

# Monetary and Exchange Rate Policy Reforms

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This chapter considers the impact of three related groups of reforms on poverty and income distribution. The three groups of reforms are exchange rate adjustments, money supply adjustments, and adjustments to controls on foreign capital flows. These reforms are combined under the heading “monetary policy” because of the conceptual links among them.

The chapter first highlights the ties among these policies and then outlines the techniques available to assess the impact of the reforms on the poor.

## MONETARY POLICY AS A WHOLE

### **Impossible trifecta**

Obstfeld and Rogoff (1996) make a compelling case for the “impossible trifecta” of monetary policy. As they describe the term, it is impossible in the long run and costly in the short run for the government of a small, open economy to sustain three independent macroeconomic policies concurrently: (1) a fixed exchange rate, (2) an autonomous policy of money supply adjustments, and (3) unregulated international flows of financial capital. The proof is a simple application of the covered interest parity

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condition: With fixed exchange rates and perfect capital mobility, arbitrage activity will force equality in nominal interest rates across countries. Autonomous monetary policy is then impossible because it must function through adjustments to the nominal interest rate, and this interest rate cannot adjust.

The implication is straightforward: Of the three potential policies (exchange rate, money supply, and capital controls), at most two can be set independently. The third will not be a true policy choice, but it will accommodate the first two.

Reforms to monetary policy must acknowledge and incorporate this interdependence. When developing countries consider monetary reforms, they usually begin from a combination of a managed exchange rate, controls on capital flows, and an overly expansionary monetary policy. Given the links among the three, it is important that these reforms be considered as complementary and that they be examined in combination.

### **Acting globally, thinking locally**

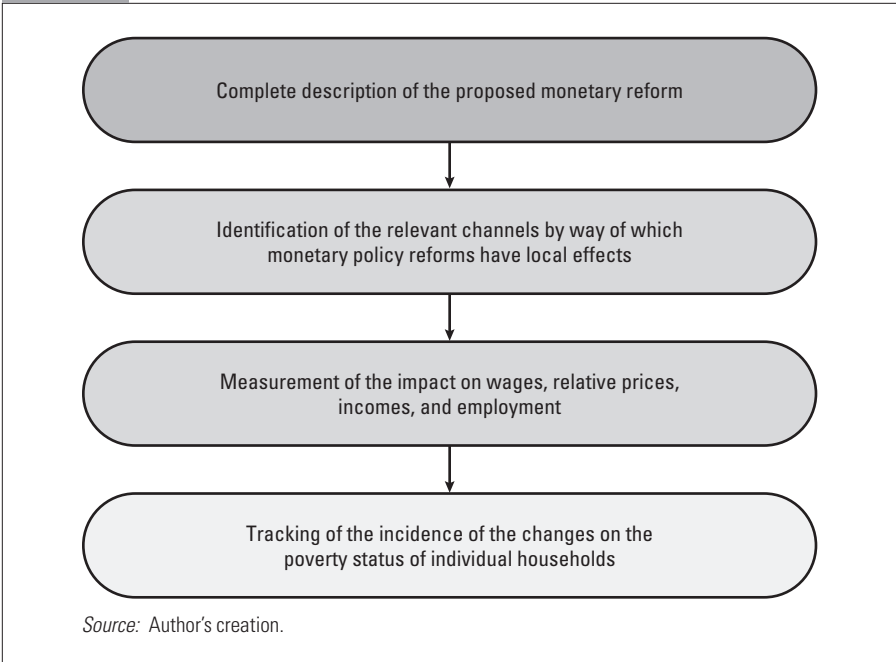
Monetary reforms are quintessentially macroeconomic policies, while the incidence of poverty must be measured at the microeconomic household level. To measure the complete impact of policy reform on poverty, it is necessary to use four sets of tools. Each tool is associated with one of the four stages in the schema illustrated in Figure 2.1.

#### ***Complete description of the proposed monetary reform***

The impossible trilemma illustrates a fundamental point about macroeconomic reforms: They cannot generally be considered in isolation. A reform in one macroeconomic aggregate will work through the budget and balance of payments to bring about collateral changes in other policy instruments. The discussion of the impact on poverty should therefore consider the joint impact of the direct monetary policy reform and all collateral macroeconomic changes. Two examples illustrate this phenomenon.

First, the removal of controls on international financial capital could lead to financial inflows to the reforming country that would, all else being equal, have an adverse effect on the balance of payments. The central bank must then purchase foreign currency and place it in foreign reserves to maintain the balance at a constant exchange rate. This accumulation in foreign reserves would cause an expansion in the money supply.

Second, a reduction in the growth of the money supply cannot be considered in isolation from the government's fiscal budget. If the initial growth in the money supply was necessary to finance a budget deficit, then

**FIGURE 2.1 Analytic Schema: Monetary Policy Reforms**

a reduction in the growth of the money supply must be accompanied by expenditure cuts, tax revenue increases, or more government borrowing.

In the calculation of the impact of a policy reform, it is crucial to include a complete (direct, plus collateral) statement of the policy changes implied by the proposed reform. The analytic tool required to complete this stage is a financial flow-of-funds model.

***Identification of the relevant channels by way of which monetary changes have local results***

Macroeconomic policy has direct and indirect effects, as Agénor (2002) demonstrates quite clearly. The direct effects can be separated into short- and long-term effects.

The short-term effects of monetary policy are typically expansionary or contractionary through the policy's impact on the nominal interest rate. Expansion follows from falling interest rates, while contraction follows from rising interest rates.<sup>1</sup> An expansionary effect will lead to growth in real product, income, and employment, while a contractionary effect will produce opposite results. Economic expansion typically favors the poor.

Monetary policy also can have a short-term effect through its impact on the exchange rate. Reforms can change the price of traded goods in the economy relative to the price of nontraded goods, which can result in substitution effects in the supply and the demand for the goods and in altered returns to factors of production. Devaluing the exchange rate, for example, will increase the price of traded goods relative to the price of nontraded goods in the short term.

Monetary policy will have long-term effects through its impact on consumer inflation. Agénor (2002) concluded that the poor are more vulnerable to inflation. Their incomes often are defined in nominal terms (that is, not indexed for inflation), they typically have fewer inflation hedges, and they tend (more than the nonpoor) to hold cash balances that lose value through the inflation tax. Thus, expansionary monetary policy that does not bring about a permanent increase in output will raise the number and reduce the welfare of the poor in the long term through its induced inflation.

It will be necessary to account for all these channels when tracking the impact of a policy reform. The analytic tool to complete this stage is a macroeconomic model.

