

TRANSMISSION OF REAL AND MONETARY DISTURBANCES UNDER FIXED AND FLOATING EXCHANGE RATES

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The world economy since the 19th century has been characterized by varying degrees of interdependence. In the pre-World War I world, individual economies to a great extent were exposed to economic events in the rest of the world. Countries were linked together through trade in goods and services; flows of human, financial, and physical capital; and information transfers. World War I fundamentally contracted each of these links. That process accelerated during the interwar period, when countries sought to insulate themselves from what they perceived to be negative impulses transmitted from abroad. One of the hallmarks of the Bretton Woods years, in reaction to the interwar experience, was a drive to liberate trade and immigration flows while preserving barriers to capital flows. Although the record is mixed because of actual steps and threats of further steps to restrict the channels of transmission, a distinctive feature of the period of floating exchange rates since 1973 is said to be a high and rising degree of interdependence.

Theoretical channels of transmission differ under alternative exchange rate arrangements as well as in an open world economy, as compared with a world economy in which restrictions on international trade and capital controls are mandated. The types of theory economists have constructed reflect the differences in conditions that have arisen in the world economy, possibly in response to their

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doctrines.¹ One objective of this paper is to relate the changing content of the theory of transmission to these differences. We neglect the views of “real business cycle” theorists who assert that the transmission is unaffected by exchange rate regimes or monetary forces.

Disturbances are both monetary and real in nature. They are transmitted by a number of channels, of which the most prominent is the current account of the balance of payments with effects on relative prices, output, and income, and by capital flows induced by interest rate differentials that establish interest rate equality except for differences in risk premia, taxes, or transaction costs.

Foreign exchange rate arrangements traditionally were regarded as crucial in assessing the role of transmission through various channels—transmission that occurred under fixed exchange rates and was mostly prevented when exchange rates floated. The insulation property of floating exchange rates and the expectation that monetary independence would be granted to countries that floated were key reasons for the shift to the present regime of floating. The experience of recent years, however, suggests that floating rates may not provide the degree of insulation once believed. Reasons given for interdependence under floating rates include increased capital mobility, exchange rate expectations, and policy interdependence.

This paper examines the operation of channels of transmission under fixed and floating rates according to two standard approaches: a traditional one of long standing designed for an open world economy, and the other derived from Keynesian thinking influenced by a closed world outlook associated with the interwar period. The Keynesian approach has undergone significant change since the advent of floating exchange rates. We trace the policy implications of each approach, focusing on the role each assigns to government intervention in promoting or blocking the transmission mechanism. Following a historical overview of empirical channels of transmission during the past two centuries, we conclude with a discussion of the policy lessons that the historical record suggests.

Transmission Channels in an Open and Closed World Economy

Traditional Approach in an Open World Economy

Under the conditions of the fixed exchange-rate specie standard that (in one form or another) characterized an open world economy

¹Keynes, for example, early in his career advocated a gold exchange standard with limited intervention, but by the 1940s he proposed extensive intervention and made the case for exchange and capital controls. See Keynes ([1913] 1971, [1941] 1980).

for most of the two centuries preceding World War I, both monetary and real shocks were transmitted through the balance of payments, thereby affecting domestic money supplies, expenditure, price levels, and real income. The adjustment mechanism worked through the current account supplemented by the capital account.

An example of a monetary disturbance is the case of a large country on a specie standard, which temporarily issues fiat money to finance a war. Under fixed exchange rates, the increase in the money supply raises domestic expenditures, nominal income, and, ultimately, the price level. The rise in the domestic price level leads to an improvement in the terms of trade, but a balance-of-trade deficit results. In its trading partners, the same forces produce a balance-of-trade surplus.

The deficit is financed by a specie outflow from the inflating country to its trading partners, reducing the monetary gold stock in the former and raising it in the latter. As a consequence, in the trading partners, money supply increases, raising domestic expenditure, nominal income, and, ultimately, the price level. Depending on the relative share of the inflating country's monetary gold stock in the world total, world prices and income rise. The initial effects of monetary change may fall on real output, reflecting possible rigidities, but eventually the full effect is on the price level.

An alternative channel is price arbitrage. To the extent that the law of one price holds, the prices of traded goods are continuously equated across the world, without the need for relative prices of exports and imports to adjust. However, relative prices of traded and nontraded goods are altered.

Since the initial effects of increases in the money supply tend to lower interest rates, capital flows abroad are also a channel of transmission. A short-term capital inflow, however, may provide temporary financing of the current account deficit.

An example of a real disturbance is a new technology that exploits an existing resource, raising the expected real rate of return in the home country. Investors in other countries, with a lower real rate of interest, purchase securities issued by the home country. Under fixed exchange rates, the capital flow is financed by a specie flow from the foreign countries to the home country. The specie inflow raises the home country's money supply and price level, in turn raising the price of exports relative to the price of imports. The demand for imports in the home country rises, with a resulting transfer of real resources from the foreign to the home country.

