	-0.04	18.34	22.21	25.83	-0.00
VAR	10.44	-0.85	-6.04	16.89	18.81	-1.32
OECD	-0.96	0.13	3.26	-1.06	-1.05	0.23
LINK	-1.12	0.10	3.40	-1.27	-1.28	0.21
MSG	1.26	0.01	1.65	2.40	2.78	0.01
MSG						
Model representing reality:						
MCM	-1.89	9.20	98.69	-1.31	-1.20	100.26
LIVPOOL	15.56	-0.01	254.60	23.89	24.66	65.59
VAR	19.25	41.26	-10.38	14.90	14.55	105.36
OECD	-1.14	-0.96	5.52	-1.01	-0.99	3.07
LINK	-2.21	0.87	10.56	-1.27	-1.27	14.34
MSG	1.81	-0.18	17.40	2.52	2.58	0.59

Table 15. Effect of Averaging to Estimate Own Model, While Under Cooperative Solution: True Gain for the United States (Gains expressed in squared percentage points of GNP)

Model Subscribed to by the United States	Model Subscribed to by Europe					
	MCM	LIVPOOL	VAR	OECD	LINK	MSG
MCM						
Model representing reality:						
MCM	-0.09	-0.08	-0.06	-0.09	-0.09	-0.08
LIVPOOL	2.95	0.50	5.84	5.00	6.10	0.56
VAR	2.65	-0.27	1.68	4.49	5.38	-0.31
OECD	-0.17	0.11	0.56	-0.24	-0.27	0.13
LINK	-0.35	0.12	0.88	-0.46	-0.51	0.14
MSG	-0.68	0.20	3.45	-0.64	-0.57	0.27
LIVPOOL						
Model representing reality:						
MCM	8.32	8.47	19.77	1.42	10.98	11.59
LIVPOOL	-2.18	-1.92	-1.52	-0.39	-2.26	-2.65
VAR	30.81	32.66	56.38	2.94	31.48	37.58
OECD	9.05	9.29	21.76	1.02	11.67	12.59
LINK	3.71	3.84	8.64	0.23	4.58	5.03
MSG	1.38	1.65	0.32	-0.42	0.21	0.79
VAR						
Model representing reality:						
MCM	0.28	-0.08	0.14	0.01	0.33	0.02
LIVPOOL	0.61	0.44	6.94	2.44	3.14	1.59
VAR	0.86	-0.27	0.07	1.74	1.98	-0.45
OECD	-0.02	0.09	1.03	-0.26	-0.14	0.49
LINK	-0.20	0.11	0.13	-0.38	-0.38	0.43
MSG	-0.52	0.22	3.41	-0.66	-0.64	0.78
OECD						
Model representing reality:						
MCM	-0.01	-0.03	0.09	-0.06	-0.05	-0.07
LIVPOOL	1.93	0.12	3.27	5.30	5.59	0.34
VAR	1.41	-0.12	2.75	4.05	4.19	-0.20
OECD	-0.23	0.06	0.47	-0.35	-0.36	0.05
LINK	-0.34	0.10	0.68	-0.52	-0.54	0.06
MSG	-0.64	0.28	2.66	-0.60	-0.58	0.11
LINK						
Model representing reality:						
MCM	-0.03	-0.02	0.63	-0.09	-0.09	-0.07
LIVPOOL	2.05	0.09	1.07	5.88	6.36	0.64
VAR	1.52	-0.08	4.76	5.08	5.39	-0.03
OECD	-0.23	0.06	0.82	-0.28	-0.31	0.13
LINK	-0.34	0.10	0.65	-0.51	-0.54	0.07
MSG	-0.65	0.29	1.95	-0.59	-0.55	-0.01
MSG						
Model representing reality:						
MCM	-0.04	11.27	96.67	0.87	-0.08	14.05
LIVPOOL	3.83	10.09	36.08	5.10	5.13	11.19
VAR	4.19	45.15	222.37	10.03	4.95	46.89
OECD	0.01	16.05	110.85	1.64	-0.16	19.69
LINK	-0.30	6.49	45.44	0.38	-0.43	8.25
MSG	-0.69	-0.45	3.38	-0.70	-0.64	0.06