***Measurement of the impact on wages, relative prices, incomes, and employment***

After the policy reform is in place, after other policies have adjusted to provide consistency, and after the effects have filtered through the channels described above, the policy reform will lead to adjustments in equilibrium prices and quantities on labor, commodity, and foreign exchange markets. The analytic tool appropriate at this stage is a computable general equilibrium (CGE) model of the relevant markets: market clearing will ensure that the endogenous variables truly reflect the impact of the policy reform.

***Tracking the incidence of reform on the poverty status of individual households***

The induced changes in market outcomes have immediate implications for the incomes of individual households within the economy. The analytic tool accompanying this stage is a household-level model of income generation.

**Implementing the analytic schema: various approaches**

The analytic schema (Figure 2.1) identifies logically distinct features of an impact analysis for policy reform, but, in practice, the efforts to measure the impact of policy reform on poverty and income inequality com-

bine one or more of the stages. In the literature on policy reform, there are five separate approaches to completing the economic impact analysis: (1) the before-and-after, (2) cross-country, (3) reduced form, (4) structural, and (5) full package approaches. For each of these, there are specific techniques and data requirements, which are outlined below, along with practical examples where available.

### ***The before-and-after approach***

In the before-and-after approach, analysts identify the date of the monetary reform in a single country. They then scrutinize household surveys collected shortly before and shortly after that date. They use these surveys to measure the incidence and depth of poverty and the degree of inequality before and after the reform. A comparison of the results of the two surveys provides indicators of the impact of monetary reform on poverty and income inequality.

This approach has the virtue of simplicity. It provides an excellent retrospective indicator of the impact of shocks to the economy during the period between the two surveys. However, it will be less useful in predicting the effects of future reforms for two reasons. First, the size of the monetary reform has not been quantified. Unless this is done, connecting the impact on poverty to a specific magnitude of reform will be difficult. Second, the before-and-after approach combines all shocks to the economy between the dates of the two surveys and attributes all changes and effects to the macroeconomic reform, even in instances in which a monetary reform coincides with external shocks or independent reforms elsewhere in the economy. For example, before-and-after studies in Mexico in the mid-1990s lumped together the impacts of trade liberalization through the North American Free Trade Agreement and the impacts of exchange rate devaluation. As a result, only the combined effect of the two sets of impacts were derivable from the data.

In implementing this approach, all four stages of the analytic schema are approximated by one comparison over time.

Sahn (1987) provides an early example of this approach. He considered the evolution of poverty in Sri Lanka from 1969 through 1982. He examined four expenditure surveys and two nutritional-status surveys over this period to track the changes in nutrition, consumption, and poverty. The primary monetary reform Sahn cites is a 40 percent currency devaluation in November 1977, but, as he says,

*In 1977, the government brought about a myriad of changes in policies. . . . The most visible were devaluation of the currency,*

*reduction in the value of food subsidies, interest rate reform, lifting of most price controls, liberalizing import restrictions, establishing a free trade zone to promote exports, and reducing public-sector monopolies (1987, 823).*

His primary poverty comparisons are between the expenditure survey results of 1969/70 and the results of fiscal years 1978/79, 1980/81, and 1981/82. Sahn concludes—

*Despite the [positive] economic performance in the aggregate between 1978 and 1982, there has been increasing inequality in levels of consumption, and the benefits of economic growth have not trickled down to the poor (1987, 824).*

While his analysis is compelling, it illustrates as well the drawbacks of before-and-after analyses. Unfortunately, there is often no set of household surveys that can serve as bookends to a monetary reform. Thus, Sahn is obliged to go back to 1969/70 to obtain a “before” survey for the reform of 1977. Furthermore, monetary reform is not taken in isolation. Sahn’s conclusions can be attributed only to the entire set of reforms and, in the absence of additional study, cannot be attached to the devaluation alone.

There have been many recent applications of the before-and-after approach. Glewwe and Hall (1998) examined the combined impact of macroeconomic instability in Peru in the late 1980s through the use of Living Standards Measurement Studies in 1985 and 1990. While they focused on “vulnerability to shocks” instead of descent into (or rising out of) poverty, the methodology replicated Sahn’s approach. The cumulative impact of all policy changes and economic shocks during the intervening period is evident in the sample, but it is impossible to attribute a decomposition of the effects to one specific reform or another, or parts thereof.

Another good example is Frankenberg, Smith, and Thomas (2003) on the impact of the massive economic shock in Indonesia in 1997. In this case, household surveys furnished a tight before-and-after window for the impact of the crisis. However, while the major feature of the crisis was a massive devaluation of the rupiah relative to the U.S. dollar, the study did not measure the independent contribution of monetary reform to the economic outcome.

The before-and-after approach alone does not offer an opportunity to distinguish monetary policy from other sources of impact, but it is possible, through the use of control groups, to supply some statistical power against nonmonetary alternatives. Consider, for example, the case of

Indonesia's 1997 crisis. The forecast is that the impact of a change in the exchange rate on poverty status is different among people whose incomes derive from producing nontraded goods than among people whose incomes derive from producing traded goods. By contrast, the forecast is that the effect of inflation on poverty will not depend on the sector in which an income is earned. A distinction should then be possible between the two sets of effects through a difference-in-difference estimator. In such a research design, the data are divided into two time categories (before and after) and two source-of-income categories (traded goods and nontraded goods).

Consider an example in which the population is divided along these lines, and poverty headcounts ( $P$ ) are calculated for each combination (Table 2.1).

$(P_{T1} - P_{T0})$  is the before-and-after indicator of the increase in poverty for people with traded-good incomes, while  $(P_{N1} - P_{N0})$  is the before-and-after indicator of the increase in poverty for people with nontraded-good incomes. The distinction between these differences is a measure of the impact of exchange rate devaluation on the incidence of poverty. By establishing a control group of people with nontraded-good incomes, one can measure the differential impact of exchange rate devaluation more precisely.

Another extension of the before-and-after analysis combines information from the "before" survey with a systematic identification of household differences according to their expenditure or asset-holding patterns. This variant permits a calculation for each household of a more accurate measure of loss in real purchasing power. It uses *ex post* information, but only about readily available commodity or financial prices; the method does not require an "after" household survey to be effective. Incidence analysis, as recommended by Hossain (2003), falls into this category. So also does the rapid response framework of Friedman and Levinsohn (2002). Their goal is to predict the distributional impact of financial crises. They augment the use of household income data with a detailed examination of expenditure shares for each household and demonstrate how to match the

**TABLE 2.1 Time**

<i>Source of Income</i>	<i>Before</i>	<i>After</i>
Traded-good incomes	$P_{T0}$	$P_{T1}$
Nontraded-good incomes	$P_{N0}$	$P_{N1}$

*Source:* Author.

expenditure shares with detailed price-inflation information to derive the impact of the crisis in terms of real household purchasing power.