In the long run, whether the disturbances are monetary or real, the balance of payments under fixed exchange rates returns to equilibrium. In the case of a monetary disturbance, the rise in the price

level of the inflating country is reversed as its money supply contracts with a falling monetary gold stock. Specie is redistributed from the inflating country to the recipient countries. In the case of a real disturbance, both short-term capital flows from the home country to foreign countries (reverse specie flows consequent upon the higher price level in the former) and interest payments to service the capital imports will restore equilibrium.

Under floating rates, the issue of fiat money, if it continues beyond the point where all monetary gold is displaced, will force the country off the specie standard. The consequent rise in the domestic price level will manifest itself in a depreciating currency (Taussig 1917, Graham 1922). In the case of a real disturbance, capital inflows to the home country in response to the new technology will appreciate the country's currency. A negative supply shock will depreciate the country's currency, with contractionary effects on the rest of the world's goods, specie, and capital.

Keynesian Approach to Transmission in a Closed World Economy

A more recent and widespread view of how transmission works is the Keynesian approach developed by Meade (1951), Mundell (1968), and Fleming (1962), which was designed for those inward-looking countries of the world economy of the interwar years that were expected to behave similarly in the post-World War II era. Based on the IS-LM framework, the Mundell-Fleming model in its original version assumed Keynesian unemployment, demand-determined output short of feasible capacity utilization, and rigid wages and prices. Domestic wages, which were determined in domestic labor markets, determined domestic prices. Commodity arbitrage was neglected, and changes in exchange rates had little effect on domestic prices. Private capital outflows were held to be insufficient to finance current account imbalances. National monetary systems were assumed to be insulated. Short-term interest rates were controlled by domestic monetary authorities and were not influenced by foreign interest rates or exchange rate expectations (Kenen 1985). The model was consistent with recommendations to policymakers to restrict capital flows in the post-World War II period. The recommendations were based on the difference between transmission in the presence and in the absence of capital mobility that was featured.

Under fixed exchange rates a monetary disturbance is exemplified by an increase in the money supply in one country that lowers interest rates and raises real expenditure, including the purchase of imports. That process leads to a current account deficit at home, financed by decumulation of official reserves, and to a surplus abroad, financed by accumulation of official reserves. Real income rises both at home

and abroad; the extent of its rise is determined by a multiplier, which in turn depends on the relative sizes of the marginal propensities to import and save. The home country increases its consumption of domestic plus imported goods. The output of the foreign country responds to the increased demand from abroad by an amount that exceeds the initial increase in demand. This is transmission in the absence of capital mobility. In its presence, the fall in interest rates at home leads to a capital outflow, which in turn reduces official reserves. This reserve loss then forces a contraction of the money supply, which offsets the effects on income of the initial monetary expansion. The foreign country's surplus is increased by the capital outflow from the home country, so its income is raised even more than is the case in the absence of capital mobility.

Under fixed exchange rates a real disturbance is exemplified by an increase in government expenditure in one country that raises real expenditure and income, including the demand for imports, leading to a balance-of-trade deficit at home and a surplus abroad. Real income rises in both countries through the multiplier. In both cases the balance-of-payments disequilibrium cannot be sustained. The decline in reserves in the deficit country (rise in the surplus country) will cause the domestic money supply to fall (rise), reversing the process. This is the case in the absence of capital mobility. With perfect capital mobility, the rise in real government expenditure raises the domestic interest rate, which induces a capital inflow, which in turn enhances the rise in income at home but offsets the rise in income abroad. Thus capital mobility under fixed exchange rates enhances the transmission abroad of a domestic monetary disturbance and offsets the transmission abroad of a domestic real disturbance.

Under floating exchange rates, insulation against both monetary and real shocks results, provided capital mobility is absent. An increase in the domestic money supply lowers interest rates and raises real expenditure, including the demand for imports, leading to an incipient balance-of-payments deficit at home and a surplus abroad. The home currency then depreciates, which lowers the price of domestic goods relative to the domestic price of foreign goods. Demand shifts from foreign to domestic goods, offsetting the increase in foreign income induced through the current account. Similarly, an increase in government expenditure in one country raises real expenditure, including the demand for imports, thus depreciating the exchange rate. Demand shifts from foreign to domestic goods, offsetting the increase in foreign income.

However, under floating exchange rates with perfect capital mobility, although a rise in the domestic money supply creates an incipient

balance-of-payments deficit at home and surplus abroad (leading to a depreciation of the home currency), the concomitant decline in interest rates induces a capital outflow, which further depreciates the home currency. Demand for the home country's goods is thereby stimulated and demand for the foreign country's goods is reduced, raising income at home and reducing it abroad. With capital mobility, monetary expansion at home leads to a recession abroad.

Under floating exchange rates, an increase in government expenditure in one country raises real expenditure, including the demand for imports, hence depreciating the exchange rate. With capital mobility, however, the rise in interest rates induced by the increase in government expenditure leads to a capital inflow, which offsets the effect of the current account imbalance on the exchange rate. At the same time, the capital outflow from the foreign country depreciates its exchange rate, stimulating the demand for its goods. Hence real output abroad rises. Thus under floating exchange rates with perfect capital mobility, in contrast to the traditional approach, the Mundell-Fleming model predicts perverse effects on foreign countries' income from monetary disturbances in the home country and positive effects from real aggregate demand disturbances in the home country. Insulation no longer prevails.