Table 16. Effect of Averaging to Estimate Own Model, Under Cooperative Solution: True Gain for Europe
(Gains expressed in squared percentage points of GNP)

Model Subscribed to by the United States	Model Subscribed to by Europe					
	MCM	LIVPOOL	VAR	OECD	LINK	MSG
MCM						
Model representing reality:						
MCM	-1.20	1.16	10.72	-0.96	-0.70	1.40
LIVPOOL	12.43	-0.48	19.61	21.74	26.83	-0.46
VAR	13.19	-0.07	-6.31	19.09	21.87	-0.39
OECD	-0.89	0.18	3.47	-0.94	-0.92	0.25
LINK	-0.89	0.39	3.92	-1.01	-1.02	0.48
MSG	1.33	-0.19	1.52	2.34	2.88	-0.21
LIVPOOL						
Model representing reality:						
MCM	-1.32	-1.30	4.79	-1.14	0.75	-0.43
LIVPOOL	-0.34	-0.51	18.39	8.27	9.73	3.31
VAR	-7.93	-7.64	-9.03	0.09	-8.27	-8.44
OECD	1.93	2.21	1.20	-0.35	0.79	1.44
LINK	-0.14	0.02	-0.71	-0.80	-0.80	-0.62
MSG	1.75	1.90	3.04	1.01	2.01	1.97
VAR						
Model representing reality:						
MCM	-1.22	1.11	13.35	-1.16	-0.64	3.89
LIVPOOL	7.45	-0.48	22.44	13.64	20.98	1.29
VAR	4.31	-0.34	-5.75	10.74	11.29	-1.56
OECD	-0.57	0.21	3.38	-0.83	-0.81	0.75
LINK	-0.76	0.39	4.40	-0.92	-0.99	1.28
MSG	0.82	-0.17	1.28	1.43	2.12	-0.28
OECD						
Model representing reality:						
MCM	-1.21	0.82	6.54	-0.66	-0.54	0.71
LIVPOOL	10.60	-0.48	10.76	25.49	27.16	-0.41
VAR	9.28	-1.42	-6.53	18.91	19.51	0.13
OECD	-0.78	0.29	2.74	-0.90	-0.89	0.09
LINK	-0.85	0.35	2.72	-1.02	-1.01	0.24
MSG	1.12	-0.09	1.07	2.68	2.84	-0.13
LINK						
Model representing reality:						
MCM	-1.21	0.78	3.00	-0.72	-0.56	0.74
LIVPOOL	10.93	-0.48	4.18	26.16	28.62	-0.29
VAR	9.72	-1.53	-6.76	21.17	22.26	1.75
OECD	-0.79	0.30	2.10	-0.92	-0.90	-0.06
LINK	-0.86	0.35	1.63	-1.02	-1.02	0.18
MSG	1.16	-0.08	0.81	2.80	3.05	-0.17
MSG						
Model representing reality:						
MCM	-1.19	8.87	99.51	-0.75	-1.02	16.39
LIVPOOL	13.75	-0.45	253.07	9.69	21.21	3.22
VAR	16.54	36.47	-10.77	22.61	19.83	29.57
OECD	-0.95	-0.80	5.68	-1.04	-0.96	-0.21
LINK	-0.92	1.04	10.80	-0.77	-1.01	2.68
MSG	1.51	-0.38	17.23	1.19	2.31	-1.09

Table 17. Gains to Unilateral Switch to True Model for the United States Under Nash Noncooperative Solution (using monetary policy) (All numbers expressed in squared percentage points of GNP)