### **The cross-country approach**

In the cross-country approach, analysts collect comparable measures of aggregate poverty or income inequality from a large number of countries. They also collect indicators of monetary policy, as well as other potential determinants of aggregate poverty. They then run a cross-sectional regression of the poverty indicator on the monetary variable and other variables; the coefficient on the monetary variable is a quantification of the impact of monetary reform.

Like the before-and-after approach, this is a simple approach that does provide a framework for the prediction of the impact of monetary reform on poverty. It has serious drawbacks, however, as follows:

- Because there is no modeling of structure, the economic structure is assumed to be identical across countries. If it were not, then the estimated coefficients would not be appropriate for any one country, but rather only for an average, virtual country.
- The methods for creating indicators of poverty and inequality (for example, headcount, Gini coefficients, the income share of the lowest income decile) may differ from country to country. If different methodologies are used in constructing these indicators, an additional source of error (and perhaps bias) will be introduced.
- The spillover effects of one monetary reform on other macroeconomic policy variables (as indicated above) are not incorporated into the analysis.

All four stages of the analytic schema (Figure 2.1) are approximated in this case by a single cross-country regression.

Baldacci, de Mello, and Inchauste (2002) supply an example of the cross-country approach. The goal of their research was to provide an indicator of the impact of financial crisis on poverty. They collected measures of poverty (headcount, poverty gap) and income inequality (the Gini coefficient, quintile income shares) for 65 countries they identified as having experienced a financial crisis.<sup>2</sup> They calculated the change in these indicators for each country from the year before the crisis to the year after the onset of the crisis. They then took the sample mean as an indicator of the impact of the crisis.

Their equation (Equation 2.1) is reproduced here. The symbol  $\Delta$  represents the change from the precrisis period to the postcrisis period,  $t$ .  $F_i(t)$

is the vector of indicators of the channels through which the financial crisis in country  $i$  is expected to affect poverty, while  $X_i(t)$  is the indicator of the initial conditions in country  $i$  that affect the incidence of poverty. Country  $j$  is the control group and is proxied in their estimation by the record of the countries of the Organisation for Economic Co-operation and Development. The sample used is cross-sectional and includes between 21 and 62 countries (depending on the poverty indicator).

$$\begin{aligned} \text{Equation 2.1} \quad \Delta P_i(t) - \Delta P_j(t) = & a_0 + a_1[\Delta F_i(t) - \Delta F_j(t)] \\ & + a_2[\Delta X_i(t) - \Delta X_j(t)] + u_i(t) \end{aligned}$$

For all poverty indicators, the sample mean indicates an increase in poverty, but the estimate is insignificantly different from zero in all cases. The authors also undertake ordinary least squares regressions to test the effects of an exogenous financial crisis on changes in poverty using a cross-sectional sample of country-years in financial crisis. They separately perform these regressions on the change in gross domestic product per capita, inflation, and unemployment. The results are statistically insignificant in almost all cases for the measures of poverty, although the signs of the coefficients are as expected (for example, a more severe financial crisis leads to an increase in the poverty measure). The results for income shares by quintiles are significant more often than for poverty measures, but these results are also difficult to interpret.

The paper illustrates the advantages and the drawbacks of the cross-country approach. On the plus side, the approach is relatively easy to implement, requiring only aggregate indicators of poverty and income distribution across countries. On the minus side, the number of observations are necessarily low. Obtaining statistically significant results from equality-of-means tests becomes difficult. Equations do not regress indicators of poverty on the monetary reform variables directly, but rather on intermediate instruments (in this case, gross domestic product per capita, inflation, and unemployment), and the movements of these are assumed to be defined totally by the monetary shock.

The cross-country approach begins as well with a troubling assumption: that the income-generating (and thus poverty-generating) process in each country is identical. In this estimation procedure, differences in institutions and economic structure will be confounded with the differences in potential channels modeled in equation 2.1. It is unlikely that cross-country regression will pick up the true reduced-form parameters for each country in the sample at this level of aggregation.

A variant of the cross-country approach is proposed by Datt and Ravallion (2002) for India. Rather than using cross-country data, the authors employ cross-state data from India. They also have a substantial time series for each state, so the resulting panel data set is quite extensive. While they do not examine monetary policy (because there is only one monetary policy for all states within India), their analysis and econometric techniques provide a good example for those wishing to implement this methodology in a cross-country framework.

**The reduced-form approach**

A reduced-form analysis begins with time-series data (panel or pseudo-panel) on households in a single country. Each household  $i$  is characterized by geographic (the matrix  $G_i$ ) and demographic (matrix  $H_{it}$ ) data. The members of each household can be ranked by an unobserved continuous poverty metric ( $p^*_{it}$ ) that is a function of geographic and demographic variables, as well as a random variable ( $\epsilon_{it}$ ). Poverty is also modeled to depend systematically on macroeconomic policy indicators (the matrix  $M_t$ ). The calculated poverty line for the country in period  $t$  allows an observed categorization of either “being in poverty” ( $p_{it} = 1$ ), or “not in poverty” ( $p_{it} = 0$ ). If the observed poverty indicator is an informative proxy for the unobserved  $p^*_{it}$ , then the following set of equations can be estimated through limited-dependent variable techniques (for example, logit or probit estimation).

Equation 2.2      
$$p^*_{it} = G_i\alpha + H_{it}\beta + M_t\gamma + \epsilon_{it}$$

Equation 2.3      
$$\begin{cases} p_{it} = 1 & \text{if } p^*_{it} \geq 1 \\ 0 & \text{otherwise} \end{cases}$$

This estimation defines the probability of being in poverty in terms of household-specific and place-specific factors and also identifies the independent effects of various macroeconomic policy indicators that are included in  $M_t$ . After the analysts have identified the complex policy changes associated with the monetary reform, they can insert the predicted changes in the policy indicators that are associated with the monetary reform into the estimating equation. This enables them to determine the complete impact of the reform on the average probability that a household will be in poverty.

This approach combines the last three stages of the analytic schema and thus avoids the specification of the structural links between the complex of linked changes and the relative prices, wages, and incomes of the

households. This decision greatly simplifies the analysis. However, the approach accomplishes this simplification at a cost: In the absence of structural modeling, it becomes impossible to ensure that the measured policy impacts are the desired effects and not simply spurious correlations with omitted variables.

Baldacci, de Mello, and Inchauste (2002) implement an adaptation of this reduced-form model for Mexico. Rather than a continuous variable of macroeconomic policy ( $M_t$ ), they use a binary variable indicating whether the observation is pre- or postcrisis (that is, before or after 1994). The coefficient  $\gamma$  is then the indicator of the impact of financial crisis on the incidence of poverty.