In recent years, the Mundell-Fleming model has been modified in an attempt to correct its shortcomings (Frenkel and Razin 1987a, 1987b). These shortcomings include the failure of the model to base the money demand function and savings, the investment, and the trade balance on intertemporal optimizing behavior. Expectations in the model are static. It does not take into account country size, which is an important determinant of the effectiveness of monetary and fiscal policies. The results of a model in which capital flows alter capital stocks are different from one in which flow equilibrium alone is examined. In addition, the model ignores not only the distribution of assets and money across countries but also wealth effects. The rigid price and wage assumptions of the model have been relaxed, and the treatment of government expenditures has been broadened to distinguish financing of expenditures by taxation rather than bonds.

The original Mundell-Fleming model accordingly has been the inspiration for a host of recent models that vary some or many of its conditions. One direction of change has been to incorporate rational expectations and uncertainty in two-country general equilibrium approaches with full employment and flexible prices (Lucas 1982, Svensson 1985, Stockman and Svensson 1985). Another direction retains the assumption of sticky goods prices and demand-determined output but with proper microeconomic foundations, which

are derived from optimizing behavior in a rational expectations context (Svensson and van Wijnbergen 1986). Some models assume wages that are temporarily fixed due to contract lags or wage indexation (Flood and Marion 1982). Models vary according to the degree of substitutability assumed between domestic and foreign goods and between domestic and foreign money and assets denominated in different currencies.

In addition to the choice of model assumptions, the results obtained depend on the elaboration of the character of the disturbances: anticipated or unanticipated, temporary or permanent, current or future. Does the monetary disturbance originate on the supply side or on the demand side? Is it a domestic or foreign disturbance? Is the real disturbance created by a supply rather than a demand disruption? (Fischer 1976)

With such an array of variables, it is no simple task to summarize the effects on transmission under fixed or floating exchange rates. The current state of the art reflects the ingenuity of the investigator in ringing changes on the original or modified versions already reported.

How complicated the analysis becomes, even when limited to two effects of transmission, may be illustrated by the question of whether a foreign country is benefited or harmed by high interest rates in the United States (Corden 1985). The answer depends in part on whether the foreign country is a net creditor or debtor, which must be considered in relation to a terms-of-trade effect. Terms of trade might deteriorate for the period during which additional capital flows from the foreign country to the United States—the channel of transmission that generates a current account surplus. Although a worsened terms of trade would be adverse, the gain to the foreign country as a net creditor at a variable interest rate, thanks to its capital exports, would be offsetting. The total effect of transmission is thus not easy to determine even in theory.

In addition to the modifications of the Mundell-Fleming model in the recent literature, analyses of floating exchange rates have proposed at least two channels of transmission that have not been recognized in that literature. One channel is possible interdependence of money demand through direct currency substitution (Miles 1978, Brittain 1981) and indirect currency substitution: the substitution of foreign and domestic assets, which in turn are close money substitutes (McKinnon 1982). The other channel is interdependence of money supply through policy reaction functions that incorporate exchange rates and foreign interest rates (McKinnon 1982) or through buffer stock effects (Bordo, Choudhri, and Schwartz 1987).

Direct transmission of real disturbances under floating has also been proposed (Swoboda 1979). Examples are a fall in expected rates of return on investment in an important foreign country as well as at home, an increase in uncertainty at home and abroad, and changes in prospective profitability for a large industrial sector at home and abroad. Direct transmission is also possible when international capital flows are interrupted for domestic reasons from the countries of outflows.

Whether the theoretical effect of international transmission is positive or negative is thus ambiguous. The results obtained appear to reflect the model-builders' priors.

Policy Implications of the Two Approaches with Respect to Intervention

In efforts to block transmission, governments and central banks have engaged in intervention to a limited extent under fixed exchange rates and more extensively under floating exchange rates when insulation was regarded as porous.

Intervention under the Traditional Approach

Under the traditional gold standard model, the only role for monetary policy was observance of the "rules of the game" by the central bank—to facilitate internal adjustment to a balance-of-payments deficit or surplus. In the case of a current account deficit (surplus), the prescription was to contract (expand) the domestic money supply. (How faithfully the prescription was followed will be examined in the historical-overview section.) Before 1914 intervention was not extensive. In the interwar regime of the gold exchange standard, it was the rule rather than the exception.

Before 1914, when governments were expected to balance their budgets, national fiscal policy did not entail adjustments that were conventionally considered necessary for monetary policy. Worldwide peacetime fiscal policy did not usually veer from budget balance. In the interwar gold exchange standard regime, concern to avoid budget deficits as inflationary gradually diminished as theory shifted to according government expenditure and tax policy primacy over monetary policy. Intervention in exchange and capital markets and the imposition of controls were legitimized.