Model Subscribed to by the United States		Model Subscribed to by Europe					
		MCM	LIVPOOL	VAR	OECD	LINK	MSG
MCM							
Model representing reality:							
MCM	(0.0000)*	0.00	0.00	0.00	0.00	0.00	0.00
LIVPOOL	(0.0130)	5.11	2.41	7.68	-1.34	7.99	3.21
VAR	(0.4349)	1.75	0.00	1.28	1.86	3.12	0.01
OECD	(0.0128)	0.06	0.05	0.08	0.10	0.08	0.07
LINK	(0.0133)	-0.00	0.02	0.09	0.04	0.02	0.04
MSG	(2.4462)	0.01	0.65	0.21	-0.02	0.04	-2.14
LIVPOOL							
Model representing reality:							
MCM	(0.0000)	8.09	7.30	18.73	34.27	16.40	12.47
LIVPOOL	(0.0130)	0.00	0.00	0.00	0.00	0.00	0.00
VAR	(0.4349)	28.78	28.18	51.83	80.59	45.42	39.65
OECD	(0.0128)	8.91	7.79	19.92	38.28	18.16	13.40
LINK	(0.0133)	3.91	3.17	7.27	15.68	7.58	5.25
MSG	(2.4462)	2.05	1.98	-3.17	0.94	0.98	-1.81
VAR							
Model representing reality:							
MCM	(0.0000)	0.26	0.00	1.23	0.74	0.66	0.00
LIVPOOL	(0.0130)	3.16	2.36	14.95	-2.34	5.25	3.27
VAR	(0.4349)	0.00	0.00	0.00	0.00	0.00	0.00
OECD	(0.0128)	0.12	0.04	2.22	0.42	0.39	0.09
LINK	(0.0133)	0.09	0.01	1.38	0.17	0.20	0.05
MSG	(2.4462)	0.12	0.66	0.91	0.03	-0.00	-2.14
OECD							
Model representing reality:							
MCM	(0.0000)	0.06	0.04	0.02	0.07	0.07	0.04
LIVPOOL	(0.0130)	4.12	2.06	6.83	-1.68	7.04	2.83
VAR	(0.4349)	0.56	0.13	1.83	0.81	1.47	0.21
OECD	(0.0128)	0.00	0.00	0.00	0.00	0.00	0.00
LINK	(0.0133)	0.01	0.00	0.01	-0.00	0.00	-0.00
MSG	(2.4462)	0.05	0.72	-0.00	-0.01	0.01	-2.13
LINK							
Model representing reality:							
MCM	(0.0000)	0.04	0.04	0.03	0.04	0.04	0.04
LIVPOOL	(0.0130)	4.28	2.09	6.72	-1.61	7.24	2.86
VAR	(0.4349)	0.71	0.11	1.92	0.99	1.77	0.19
OECD	(0.0128)	-0.00	0.00	-0.00	0.01	0.00	0.00
LINK	(0.0133)	0.00	0.00	0.00	0.00	0.00	0.00
MSG	(2.4462)	0.04	0.72	-0.03	-0.01	0.02	-2.13
MSG							
Model representing reality:							
MCM	(0.0000)	0.11	13.45	95.91	0.21	0.28	110.20
LIVPOOL	(0.0130)	6.62	13.17	37.64	-1.92	6.15	54.54
VAR	(0.4349)	4.48	53.58	219.22	0.29	0.44	335.10
OECD	(0.0128)	0.38	18.77	109.33	0.04	0.09	141.69
LINK	(0.0133)	0.08	7.51	44.20	0.01	0.06	58.83
MSG	(2.4462)	0.00	0.00	0.00	0.00	0.00	0.00

* Gains of coordination to the United States assuming that all countries believe the same, correct model.

Table 18. Gains to Unilateral Switch to True Model for Europe Under Nash Noncooperative Solution (using monetary policy)
(All numbers expressed in squared percentage points of GNP)