### ***The structural approach***

Structural analysis combines a study of the panel data on households with an economic model that defines the changes in relative prices, wages, employment, and incomes, which are the result of the complex of linked changes associated with monetary reform. This economic model takes, as inputs, the policy changes derived through the first step and provides, as output, the changes in relative prices, wages, employment, and incomes that result from the policy reform. The data on household choices are then used to derive statistically the impact of all these variables on the incidence of poverty. The equation from that estimation then is combined with the predicted changes in relative prices, wages, and other variables from the economic model. Each household can be evaluated before and after for incidence of poverty, and the effect of the reform can be derived in aggregate or for subgroups among the households. For logical completeness, the reform's microeconomic effects on employment and consumption can be aggregated to compare them with the predictions of the economic model; if there are differences, an iteration algorithm can be introduced to align the aggregated and disaggregated data.

This approach separately focuses on the second, third, and fourth stages of the analytic schema. There are three advantages to this approach. First, the channels through which a monetary reform passes in order to affect household choices are clearly defined, and the impact of each is measured separately. Second, these separate channels supply a richer view of the impact of the reform on the individual household and thus make possible a more nuanced interpretation of the impact of reform on poverty. Third, the resulting model can be used to make predictions about the impact of monetary reforms and an "after" household survey is not needed.

The approach has substantial data requirements. Not only is it necessary to possess household survey data, but analysts must also create the eco-

conomic model. If they do this through an estimation of structural equations, the data requirement is tremendous. If, instead, they use a CGE model to approximate the economic structure, they must face the risk that the model reflects only imperfectly the actual transmission channels in the economy under study. In contrast to before-and-after analyses, however, this method can be calibrated with consistent data for one year alone. Moreover, the household poverty profiles can be estimated from a single household survey.

Robilliard, Bourguignon, and Robinson (2001) examined the impact of the economic crisis of 1997 in Indonesia using a structural model. Their model has three parts. The “top” is a CGE model for 1995 with 38 sectors and 15 factors of production. The “bottom” is a set of income- and employment-generating equations estimated from Indonesia’s 1996 SUSENAS household survey. The “middle” of the model is a set of iterative constraints that ensure the equality of the values generated in the CGE model and the aggregated employment and income responses of households from the household-survey simulations.

Through a series of simulations, the authors concluded that the real depreciation was but one of the causes for the sharp increase in poverty in Indonesia after the crisis. They found that the credit crunch among firms during the same period generated rises in poverty in the model that were roughly equivalent to the effects of the real depreciation taken alone.

The model supplies a coherent analysis of the second, third, and fourth stages of the analytic schema, but the CGE framework is not ideal for the analysis of macroeconomic reform. The financial crisis was simulated by three exogenous shifts in the model: a real devaluation of 20 percent, a 25 percent rise in the cost of marketing food, and a 25 percent decrease in the availability of working capital. Other factors affecting poverty (the El Nino effect) were modeled with the assumption that total factor productivity in agriculture fell by 5 percent. These percentages were chosen so that the model would mimic the actual macroeconomic evolution: The credit crunch generates a large reduction in gross domestic product in the model, while devaluation and food processing costs generate a rise in food prices relative to non-food prices. However, there was no estimation or examination of financial markets to check whether this set of shocks was, in fact, most likely responsible for generating these outcomes.

Early efforts at the structural approach depended exclusively on CGE models to generate the implications of poverty. In terms of the analytical schema, these analyses relied on the CGE model to undertake the second and third stages of the schema. Rather than complete the fourth stage of the schema, the authors typically created “representative households”

within the context of the CGE model. This provided a consistent, but necessarily quite aggregated, prediction of the effects of the policy reforms on poverty.

Robilliard, Bourguignon, and Robinson (2001) investigated the loss in accuracy that occurs if one employs representative-household analyses using CGE constructs instead of the income distribution derived from survey information on individual households. The exploitation of information on individual households apparently captures income-distributional effects more precisely, while the representative-household approach underestimates the impact of policy reform on poverty and income inequality.

### ***The full package approach***

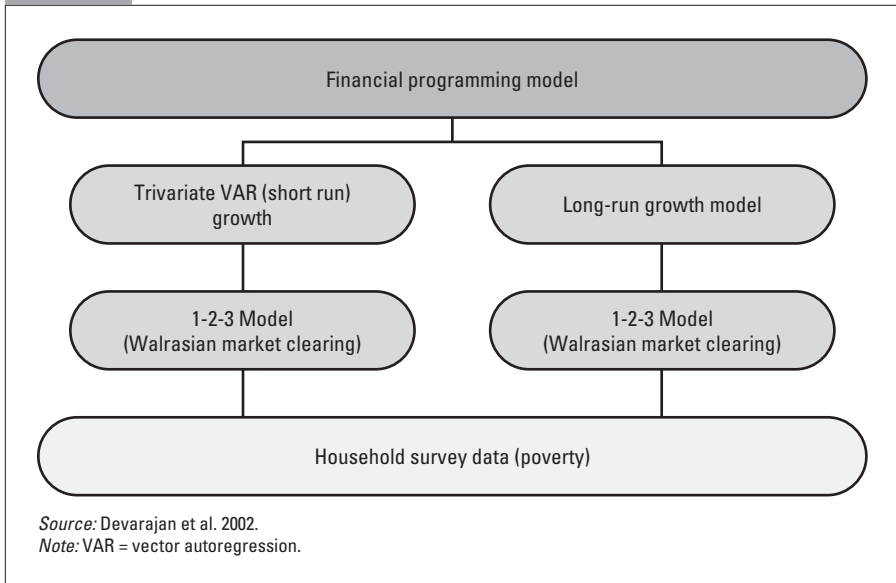
The full package approach separately completes each of the four stages of the analytic schema. It extends the structural approach by adding a financial model of the links in government monetary policy (think of this as a variant of the structural approach in which the CGE model is replaced by a financial CGE model). Its strengths and weaknesses are magnifications of those in the structural model. With this approach, analysts can perform counterfactual simulations that identify the precise contribution of specific monetary reforms to the depth and incidence of poverty in a specific country. However, the data requirements (or the dangers of approximation error) are magnified because the entire financial system is a necessary addition to the modeling exercise.

Devarajan, Go, and others (2002) present a parsimonious framework for linking macroeconomic policy variables to the incidence of poverty. The schematic of the framework illustrates nicely the nature of the links involved in a three-step analysis (Figure 2.2).

The top layer of the modeling framework is the financial programming model. This model links monetary and macroeconomic variables through national income and product account identities so that, in the adjustments of other macroeconomic aggregates, there is a consistent accounting of any macroeconomic imbalance caused by the policy reforms. For example, income tax reduction is a single policy reform. However, if it leads to a government budget deficit, it will also bring about monetary expansion, increased domestic borrowing, or increased foreign borrowing. The financial programming model ensures that these macroeconomic implications are all recognized.