Intervention under the Keynesian Approach

Under fixed exchange rates, according to the Mundell-Fleming model, with perfect capital mobility, monetary policy in a small, open

economy has no effect on the rest of the world. The larger the economy, the greater will be the impact of its monetary policy on the rest of the world. The result is qualified by the immobility of factors of production, imperfect substitution of assets, and lags in adjustment (Mussa 1979). Under fixed rates, however, monetary disturbances are imported from abroad, establishing the case for sterilization of reserve flows in the short run and, ultimately, the abandonment of fixed rates to achieve monetary independence.

Under floating rates with perfect capital mobility, monetary disturbances can produce perverse effects on foreign countries' incomes, while fiscal policy changes produce positive effects. Capital flows link interest rates in different countries, thereby preventing independent manipulation of interest rates by any one country to achieve its own domestic macroeconomic goals. These results underlie the case for coordinated intervention (Fischer 1987).

Other arguments for intervention in exchange markets are the prevention of exchange rate turbulence and overshooting, offsetting wide swings of exchange rates, and inflationary effects of exchange rate depreciation (John Williamson 1983, Frenkel and Mussa 1980).

Under fixed exchange rates, intervention to prevent effective transmission eventually involves resorting to exchange and capital controls and other forms of protectionism.² Under floating rates, intervention is designed to protect export-market shares when the exchange rate appreciates and to preclude inflation when the exchange rate depreciates. This course ignores the fact that movements in exchange rates and prices are a consequence of the choices that countries make with respect to monetary policy, public sector expenditures and taxes, protection of property rights, and regulation. Intervention under floating rates shifts adjustment away from the exchange rate back to the real economy, abandoning the benefits of floating.

The Case for and against Policy Coordination

The case for policy coordination under fixed exchange rates was based on inconsistency of Phillips curve ambitions of individual nations or, for fiscal policy, incompatibility of independent policy. Policies adopted for their impacts on domestic targets would spill over to affect policy instruments or targets of other countries. There are externalities. To rectify the effects of externalities, countries

²A deficit country following a policy of sterilization ultimately will be drained of international reserves. In this predicament, such countries sometimes opt for dual exchange rates and controls on capital export. In a surplus country, the accumulation of international reserves will produce inflationary pressure. Controls on capital inflow are a likely response.

would have an incentive to trade off policies (Caves 1968). Policy harmonization thus would promote efficient adjustment by all countries in maintaining fixed exchange rates.

Another argument, based on game theory, was that nations following their own objectives in a regime of fixed exchange rates would not achieve optimal results in an interdependent world. One model demonstrated that if two countries tried to achieve, for instance, balance-of-payments surpluses to increase their international reserves in excess of the growth of world reserves, monetary policy in a noncooperative solution would be more contractionary and inflation rates would be lower than desired. The result would be avoided in a cooperative solution (Hamada 1979).

Under floating rates with capital mobility, the case for policy coordination also rests on spillover effects of monetary and fiscal policies. Again game theory has been introduced to show that coordination can yield better results than independent national policies. It has been used to suggest that decentralized decisionmaking in a floating rate world will lead to excessive economic contraction in response to an exogenous world supply shock (Cooper 1985).

The game-theoretic analysis of policy coordination treats countries as if they were persons, bypassing the question of how to coordinate capital flows and other transactions involving decisions by many agents.³ The main problem with this approach, however, is the lack of agreement in the literature on the effects of alternative policies. It is not clear whether the difference among the models on the theoretical size and sign of gains from coordination arises from special assumptions or from the need to modify the models to make estimation tractable. Measures of spillover effects, moreover, are not overwhelming (Fischer 1987). If there are negative spillover effects, the likely reason is that domestic policies from which they originate are misguided.

If policymakers in a floating exchange rate world cannot agree on the cause of current values of real exchange rates or real interest rates or the consequences of policy actions either domestically or internationally, what possible guidance can game-theoretic analysis give?

A cynical justification offered for policy coordination is that it is politically advantageous to adduce foreign considerations to lessen opposition to unpopular domestic policies. A special case for international monetary coordination to achieve exchange rate stability has been proposed by McKinnon (1984). Coordination in his view requires

³We are indebted to Allan H. Meltzer for this insight.

offsetting U.S. money growth rates vis-à-vis those of Germany and Japan.

Advocates of policy coordination sometimes have as their real goal agreement by participating countries on a system of pegged exchange rates. They do not face up to the fact that the costs of the restoration of fixed exchange rates may well exceed the benefits of overcoming negative spillovers through policy coordination.

Policy coordination as a proposal to improve the international monetary system is visionary. As long as there are separate countries, each with its own currency and its own economic objectives, conflicts of interest are inevitable. Theoretical demonstrations of improved outcomes when national interests are submerged for the projected greater common good have had little practical success because they ignore the vested interest of politicians in safeguarding their home country sovereignty.