Model Subscribed to by the United States		Model Subscribed to by Europe					
		MCM	LIVPOOL	VAR	OECD	LINK	MSG
MCM							
Model representing reality:							
MCM	(0.0001)*	0.00	2.36	12.50	0.18	0.47	2.82
LIVPOOL	(0.0010)	12.77	0.00	21.69	20.92	26.64	0.11
VAR	(0.3256)	19.46	6.23	0.00	24.47	27.69	5.36
OECD	(0.0079)	0.05	1.12	4.57	0.00	0.02	1.29
LINK	(0.0040)	0.13	1.42	5.13	0.02	0.00	1.61
MSG	(1.5561)	1.52	0.01	1.85	2.40	3.00	0.00
LIVPOOL							
Model representing reality:							
MCM	(0.0001)	0.00	0.06	6.04	24.86	3.96	1.28
LIVPOOL	(0.0010)	0.15	0.00	19.85	74.47	13.58	5.15
VAR	(0.3256)	1.05	1.19	0.00	-0.41	0.15	0.48
OECD	(0.0079)	0.48	0.62	-0.36	0.00	-0.29	-0.05
LINK	(0.0040)	0.65	0.83	0.06	1.83	0.00	0.10
MSG	(1.5561)	-0.35	-0.37	0.94	4.31	0.54	0.00
VAR							
Model representing reality:							
MCM	(0.0001)	0.00	2.34	25.76	1.20	0.88	2.94
LIVPOOL	(0.0010)	8.99	0.00	48.78	26.74	23.66	0.13
VAR	(0.3256)	11.18	5.19	0.00	16.93	16.05	4.62
OECD	(0.0079)	0.12	0.96	5.92	0.00	-0.01	1.11
LINK	(0.0040)	0.19	1.38	8.29	0.01	0.00	1.59
MSG	(1.5561)	1.13	0.04	2.94	2.81	2.53	0.00
OECD							
Model representing reality:							
MCM	(0.0001)	0.00	2.06	11.04	0.40	0.59	2.31
LIVPOOL	(0.0010)	10.89	0.00	18.76	22.60	25.66	0.04
VAR	(0.3256)	15.85	5.09	0.00	22.48	24.05	4.66
OECD	(0.0079)	0.11	1.18	4.33	0.00	0.01	1.28
LINK	(0.0040)	0.17	1.37	4.73	0.01	0.00	1.48
MSG	(1.5561)	1.21	0.00	1.65	2.41	2.72	0.00
LINK							
Model representing reality:							
MCM	(0.0001)	0.00	2.08	10.84	0.35	0.56	2.34
LIVPOOL	(0.0010)	11.20	0.00	18.38	22.25	25.87	0.04
VAR	(0.3256)	16.48	5.19	0.00	22.93	24.85	4.72
OECD	(0.0079)	0.10	1.18	4.32	0.00	0.01	1.29
LINK	(0.0040)	0.16	1.38	4.68	0.01	0.00	1.49
MSG	(1.5561)	1.25	0.00	1.65	2.40	2.77	0.00
MSG							
Model representing reality:							
MCM	(0.0001)	0.00	11.09	100.58	0.58	0.69	102.15
LIVPOOL	(0.0010)	15.57	0.00	254.61	23.90	24.67	65.60
VAR	(0.3256)	29.63	51.64	0.00	25.28	24.93	115.74
OECD	(0.0079)	-0.13	0.05	6.53	0.00	0.01	4.07
LINK	(0.0040)	0.06	2.14	11.82	-0.00	0.00	15.60
MSG	(1.5561)	1.22	-0.77	16.81	1.93	2.00	0.00

* Gains of coordination to Europe assuming that all countries believe the same correct model.

Table 19. Gains to Unilateral Switch to True Model for the United States Under Nash Noncooperative Solution (using monetary and fiscal policy)
(All gains expressed in squared percentage points of GNP)