The second layer includes a simple growth model that links the policy reforms to economic growth. For a long-term analysis, the authors suggest using Easterly's (2001) endogenous growth model estimated on the basis of a cross-section of developing countries. The coefficients from

**FIGURE 2.2** Macro-Micro Schematic



that model are combined with the policy reforms from the top layer to provide a prediction of the change in economic growth over the long term (that is, five years or more).

For a short-term analysis, the authors suggest a simple vector autoregression (VAR) for the country under study, which links the policy reforms to economic growth and the real exchange rate. This VAR is estimated for time-series data from the country, and its coefficients are used to predict the impact of the policy reforms on economic growth and the real exchange rate in the short run (that is, one to five years).

The third layer is a static Walrasian model that assumes, as givens, the growth and real exchange rate evolution of the second layer and computes the relative prices and wages of a multisector economy.

The bottom layer is an analysis of poverty in terms of relative prices and wages as derived from econometric work with household consumption surveys. The changes in relative prices and wages derived in the third layer are inserted into the estimated equations to derive the impact of the policy reforms on the number of households falling below (or being pulled above) the poverty line.

Devarajan, Go, and others (2002) illustrated the use of this model through the case of Zambia. They did not examine monetary policy

reform but focused on the impacts of government expenditure increases and the deterioration in terms of trade. While the model is quite simple, it does generate plausible results for the evolution of poverty in response to each shock.

Ferreira and others (2003) applied a full package approach to the explanation of the changes in poverty and income inequality observed following the Brazilian devaluation of 1999. They undertook the first step through construction of an investment savings–liquidity money (IS-LM) model of the macroeconomy. The second step involved expansion of this IS-LM framework to include sectoral decompositions and an expanded financial sector. This augmented IS-LM model was then estimated using Brazilian data from 1980–2000. The outcome of the second step was a vector of 48 price, wage, and employment values generated by the augmented IS-LM model. In the third step, the authors used the 1998 National Household Sample Survey to generate a prediction of occupational choice and income by individuals and then aggregated the individuals into households.

To predict the impact of the devaluation, the authors first resolved the augmented IS-LM model for the new value of the exchange rate. They then generated the vector of the wages, prices, and employment values consistent with this. They passed the wage and price values to the equations for the household sector and then iterated to a convergence that the disaggregated occupational choices aggregated to the employment values from the IS-LM model. This represented a prediction of the impact of the devaluation.

The authors reported the results of their predictions side by side with the actual poverty and inequality figures from the 1999 National Household Sample Survey in Brazil. They found that the model predicts well for occupational shifts, but, as they noted, “the predictive performance of the model is much worse for earnings” (Ferreira et al. 2003, 25). However, on average, the predicted results for the changes in poverty and inequality were close to those actually observed.

Agénor, Izquierdo, and Fofack (2003a) offered another example of the full package approach. The authors constructed a financial CGE with a great deal of disaggregation in labor-market choices. They calibrated this to a “virtual country,” not to data for a specific country (although they presumably could have recalibrated as appropriate for work on specific economies). They proposed two ways of examining poverty: (1) by generating poverty statistics from the virtual households of the simulation model, or (2) by creating representative-household equations from a household survey for a specific country. In their paper, they took the vir-

tual country approach. This structure provides a good framework for decomposing the various conceptual channels through which monetary reform affects poverty and income inequality. It is not clear from the paper how difficult it will be to calibrate the model to a specific country, and this last step will be necessary to make the model fully comparable to the preceding references.

## **REFORM BRIEF: EXCHANGE RATE REFORMS**

The following sections provide reform briefs for two parts of the impossible trilemma. The first brief is a report on the efforts of various researchers to derive the impact of exchange rate reform on poverty and income inequality. The second brief is a report on the efforts of researchers to identify the impact on poverty of reforms to money-growth rules or interest-rate-targeting rules. The third part of the trilemma—the removal of capital controls—is not given separate treatment. While there have been studies on the macroeconomic consequences of the removal (or introduction) of capital controls, it has not been possible to identify any research on the quantitative impact of capital account liberalization on poverty and income inequality.<sup>3</sup>

Alterations to the exchange rate regime or to the parity of the home currency with a foreign currency in a fixed exchange rate regime are illustrations of monetary reform. Any such reform will be subject to the impossible trilemma, as outlined in the introduction of this chapter. In many theoretical models of speculative attack (for example, Flood and Garber 1984, or as summarized in Agénor and Montiel 1996), the changes in the fixed exchange rate are in fact the product of this trilemma: Given an independent money-growth policy and free capital movements, the fixed exchange rate at the given parity is unsustainable.

### **What are the types of reform encompassed in this family of reforms?**

There are three changes to exchange rate policy typically included in this category of reforms. First, a country may choose to change from a regime with multiple exchange rates to a regime with a unified exchange rate. Second, a country may choose to replace a fixed exchange rate regime with a flexible exchange rate regime or with a regime characterized by periodic auctions. Third, a country with a fixed exchange rate regime may choose to replace its current parity with a new parity. If the new parity involves increasing the exchange rate, this represents a policy of devaluation.

## **What is the typical rationale?**

The typical rationale for the removal of multiple exchange rates is that this will eliminate the inefficiencies and corruption that follow from such rates. This is a standard recommendation of the International Monetary Fund (IMF) to developing countries (see Krueger 2002 on Argentina). The reform will cause a shift in the relative prices of the goods sold under the multiple rates; it will also change the allocations of income among producers.

The typical rationale for doing away with a fixed regime or for devaluing the currency is to avoid the shortage in foreign-exchange reserves or the speculative attack that can arise from inconsistency between the fixed exchange rate and the country's monetary policy (see Obstfeld and Rogoff 1996, section 8.4). If the exchange rate and monetary policy are inconsistent, then there will be substantial growth (positive or negative) in the stocks of official reserves; if these decline to zero, the exchange rate regime can no longer be supported. This reform (to the extent that the nominal exchange rate changes relative to nominal wages and prices) will alter the relative price of traded goods and will reduce the purchasing power of consumers in terms of traded goods.

There are many variants of the exchange rate regime available to open economies, including dollarization, currency boards, managed floating, crawling pegs, basket pegs, and pure floating. Reform may include moving from any one of these to any of the others. Detailed discussion of the costs and benefits of these regimes is beyond the scope of this brief (see Caramazza and Aziz 1998 for an accessible overview).