Historical Overview of Empirical Channels of Transmission

The Classical Gold Standard

Many examples may be cited of transmission of both monetary and real disturbances during the 19th century, when major countries adhered to the gold standard. A prime example of monetary transmission is the analysis by Cairnes and Jevons of the 19th-century gold discoveries in Australia and California. (There are elements of a real disturbance in gold discoveries, which we neglect here.) They demonstrated how increased gold output altered money supplies, expenditures, and prices in country after country in the manner predicted by Hume and Ricardo (Bordo 1975; Laidler 1982; for a counter view, see Glasner 1985).

A frequent case of a pure monetary disturbance with domestic effects transmitted abroad was the Bank of England's action of raising the Bank Rate (1837–38, 1857, 1890) to stem a drain of its gold reserves. The rapid curtailment of capital flows precipitated financial stringency and, on occasion, panic in peripheral countries such as, for example, the United States in 1838 (Levy-Leboyer 1982) and Australia in 1890 (Kindleberger 1984).

Monetary-induced business cycles were transmitted through the specie standard from Great Britain to the United States before the Civil War and in the reverse direction thereafter (Huffman and Lothian 1984). In addition, financial crises including stock market crashes and bank runs occurred nearly simultaneously in numerous countries linked together under the classical gold standard (Bordo 1986). Evi-

dence linking financial market disturbances through interest-rate arbitrage is documented (Morgenstern 1959).

Real shocks, such as harvest failures in England, had consequences on numerous other countries closely linked to gold. The shocks were transmitted through the current account and the Bank of England reaction to an external drain (Dornbusch and Frenkel 1984).

The transfer of real resources associated with long-term capital flows is an important theme in the economic development of the United States (Jeffrey Williamson 1963); Australia (Butlin 1962, Cairncross 1953); Argentina (Ford 1962); and Canada (Viner 1924). Long-term capital flows, however, were subject to decisions by the exporting countries to redirect capital from one part of the world to another or to reduce or halt the flow, with consequent disruption of investment plans in the affected capital importers.

Viner's analysis of the adjustment mechanism in Canada in 1900–13 is still regarded as the classic description. According to Viner, an investment boom, consequent on the opening of the prairies by railroad construction, was financed by long-term capital flows from the United States and the United Kingdom. The capital inflows were accompanied by a specie inflow that raised the reserves of the Canadian banking system. The increase in the money supply, domestic price level, and terms of trade that followed produced a balance-of-trade deficit allowing a real transfer of goods. Debate continues over the question of whether the rise in prices was related to the investment boom rather than the increase in bank reserves (Ingram 1957, Rich 1989, Dick and Floyd 1987).

Emigration and immigration characterized the pre-1914 world, with real effects on housing demand and supply and on wages and incomes in countries losing and gaining population (Thomas 1973).

Whether the channels of transmission under the classical gold standard invariably operated as theory prescribed is doubtful. Central banks did not systematically follow the rules of the game but periodically engaged in sterilization to shield the domestic money supply from external disequilibrium (Bloomfield 1959). Sterilization, however, was possible only as a temporary maneuver. In the case of a balance-of-payments deficit, sterilization was bounded by the stock of international reserves that the central bank held, and in the case of a surplus, by changes in domestic credit. In most cases before 1914, as noted, intervention was never extensive enough to threaten convertibility.

The Greenback Episode, 1862–78

From 1862 through 1878, the U.S. greenback dollar floated against the British pound and other European currencies that were on a

specie standard. Graham (1922) analyzed the balance-of-payments adjustment mechanism during the greenback episode. According to him, heavy capital inflows, such as occurred from 1863 to 1873, reduced the premium on gold (the price of foreign exchange) and their cessation raised it. Moreover, the relative price of exports, imports, and domestic goods changed as the dollar depreciated, as predicted by classical theory. The relative price adjustment differed, as predicted, from that occurring under the gold standard. Huffman and Lothian (1984, pp. 471–75, 478) provide evidence of insulation from foreign disturbances during this period: A pronounced cyclical downturn in the United Kingdom in 1866 was not reflected in the United States, while the severe contraction of 1873 in the United States had little impact on the United Kingdom.

The Gold Exchange Standard

Irving Fisher (1935) first clearly stated the case that the Great Depression was transmitted from the United States to the rest of the world by the gold standard, and he gave evidence of insulation from declining income and prices in countries not linked to gold. Confirmation for a number of European countries of Fisher's insight is found in Choudhri and Kochin (1980). The depression was transmitted through relative price and income effects. The gold exchange standard did not survive the gold hoarding policies of the United States and France, and it misaligned exchange rates (an overvalued pound and an undervalued French franc). Universal sterilization (Nurkse 1944) exacerbated the effects of inappropriate policies in the United States and France (Eichengreen 1987).

Bretton Woods

The Bretton Woods fixed exchange rate system provided ample evidence of transmission of monetary shocks. Michael Darby, James Lothian, et al. (1984) show, based on simulations of their eight-country model, over the period of 1955 to 1976 that U.S. monetary policy was responsible for transmitting inflationary shocks from country to country. The dominant mechanism of transmission, they find, was a variant of the Humean mechanism through changes in relative prices and capital flows. They also find that other channels including currency substitution and direct income effects were negligible. Though the seven countries other than the United States maintained some short-run control over domestic monetary policy by sterilization, the dominant impulse originated in the United States.