Model Subscribed to by the United States		Model Subscribed to by Europe					
		MCM	LIVPOOL	VAR	OECD	LINK	MSG
MCM							
Model representing reality:							
MCM	(0.0007)*	0.00	0.00	0.00	0.00	0.00	0.00
LIVPOOL	(0.0000)	68.21	22.01	10.30	340.72	1.06	737.68
VAR	(0.0001)	41.49	4.84	38.75	160.71	0.08	1673.07
OECD	(0.0001)	5.33	2.06	-8.21	13.43	1.14	153.88
LINK	(0.0001)	2.65	0.39	15.53	17.78	1.38	385.24
MSG	(0.0001)	-1.31	6.09	10.87	48.32	1.19	738.71
LIVPOOL							
Model representing reality:							
MCM	(0.0007)	11.49	6.62	24.63	62.36	8.85	18.41
LIVPOOL	(0.0000)	0.00	0.00	0.00	0.00	0.00	0.00
VAR	(0.0001)	13.32	15.92	84.94	82.56	11.07	34.51
OECD	(0.0001)	4.52	2.28	6.48	44.48	3.03	7.94
LINK	(0.0001)	4.23	2.37	52.66	87.66	3.49	11.08
MSG	(0.0001)	-7.83	5.61	45.29	110.15	8.29	22.07
VAR							
Model representing reality:							
MCM	(0.0007)	70.66	6.02	388.24	53.29	-0.00	6.74
LIVPOOL	(0.0000)	2103.28	54.05	22374.46	639.62	2.25	229.58
VAR	(0.0001)	0.00	0.00	0.00	0.00	0.00	0.00
OECD	(0.0001)	75.33	11.66	300.99	61.25	0.97	13.56
LINK	(0.0001)	25.23	5.63	75.88	26.57	1.72	5.40
MSG	(0.0001)	99.16	9.23	393.77	67.82	0.50	17.00
OECD							
Model representing reality:							
MCM	(0.0007)	4.11	4.99	30.17	14.39	4.56	2.61
LIVPOOL	(0.0000)	65.17	80.46	5382.90	4449.42	116.29	12.37
VAR	(0.0001)	22.33	50.72	71.76	139.67	29.84	36.16
OECD	(0.0001)	0.00	0.00	0.00	0.00	0.00	0.00
LINK	(0.0001)	3.21	3.17	-0.09	0.27	4.62	6.37
MSG	(0.0001)	-5.03	44.96	189.50	83.33	39.24	30.25
LINK							
Model representing reality:							
MCM	(0.0007)	1.69	0.01	123.99	20.20	0.38	-1.19
LIVPOOL	(0.0000)	73.80	55.23	19177.02	5725.06	53.15	84.84
VAR	(0.0001)	7.86	9.33	118.09	155.34	6.64	8.45
OECD	(0.0001)	3.66	2.98	31.10	0.96	2.58	3.50
LINK	(0.0001)	0.00	0.00	0.00	0.00	0.00	0.00
MSG	(0.0001)	-0.49	14.37	792.24	129.16	15.60	17.76
MSG							
Model representing reality:							
MCM	(0.0007)	119.54	1.29	3.85	4.04	0.08	2.80
LIVPOOL	(0.0000)	5205.14	1.55	201.97	480.72	10.16	109.42
VAR	(0.0001)	933.11	5.33	33.98	49.44	0.29	27.63
OECD	(0.0001)	211.19	1.36	-4.42	12.16	0.65	6.84
LINK	(0.0001)	107.52	2.24	7.15	2.96	2.38	8.60
MSG	(0.0001)	0.00	0.00	0.00	0.00	0.00	0.00

* Gains of coordination to the United States assuming that all countries believe the same, correct model.

Table 20. Gains to Unilateral Switch to True Model for Europe Under Nash Noncooperative Solution (using monetary and fiscal policy)
(All gains expressed in squared percentage points of GNP)