## **How are the reforms typically implemented? What issues emerge?**

These reforms are typically under the purview of the central bank. A dual exchange rate regime requires that the central bank stand ready to exchange foreign currency for home currency at two different exchange rates, depending on the nature of the transactions. Reform entails the unification of the exchange rates by the central bank to a single parity. Suspension of a fixed exchange rate regime is characterized by the central bank's decision to "close its window," that is, no longer to stand ready to exchange foreign currency for home currency at the preexisting parity. The central bank can then stay out of the foreign exchange market entirely, it can establish a new parity at which it will trade currencies, or it can establish a regular sequence of auctions at which actors (including the central bank) can trade foreign for domestic currency.

Reforms to the exchange rate regime have wide-ranging effects and typically are not undertaken lightly. They are often implemented in response to a foreign-exchange crisis and are frequently paired with reforms in trade policy and reforms to address budgetary imbalance. The traditional view of the advice of the IMF to countries with balance-of-payments deficits illustrates this “jointness”: The Fund was expected to call for expenditure switching (through a devaluation) and expenditure reduction (through a cut in government expenditure).<sup>4</sup> During the recent Asian crisis, it was recognized that devaluation can have balance-sheet effects in a country’s domestic financial sector (because assets are denominated in local currency, while liabilities are denominated in foreign currency). These effects on credit markets should be considered as if they were determined along with exchange rate reform.

### **Which stakeholders will be affected by the reform positively or negatively?**

Exchange rate reform is a macroeconomic reform. Those having a say in the size and timing of the reform are typically linked with the central government and the central bank. If we consider those affected by the reform, all citizens become stakeholders. Whether we can single out groups for special attention depends on the degree of the pass-through of exchange rate change to the prices of domestic goods.

- If there is a substantial degree of pass-through to local prices, then there will be few relative-price effects of a devaluation (for example). In that case, the key stakeholders will be those individuals holding financial assets denominated in the local currency. These stakeholders will lose because of the reform caused by the loss in the purchasing power of the assets. People holding foreign-currency assets will be winners because of the increase in their purchasing power.
- If there is little pass-through, then the devaluation will be felt because of its impact on the relative price of traded and nontraded goods. Producers of traded goods (both import substitutes and exports) will benefit from the switch of expenditure to their products, while consumers of traded goods will suffer because of the higher prices for imports in local currency. Producers of nontraded goods will be relatively disadvantaged.
- For intermediate degrees of pass-through, both effects will be important and both sets of stakeholders should be monitored.

Following Pangestu (2001), we can speak in more concrete fashion of stakeholders and the benefits they receive. With a devaluation—

- Rural workers benefit relative to urban workers, because their products are often traded goods.
- Residents of agricultural regions benefit, while residents of nonagricultural regions suffer.
- Ethnic groups face differing impacts: Those dependent on international trade (for example, ethnic Chinese) will be advantaged relative to others.
- Younger, less-educated, and informal-sector employees may be disproportionately disadvantaged.
- Urban residents with family ties in rural areas will be affected less because of the opportunity to relocate temporarily.

**What is the principal transmission channel through which each stakeholder is affected by the reform? What is the direction and magnitude of impacts, and how do they evolve over time? What are the assumptions?**

We can identify four transmission channels that carry the impact of the changes in the exchange rate regime to households.

**The relative prices of commodities will change.** This will affect the consumption choices of households. In a general devaluation, traded goods will become more costly relative to nontraded goods. This will reduce the purchasing power of every household, all else being equal, but will, in turn, raise the incomes of those households that supply traded goods. When multiple exchange rates are removed, this same effect on producers and consumers is observed for the subsets of traded goods subject to the appreciated exchange rate.

**Household incomes will change.** The shift in production patterns toward traded goods will create excess demands for labor in some sectors, pushing up the nominal wages of hired labor. The rise in wages will be centered on the traded-goods sector, and people in the service sector should observe a more moderate increase in nominal wages.

**Employment patterns will change.** The shift in demand toward traded goods should pull workers out of the informal and service sectors and into the traded-goods sectors. The new jobs will have different wage and

benefit streams and, thus, will alter the standard of living of the households to which the workers are attached.

**A balance-sheet effect in the banking sector could lead to a credit shortage in response to the devaluation.** As the banks call in their outstanding credit, formal-sector firms cut back their scale of operations. This will lead to a lowering of profits, employment, and wages in all sectors.

### **What is the typical methodology used to analyze the distributional impact through each channel?**

The typical methodology used to analyze exchange rate reform will capture the distributional impact of all channels. The introduction of this chapter summarizes five approaches to the measurement of the distributional impact: the before-and-after, cross-country, reduced-form, structural, and full package approaches. The first three approaches provide methods to gauge the impact of the reform on poverty and income inequality aggregated over all transmission channels. The structural and full package approaches decompose the individual contributions of the transmission channels to poverty and income inequality.

Empirical analyses of the impact of exchange rate policy changes on poverty and social issues typically focus on periods of financial crisis. As noted in Sahn (1987) and Smith and others (2000), the exchange rate policy reform in such times is only one of many shocks to an economy in crisis. Generally, it will be quite difficult to disentangle the effect of exchange rate policy reform and the many factors that trouble the economy.

McKenzie (2003a, 2003b) performed a careful before-and-after analysis of consumer survey data relevant to the peso crisis in Mexico. He examined samples from 1994 and 1996 and attributed the difference in behavior in the two samples to the impact of the Mexican peso crisis (which began in December 1994). He did not supply an explicit definition of poverty or income inequality, but his analysis documented the fall in consumption among disaggregated population groups. For example, urban and more highly educated households suffered the greatest falls in income during the peso crisis. He also decomposed the adjustment in consumption into an Engel effect of reduced income and a switching effect of consumption during the crisis. He noted that the consumption shares, on average, rose for essential items and fell for durable goods and luxury items. There was some evidence as well that goods not considered necessities before the crisis became necessities during the crisis. McKenzie's two papers do not assist in quantifying the impact of a future exchange rate depreciation, but

they do identify some of the mechanisms through which Mexicans adjusted to the shock. One adjustment mechanism was reduced fertility, that is, families had fewer children. Another mechanism involved adjustment in the consumption basket of essential items, as noted above.

Baldacci, de Mello, and Inchauste (2002) presented a complementary before-and-after analysis of the impact of the 1994 Mexican devaluation. The data surveys used were the same as those used by McKenzie. While McKenzie analyzed consumption demand, Baldacci, de Mello, and Inchauste adopted the poverty definition of the Mexican statistical agency, characterized each household as being in or out of poverty as of that date, and then estimated the probability of being in poverty as a function of demographic and geographic factors. There was no explicit consideration of the devaluation: The authors attribute all changes between 1994 and 1996 to the devaluation in December 1994.

There are no cross-country studies of the impact of exchange rate reform on poverty. Baldacci, de Mello, and Inchauste (2002) are nearly on topic, given that the definition of financial crisis in the paper is exchange rate based, but the analysis suffers from the shortcomings noted in the previous section.