As for transmission of real shocks under the Bretton Woods system, the main one on which empirical evidence exists is the effect of a

shift in foreign demand for the home country's output. The finding is that distributed lag coefficients on real export shocks in a real income equation are insignificant in the sample of countries studied by Darby, Lothian, et al. (1984), with the possible exceptions of the United Kingdom and Canada.

Canada's Experience under Floating Exchange Rates, 1950–62

To avoid the inflationary consequences of a massive capital inflow, Canada shifted to a floating exchange rate in 1950. The evidence on insulation in this episode is mixed. Paul Wonnacott (1965, pp. 78–79) reports a decline in the average amplitude of cycles relative to U.S. cycles in the 1950s compared to the interwar period (1946–54 vs. 1929–39). He provides limited evidence of monetary independence in the trends of short-term interest rates. However, he concludes that Canada's success at stabilization policy during the floating rate period may have stemmed from following conservative monetary and fiscal policies not dissimilar to those in the United States. Using spectral analysis, on the other hand, Bonomo and Tanner (1972) find little evidence of reduced Canadian cyclical sensitivity to U.S. cycles in the 1950s.

Floating Rates since 1973

Since the advent of general floating in 1973, evidence has been presented of increased independence of monetary policy and a tendency for long-run independence in the movements of nominal magnitudes (interest rates and price levels). However, there is also evidence of increased short-run interdependence of nominal and real magnitudes (Darby and Lothian 1989).

Among the factors accounting for the high degree of short-run interdependence are the reaction to common real shocks, such as the oil price shocks of 1974 and 1979; increased capital mobility (Fischer 1987); and the presence of foreign variables in policy reaction functions in different countries (Hodgman 1983). Interdependence has been related to changes in world commodity supplies: oil in 1974 and 1979, sugar in 1973–74, and grain in 1972–73 (Cooper 1986). Presumably, similar changes also characterized earlier periods in economic history.

The international money multiplier—the response of foreign money growth to U.S. money growth—has been cited as contributing to interdependence (McKinnon 1984): World depression results when the exchange value of the dollar appreciates and growth in world money contracts; world inflation results when the exchange value of the dollar depreciates and world money increases. Likewise, with

an increase in the dollar exchange rate, debt-service payments in dollars of debtor countries become more burdensome, and the reverse for a decrease in the dollar exchange rate.

Fiscal policy interdependence, as predicted by the Mundell-Fleming model, is generally taken for granted. U.S. fiscal expansion since 1982 is implicated in producing an increase in real interest rates that attracted foreign capital and created a demand for dollar securities. The capital inflow caused a dollar appreciation and, by drawing capital out of foreign economies, raised interest rates abroad too. High real U.S. interest rates and a high real interest rate differential between the United States and the rest of the world produced the dollar appreciation. The evidence is an annual regression of the dollar-DM exchange rate, 1973-84, on a five-year forward-looking measure of the U.S. budget deficit and other variables including money growth and inflation forecasts. The budget deficit in this regression has the most explanatory power (Feldstein 1986).

Several problems with this mainstream view cast doubt on the fiscal channel. The domestic link between fiscal deficits and real interest rates has not been established (Evans 1986, Mascaro and Meltzer 1983). In any event, the rate of interest is not set by the market for the flow of new debt, but for the existing stock of debt. Through early 1985, dollar investment opportunities were more advantageous than foreign investments, thanks to favorable tax provisions. Combined with declining U.S. inflation, the investment opportunities stimulated the rise in foreign demand for dollars. The U.S. experience of 1982-85 is not an exception to the historical inverse relationship between fiscal deficits and the external strength of a currency. The depreciation of the dollar since early 1985 is inconsistent with the commonly held view that high budget deficits drive up the U.S. dollar. The depreciation since 1985 reflects a lower foreign demand for dollars in view of weaker U.S. real growth and less favorable tax provisions.

The fiscal deficit approach ignores effects related to the stock of government debt, to the use of resources for consumption or investment arising from government expenditure and tax policies, and to the effects of increased monetary uncertainty that accompanied the growth in the fiscal deficit.

Nevertheless, the available evidence on transmission focuses on fiscal shocks. Using simulations for a number of multicountry econometric models, Stanley Fischer (1987) shows that fiscal shocks in the United States have positive significant and lasting effects on real income in U.S. major trading partners, although the reverse effect from foreign fiscal shocks on the United States is negligible. How-

ever, there is great diversity of views among the individual empirical models. One finds that a bond-financed increase in U.S. government spending leads to a small negative effect on output at home and abroad, while another obtains strong positive effects (Minford 1985, Oudiz and Sachs 1985).

There is even greater diversity of views among the individual models with respect to the effects of monetary expansion than with respect to the effects of fiscal expansion. Expansionary U.S. monetary policy leads to worsened current accounts of the United States and OECD countries, and presumably improved current accounts of non-OECD countries, according to Fischer's simulations of 12 models. Again, one model reports strong positive spillover effects of monetary expansion in the United States; the other, small negative effects.