Model Subscribed to by the United States		Model Subscribed to by Europe					
		MCM	LIVPOOL	VAR	OECD	LINK	MSG
MCM							
Model representing reality:							
MCM	(0.0001)*	0.00	2.70	74.82	0.34	7.31	1128.64
LIVPOOL	(0.0001)	674.53	0.00	195.68	2415.63	88.89	8371.36
VAR	(0.0002)	84.65	12.23	0.00	241.96	15.51	988.46
OECD	(0.0002)	-0.43	0.44	61.77	0.00	8.76	669.74
LINK	(0.0002)	27.83	2.80	19.46	133.52	0.00	742.96
MSG	(0.0003)	-297.31	-385.00	-343.97	-101.18	-361.36	0.00
LIVPOOL							
Model representing reality:							
MCM	(0.0001)	0.00	4.76	163.04	36.30	0.02	9.38
LIVPOOL	(0.0001)	66.92	0.00	154.93	354.03	48.21	19.91
VAR	(0.0002)	19.84	12.27	0.00	71.53	17.14	24.15
OECD	(0.0002)	-21.26	-24.20	79.17	0.00	-22.42	-20.82
LINK	(0.0002)	0.11	1.41	14.15	64.74	0.00	0.73
MSG	(0.0003)	-6.55	-15.94	147.48	66.34	-9.91	0.00
VAR							
Model representing reality:							
MCM	(0.0001)	0.00	1.82	86.54	12.05	8.79	4.03
LIVPOOL	(0.0001)	635.81	0.00	10650.70	292.31	91.78	64.43
VAR	(0.0002)	16.53	11.94	0.00	40.30	16.37	10.00
OECD	(0.0002)	52.41	-3.73	1147.01	0.00	1.28	13.74
LINK	(0.0002)	65.45	5.27	506.61	44.04	0.00	7.74
MSG	(0.0003)	117.90	1.05	836.78	98.53	28.67	0.00
OECD							
Model representing reality:							
MCM	(0.0001)	0.00	37.52	13.49	111.34	8.98	15.68
LIVPOOL	(0.0001)	398.60	0.00	4361.00	6263.85	51.55	50.86
VAR	(0.0002)	61.89	35.02	0.00	262.29	32.69	41.34
OECD	(0.0002)	2.73	8.23	271.57	0.00	5.38	4.54
LINK	(0.0002)	15.51	1.32	183.10	275.93	0.00	3.01
MSG	(0.0003)	49.92	21.04	299.18	1371.48	-0.65	0.00
LINK							
Model representing reality:							
MCM	(0.0001)	0.00	5.72	39.70	156.79	0.01	0.89
LIVPOOL	(0.0001)	65.54	0.00	11889.57	7255.83	68.44	25.61
VAR	(0.0002)	25.43	19.13	0.00	276.35	26.24	21.48
OECD	(0.0002)	8.76	1.51	724.24	0.00	7.77	4.85
LINK	(0.0002)	0.06	2.20	469.92	314.17	0.00	0.63
MSG	(0.0003)	2.38	2.64	1208.71	1698.34	3.90	0.00
MSG							
Model representing reality:							
MCM	(0.0001)	0.00	-9.79	27.75	-3.01	-0.26	6.06
LIVPOOL	(0.0001)	14682.06	0.00	532.65	1407.17	96.51	300.40
VAR	(0.0002)	475.02	6.49	0.00	84.93	13.14	0.24
OECD	(0.0002)	149.12	2.38	72.83	0.00	10.20	35.94
LINK	(0.0002)	897.37	3.49	35.55	50.29	0.00	25.87
MSG	(0.0003)	1367.89	3.81	1.69	234.22	37.21	0.00

* Gains of coordination to Europe assuming that all countries believe the same, correct model.

References

Brainard, William, "Uncertainty and the Effectiveness of Policy," American Economic Review (1967).

Branson, William and Julio Rotemberg, "International Adjustment with Real Wage Rigidity," European Economic Review 13, 3, May 1980, 309-337.

Bryant, Ralph and Dale Henderson. Empirical Macroeconomics for Interdependent Economies. Brookings Institution, Washington, D.C. (forthcoming).

Canzoneri, Matthew and Patrick Minford, "When International Policy Coordination Matters: An Empirical Analysis," Centre for Economic Policy Research Discussion Paper No. 119, July 1986.

Carlozzi, Nicholas and John Taylor, "International Capital Mobility and the Coordination of Monetary Rules." In Exchange Rate Management Under Uncertainty," edited by J. Bhandari. Cambridge, MA: MIT Press, 1985.

Cooper, Richard, "Economic Interdependence and Coordination of Economic Policies." In Handbook in International Economics, Vol. II, edited by R. Jones and Peter Kenen. Amsterdam: North Holland, 1985.