It has not been possible to identify in the literature a reduced-form study of exchange rate reform.

The paper by Robilliard, Bourguignon, and Robinson (2001) is a good example of the structural approach to exchange rate policy. The exchange rate movement in question (in Indonesia) is a policy reform in the sense that a fixed exchange rate regime was abandoned in favor of a temporarily flexible exchange rate. The resulting depreciation of the equilibrium nominal exchange rate models a real-life devaluation. The simulation model constructed is a combination of a CGE model at the macroeconomic level and a household behavioral model derived from a household survey at the microeconomic level. The iterative approach, as outlined in the previous section, ensures the consistency of the macroeconomic and microeconomic conclusions. The model replicates well the precrisis year of 1996. Then, in simulation, the authors examined the 1997 crisis. The authors concluded that the Indonesian crisis was, in part, a crisis of real devaluation, but was, in equal part, a crisis of credit availability to producers. The authors were able to replicate aggregate output, employment, poverty, and inequality indicators for the crisis years. They did not report comparisons of their simulation results with the actual outturns at a more disaggregated level.

Sahn, Dorosh, and Younger (1997) reported an evaluation of trade and exchange rate policy reforms in five Sub-Saharan African countries.

Their analysis considered the income-distributional effects of these policies for four representative households: rural poor, rural non-poor, urban poor, and urban non-poor. The analysis is implemented through CGE models, and so the financial aspects of exchange rate policy reform are ignored. The effect of the reform is to remove restrictions on the exchange rate and thus allow the real exchange rate to depreciate to clear the foreign exchange market. (Before the policy reform, the economies were characterized by shortages and the rationing of foreign exchange.) The policy experiment considered is a joint hypothesis: If export revenue falls by 4 percentage points of gross domestic product, then which policy (flexible real exchange rate or fixed real exchange rate and foreign-exchange rationing) leads to higher income for poor households? According to Sahn, Dorosh, and Younger—

*... both urban and rural poor gain from the liberalization. The real exchange rate depreciation improves production incentives for tradable goods; agricultural output rises, leading to increased labor demand and higher real incomes for the poor (1997, 89).*

Ferreira and others (2003) implemented the full package approach in examining the effects of the 1999 Brazilian devaluation on poverty and income inequality. They developed a multisectoral IS-LM model and then created links between the wage, price, and employment levels implied by that model and the information in a household survey. The authors estimated the IS-LM model, thus adding an ability to check confidence in the accuracy of the coefficients they use. They created 18 representative households from the household survey data by estimating job choice and income equations over various subsets of the survey. They also specified a system of linking equations that assures an iterative solution for wages, prices, and employment choices. In this system, the predictions of aggregate employment and income from the first step are equal to the sum of the individual employment and income measures created from the survey. The resulting system replicates the features of the Brazilian economy fairly well for 1998. They then derived their predicted effects of devaluation on poverty and inequality through a three-step procedure: (1) they resolved the IS-LM model for the devalued exchange rate; (2) they used the linking equations to derive appropriate wages, prices, and employment; and (3) they used the representative-household equations to derive individual job and earning choices. They then iterated. From the model, the authors were able to produce a nuanced description of increased poverty and inequality in response to devaluation.

The paper illustrates nicely the data and computational requirements of a full package approach to exchange rate reform.

- At the top level of the analysis, the IS-LM model includes six sectors of the economy (urban informal, rural informal, urban formal tradable, rural formal tradable, urban formal nontradable, and rural formal nontradable). Productive labor is decomposed into three skill levels: unskilled, semi-skilled, and skilled. Production functions are specified for each sector. Wages and goods prices are determined endogenously in the model. The balance of payments is modeled in some detail, including the trade in goods in four of the sectors, as well as financial capital flows. The financial markets are modeled in great detail. Eight types of financial instruments are considered: local currency, time deposits, bonds, domestic-currency loans, equity, foreign currency, foreign loans, and foreign bonds. For each instrument, the portfolio demands for each asset must be equal to the supplies; this generates the structure of interest rates. The IS-LM model is estimated using time-series data from Brazil (1981–98).
- The middle level of the analysis generates employment, incomes, and prices from the results of the top-level model. Employment is represented by the model's prediction on occupational status for 24 job categories (for example, an individual in an urban unskilled formal tradable job). There are also predictions of incomes for 18 categories of factors, and there are six predictions of changes in relative commodity prices.
- The bottom level of the analysis is based on information from household surveys (the National Household Sample Survey) for Brazil in 1998 and 1999. Roughly 90,000 respondents are included for each year. The data are used to estimate a model of household income determination according to occupational choice and the earnings derived from such occupational choices. The predicted individual incomes are aggregated into household incomes.

The experiment involved in the paper introduced the observed depreciation in the real exchange rate in 1998 into the top level of the IS-LM model. The new equilibrium at the top level measures employment, income, and price implications in the transmission channels of the middle level. At the bottom level, the predicted effect on household incomes is measured and then aggregated into indicators of the increase in poverty and income inequality.

The estimation and computational demands of this full package approach are large. A detailed macroeconomic model must be estimated

on the top level using time-series data. The bottom level requires a cross-sectional estimation of occupational-status equations and Mincer earnings equations for the individuals in the national household survey sample. The top and bottom levels are linked through the transmission channels of employment, wages, and prices. In computation, these equilibrium values must be consistent on the top and bottom levels (that is, the household-level results of the bottom level must aggregate to the macroeconomic results at the top level).

In addition to these techniques for examining transmission channels together, methods also exist to examine one channel at a time. Levinsohn, Berry, and Friedman (2001), for example, examined in isolation the relative price effects of the 40 percent nominal devaluation in Indonesia in 1998. The authors used data on 58,100 households from the SUSENAS survey of 1993 to create a prediction of the impact of the devaluation on poverty. The authors held consumption shares for individual goods constant at the percentages observed in 1993 and changed the relative prices of goods to reflect the 1998 values. They then measured the impact of these new relative prices on the income distribution and the incidence of poverty.

This method has the advantage of simplicity, but leaves two questions unanswered. First, can the entire increase in commodity prices be attributed to exchange rate movements? Second, did the financial crisis have an impact on employment and disaggregated wages that intensified inequality or poverty? The evidence of Smith and others (2000) from household and labor surveys in Indonesia suggests that the impact of the crisis on real earnings was notably different by gender and location (urban versus rural), and this will be critical in a more general equilibrium analysis.

### **What are the main risks? How serious are the risks?**

Exchange rate reforms create systemic risks. Large numbers of citizens and majorities of the population in parts of the economy are affected in the same way. The risks facing all households are unemployment, higher prices for foodstuffs (because they are traded goods), pressure on the employed to accept lower or no wage increases, higher costs of borrowing, and reduction in the purchasing power of financial assets. Households producing traded goods will also face the positive risk of an increased return for their goods (when measured in domestic currency).