The conclusion that emerges is that little firm evidence exists on the actual effects of transmission under the present floating exchange rate system. Theory can outline the mechanisms of transmission, but with no agreed-upon econometric model, the results are far from established. Moreover, theory distinguishes between fixed and floating exchange rate regimes. The quantitative effects, however, are estimated for the actual world. The results showing interdependence may not be a contradiction of theory. Since the post-1973 regime cannot be characterized as a pure float, much of the interdependence may be a consequence of policy management and U.S. policy instability.

Lessons from History

The chief difference between the pre-1914 world and the world we now know is that the former was characterized by a relatively free international flow of factors and goods. Countries did not then believe that they had the leeway to resist the adjustments required to maintain gold convertibility. Countries accepted the burden (discipline) of fixed exchange rates. Higher priority was assigned to maintenance of external balance than to stabilizing the internal level of prices and income. In the gold exchange regime and the Bretton Woods system that followed, intervention was widely accepted as needed to achieve domestic economic objectives. That concern has carried over into the current floating regime.

In the past, under fixed exchange rates, the channels of transmission were mainly shifts in foreign demand for the home country's output, changes in international commodity supplies, arbitrage because of substitutability in goods and financial assets among countries, and international money flows (gold or foreign exchange) that bridged

the gap between imports and exports. Monetary contraction in response to a current account deficit was not unusual. An imbalance on current account could, however, be fully offset by a flow of short-term capital to a deficit country experiencing a boom and a higher interest rate than elsewhere.

Long-term capital flows under fixed exchange rates from a country with surplus savings to a country with a deficit of savings relative to investment opportunities was another channel of transmission. If capital flows shifted from one country to another, the results were cyclical contraction in the country from which capital was withheld and cyclical expansion in the country to which capital was redirected. Human capital flows could have a similar effect, stimulating the country of inflows and depressing the country of outflows. Under fixed exchange rates, deficit-country money supplies, domestic demand, real output, and prices had to fall, while interest rates rose; surplus-country money supplies, domestic demand, real output, and prices had to rise, while real interest rates fell. Investment declined in deficit countries and rose in surplus countries. None of these influences on domestic demand were expected to occur if imbalances in international payments on current account were corrected by movements in exchange rates.

In recent analyses of the floating exchange rate system, this conclusion does not hold. The reason is that the analysis takes for granted slow adjustment to monetary change of prices and wages, so while the nominal exchange rate adjusts rapidly to policy changes, wages and prices do not; hence the real exchange rate moves closely with the nominal one. Since the real exchange rate determines the profitability of exports, foreign countries are thought to be quickly affected by changes in it. In addition, as prices of imports change, so do overall price indexes.

Whether price and wage stickiness is as pervasive as is assumed is not examined in current analyses. More rapid inflation should shorten the time between price revisions, and large monetary shocks should induce more agents to revise their nominal prices in a given period.

Despite the emphasis in current analyses on sluggish wage and price adjustment, the effects of exchange rate changes on domestic inflation are supposed to be quickly transmitted. Therefore, depreciation of the currency leads to an increase in the prices of imports and an increase in wage claims as exports become more profitable and increase aggregate demand. Why should the response of wages and prices to exchange rate changes be more rapid than to monetary changes?

Especially under floating exchange rates, expectations of policy decisions affecting interest rates, asset prices, and exchange rates are given an important role as a channel of transmission. Much has been made of this channel in recent analyses, focusing in particular on U.S. policy decisions. One problem is that expectations of similar policy decisions in other countries do not match the effects assumed to occur in the United States.

The role of expectations with respect to fiscal policy has been especially prominent in recent discussion. Current analysis of channels of transmission pays much attention to fiscal influences. This emphasis was not present in discussions of either the pre-1914 gold standard or the Bretton Woods system.

Though we can state confidently that one obvious international interaction is widely recognized—the current accounts of both oil-importing and oil-exporting countries are affected by OPEC pricing decisions—we conclude that, more generally, our understanding of international interactions is limited both theoretically and empirically. The effects of transmission are diverse, and our ability to measure them is primitive. Moreover, if economists cannot agree on the links among variables domestically, the extent of spillover of these connections to the rest of the world is even more doubtful.

The exercises in model building that have occupied specialists in international economics seem designed to impress readers with the ingenuity of the effort rather than the value of the analytical contribution. The theoretical predictions in many cases conflict because they are model specific. Similarly, the empirical evidence on channels of transmission based on these theories has not yet resulted in a consensus. This suggests that policy advice, particularly with respect to support for exchange market intervention and policy coordination, should be forsworn.

The reasons for the massive swings in the dollar exchange rate—depreciation in 1977–79, appreciation from the summer of 1980 through the first quarter of 1985, and depreciation thereafter—are not well understood by economists. Disillusionment by some with floating exchange rates, however, has prompted proposals to fix or manage them.