Corden, W. Max. Inflation, Exchange Rates, and the World Economy. Chicago: University of Chicago Press, 3rd ed., 1986.

_____, "Fiscal Policies, Current Accounts and Real Exchange Rates: In Search of a Logic of International Policy Coordination," Weltwirtschaftliches Archiv, 1986.

Dooley, Michael and Peter Isard, "Country Preferences and Exchange Rate Determination," International Monetary Fund, September 1986.

Fischer, Stanley, "International Macroeconomic Policy Coordination," NBER Working Paper No. 2244, May 1987. Forthcoming in International Policy Coordination, edited by M. Feldstein. Chicago: University of Chicago Press.

Frankel, Jeffrey, "Ambiguous Macroeconomic Policy Multipliers in Theory and in Twelve Econometric Models." Revised, International Monetary Fund, October 1986. Forthcoming in Bryant and Henderson.

Frankel, Jeffrey and Katharine Rockett, "International Macroeconomic Policy Coordination When Policy-Makers Do Not Agree on the True Model," NBER Working Paper No. 2059, October 1986. American Economic Review, 1988, forthcoming.

Holtham, Gerry and Andrew Hughes Hallett, "International Policy Cooperation and Model Uncertainty," Centre for Economic Policy Research Discussion Paper No. 190, July 1987.

Hughes Hallett, Andrew, "Macroeconomic Policy Design with Incomplete Information: A New Argument for Coordinating Economic Policies," Centre for Economic Policy Research Discussion Paper No. 151, January 1987.

Kenen, Peter, "Exchange Rates and Policy Coordination," Brookings Discussion Paper in International Economics No. 61, October 1987.

Kenen, Peter and Stephen Schwartz, "An Assessment of Macroeconomic Forecasts in the International Monetary Fund's World Economic Outlook," Working Paper in International Economics No. G-86-04, Princeton University, December 1986.

Mankiw, Gregory and Matthew Shapiro, "News or Noise: An Analysis of GNP Revisions," Survey of Current Business, May 1986, 20-25.

Masson, Paul and Jocelyn Horne, "Scope and Limits of International Economic Cooperation and Policy Coordination," IMF World Economic Outlook Staff Studies (forthcoming 1987).

McKibbon, Warwick and Jeffrey Sachs, "Coordination of Monetary and Fiscal Policies in the OECD," NBER Working Paper No. 1800. Forthcoming in Jacob Frenkel, ed., International Aspects of Fiscal Policy, 1986.

McNees, Stephen, "The Forecasting Record of the 1970s," New England Economic Review, September/October 1979, 1-21.

Melitz, Jacques, "The Welfare Case for the European Monetary System," Journal of International Money and Finance, 4, 1985, 485-506.

Obstfeld, Maurice, "International Finance," NBER Working Paper No. 2077, November 1986. Forthcoming, The New Palgrave Dictionary of Economics.

Oudiz, Gilles, "European Policy Coordination: An Evaluation," Centre for Economic Policy Research Discussion Paper No. 81, October 1985.

Oudiz, Gilles and Jeffrey Sachs, "Macroeconomic Policy Coordination Among the Industrial Economies," Brookings Papers on Economic Activity, 1984, 1-76.

Rogoff, Kenneth, "Can International Monetary Policy Cooperation Be Counterproductive?" Journal of International Economics 18, 199-217.

Summers, Larry, "Tax Policy and International Competitiveness," NBER Working Paper, March 1985. In Jacob Frenkel, ed., International Aspects of Fiscal Policies. Chicago: University of Chicago Press (forthcoming).

Zarnowitz, Victor, "On Functions, Quality and Timeliness of Economic Information," Journal of Business, January 1982, 87-119.

_____, "The Accuracy of Individual and Group Forecasts from Business Outlook Surveys," Journal of Forecasting, January-March 1984, 11-26.

Zarnowitz, Victor and Geoffrey Moore, "Sequential Signals of Recession and Recovery," Journal of Business, January 1982, 57-85.