Fluctuations in real exchange rates, however, do not imply instability. Output and prices are not more variable in the United States under floating than under fixed exchange rates. In Germany and Japan output and prices are more stable than in the United States because their policies are more stable. If markets are not permitted to adjust exchange rates freely, adjustment will take place in other markets: debt, equity, commodity, labor, money. A change in exchange

rates may have lower costs of adjustment than a change in wholesale prices.

A preference for one's own economic objectives seems to characterize the nations of the world. A stable international order is achievable with a floating rate system that provides independence to pursue stable domestic policies consistent with that preference. For international economic stability, policy coordination is neither necessary nor attainable.

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REAL EXCHANGE RATES AND FREEDOM OF INTERNATIONAL TRADE AND CAPITAL FLOWS

Michael R. Darby

I would like to respond to rather than comment in detail on the paper by my former colleagues Michael Bordo and Anna Schwartz. While I agree with most and disagree with some of their presentation, I fear that there is real potential of a forest and trees problem if I attempt to distinguish which is which. Instead, I would like to present a different way of looking at economic transmission under alternative systems.

A Four-Way Classification

Bordo and Schwartz arrange their taxonomy around whether the economy is on a floating or fixed exchange rate system. I would argue that across this dichotomy lies a much more fundamental dichotomy of whether there is an open or closed trading system for goods and financial assets. Both dichotomies suggest black or white cases where there may be shades of grey in between, but I think they are useful because one or another philosophy or strategy predominates at a given place and time.

Open trading systems differ from closed systems in that changes in fundamentals have strong effects on the real exchange rate between two countries. The real exchange rate is the amount of goods in one country that trades for a given amount of goods in the other. An increase in taxes on capital or decrease in the international value of a dominant national product will tend to depreciate the real exchange rate. If the country has a floating exchange rate, its nominal exchange rate will depreciate as required by the assumed change in fundamentals. Alternatively, if there is a fixed exchange rate system, the depre-

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ciation will be achieved by a reduction in money supply and prices at home—a deflation—or increase in money supply and prices abroad—an inflation—according to which is the nonreserve country. The timing and sectors that are affected in the transition depend on whether a fixed or floating exchange rate system is followed but not the ultimate size of the real depreciation of the domestic currency or real appreciation of the foreign currency.

Under a closed trading system, capital and trade flows are restricted so that the assumed changes in fundamentals may cause smaller moves in the equilibrium real exchange rate. Indeed the controls—which are part of the fundamentals in this system—are likely to be adjusted to offset pressures on the nominal exchange rate if we are to judge from the historical precedent of the Bretton Woods system or other present-day examples.

The Evolution of Systems

Now, I have suggested a four-way classification—fixed open, floating open, fixed closed, and floating closed—but only the first three really seem to be observed much in the real world. If there is only one independent central bank with any other monetary authorities passively adjusting their money supplies as required to maintain the nominal exchange rate, then one has a fixed open system. The ultimate example would be the linkage of the other 11 Federal Reserve districts to that headquartered in New York, but some observers would characterize the European Monetary System this way as well as certain countries that independently have chosen to define their national currencies as a certain quantity of dollars or pounds.

When there are sovereign nations involved, each has the right to set up a central bank with the power to determine its own money supply so that inflation or deflation reflects national goals, not the choices of a foreign central bank or the implications for the real exchange rate of changing tax policies or other fundamentals. This is why sovereign nations rarely operate for long under fixed open systems.

There is a strong impulse for a nonreserve country to resist an unwanted inflation or deflation by imposing capital controls. At the same time a bit of protectionism is likely to be added. As time goes on these controls build up until the system can only be characterized as closed. This is the sad history of the Bretton Woods system. That system was broken both by the growing gap between the inflationary impulse in the reserve country and the lower inflation goals in many major nonreserve countries as well as by technological innovations that made capital controls increasingly difficult to enforce.

With the advent of floating rates, there is little to be gained to offset the costs of operating a closed system, so we should not be surprised that the controls were dismantled and that international trade boomed. The costs of dealing with fluctuating real exchange rates while real proved much less a burden on trade than the costs of the controls needed to prevent the fluctuations. As Bordo and Schwartz report, in work with James Lothian I have recently developed evidence that the floating open regime has indeed resulted in a much more integrated world real economy even as nations have pursued much more divergent inflation goals than were possible under the Bretton Woods system.

Conclusion

I believe that the basic distinction is between open trading systems in which real exchange rates fluctuate and closed trading systems in which the effects on the real exchange rate of changing fundamentals are attenuated or offset by variable controls on the flows of goods and capital. While both fixed and floating exchange rates are consistent with open trading systems, the fixed system requires acceptance of substantial fluctuations in the price level of the nonreserve countries. For this reason, we observe historically major sovereign nations linked primarily either by fixed closed or floating open systems. It seems preferable to me when analyzing transmission under fixed and floating exchange rates to account simultaneously for the differences in capital and goods controls that are associated with the two systems. There is little gain and much potential mischief in comparing real systems with imaginary alternatives: After all, even democracy and capitalism suffer by comparison to idealized utopias instead of real alternatives.