The literature suggests that a relative price movement is quite likely in response to devaluation in the short term; few countries are so open that the pass-through to domestic wages and prices is immediate. Unemployment and a credit shortage are also likely in the short term, as adjustments

to the relative price shock begin with closures of firms and only gradually lead to an expansion of the traded-goods sector.

McKenzie (2003b) calls exchange rate movements “aggregate shocks.” Households have many coping mechanisms for idiosyncratic shocks (for example, interhousehold transfers, borrowing, increased labor force participation) that will be less effective if the households are faced with an aggregate shock. The research of Glewwe and Hall (1998) and McKenzie (2003b) indicates that exchange rate reforms will have differentiated impacts on individual households. As Glewwe and Hall found for the Peruvian case, some households are more vulnerable to this aggregate shock than are others. These authors concluded that households with better-educated heads of household are less vulnerable to macroeconomic shocks; they also found that female heads of households are less vulnerable. McKenzie (2003b) examined the data from Mexico in 1996 for evidence of coping mechanisms and found that the only robust responses were reduced consumption and reduced fertility.

## **Monitoring and evaluation**

The existence of household surveys before and after the exchange rate reform offers excellent opportunities to monitor the changes in poverty and income inequality: Sahn (1987); Frankenberg, Smith, and Thomas (2003); and McKenzie (2003b) provided good examples of such an evaluation. In each of these cases, however, it is difficult to attribute the shifts in poverty or income inequality exclusively to exchange rate changes. There were many concurrent macroeconomic and microeconomic policies implemented in Sri Lanka, Indonesia, and Mexico, respectively, and it is imprecise to attribute all the shifts observed in poverty to the exchange rate policy alone.

## **REFORM BRIEF: REFORMS TO THE MONEY-GROWTH (OR INTEREST RATE) RULE**

### **What are the types of reform encompassed in this family of reforms?**

The monetary authority in a given country has a rule for putting money into circulation. It may be a rule setting the growth rate of the money supply. It may also be a rule using money issuance to stabilize the domestic interest rate. Any change to either of these rules is considered a reform. For example, reducing the growth rate of the money supply is a policy reform, so also is a change in the interest-rate-targeting rule.

These reforms must be taken in the context of the impossible trilemma: If the country currently has a fixed exchange rate and no controls on the international flows of capital, then it cannot have independent money-growth or interest-rate-targeting rules.

### **What is the typical rationale?**

The typical rationale for reducing the rate of growth of the money supply revolves around the effort to lower inflationary pressure. This is a standard recommendation of the IMF to developing countries (see Bruno and others 1988). Because money creation is a financing source for a government budget deficit, reducing the rate of growth of the money supply is linked in most developing countries to a reduction in the government budget deficit or an identification of alternative sources of financing.

Changes in the interest-rate-targeting rule usually follow from speculative pressure. If the monetary authority is attempting to stabilize the domestic interest rate at a level below that on the world market and if there is a fixed exchange rate, then capital flows out of the country will make the interest-rate-targeting rule unsustainable. Reform in this instance will require abandoning the unsustainable interest rate target.

### **How are the reforms typically implemented? What issues emerge?**

Reducing the rate of growth of the money supply is typically attained through refusal by the central bank to purchase promissory notes from the government, the departments of which are running fiscal deficits. This refusal forces the government to lower expenditure, increase government revenue, or shift to the foreign financing (and international debt) of fiscal deficits. It is a choice made by the head of state and the ministry of finance. This reform will typically cause a shift in purchasing power between borrower and lender, with those who hold nominal financial assets gaining from the reform.

Interest rate targeting is achieved through government intervention in the bond market (open-market operations). This is, of course, only feasible if there is a deep, functioning bond market and a professional bureaucracy within the central bank or the ministry of finance that can implement such an intervention. The typical rationale for stabilizing interest rates is to reduce the uncertainty involved in financial investment. The use of such an interest-rate-targeting rule normally has the effect of making observed unemployment, wages, or prices more volatile.

## **Which stakeholders will be affected by the reform positively or negatively?**

Monetary policy reform is a macroeconomic reform. Those within the economy who have a say in the size and timing of the reform are typically within the central government and the central bank. If we consider those affected by the reform, all citizens within the economy become stakeholders.

With reform in the money-growth or interest-rate-targeting rule, the initial impact will be observed in domestic interest rates or in government expenditures.

- If the reform leads to higher domestic interest rates (for example, a reduced money-growth rate, or abandoning a lower interest rate target), then the key stakeholders will be the people with nominal financial assets denominated in local currency. Stakeholders who are net borrowers at the prior interest rate will lose if the reform leads to lower inflation (and thus a higher real interest rate) or if they have to roll their loan over into a loan at the higher interest rate. Both outcomes tend to raise the cost of borrowing.
- People who have lent funds denominated in local currency (net savers) will be the winners because of the increased value of their savings.
- Those who rely on government expenditures or transfers will lose to the extent that the government must lower spending to sustain the cuts in money growth.
- If the reform involves a reduction in the volatility of macroeconomic outcomes (for example, adoption of a fixed exchange rate), then Agénor (2002) suggests that the poor will benefit. Investment will be stimulated by the reduction in volatility, thus leading to employment and income. Saving will be reduced, thus lowering the leakage from the economy's circular flow. Risk premia on financial transactions will be reduced. To the extent that the poor participate in these markets, they will benefit.

## **What is the principal transmission channel through which each stakeholder is affected by the reform? What is the direction and magnitude of impacts, and how do they evolve over time? What are the assumptions?**

There are two primary transmission channels for a reduction in the growth of money: (1) the domestic nominal interest rate will rise, and (2) the rate of consumer price inflation will fall. We can think of the first effect as dominant in the short term, while the second effect will dominate in the long

term. We can single out three groups for which this has a differential impact.

- *People with savings in nominal domestic financial assets.* The nominal return on these assets will rise with the reform, and, because of the lower rate of inflation, the purchasing power of the returns on these assets will fall by a rate lower than the previous corresponding rate. Those people with domestic liabilities will face the opposite effects.
- *People with unindexed wages.* These workers, typically not in unions, will benefit from the lower inflation rate. The value of indexation for unionized workers will be reduced.
- *Owners of indebted corporations and workers at such corporations.* This group will normally suffer. Because working capital is more expensive, many of these firms will shut down or reduce operations. Workers in these corporations will become unemployed.

If the monetary authority abandons an interest-rate-targeting rule, this could lead to higher interest rates and lower inflation, with the impacts outlined above. If the abandonment of the interest-rate-targeting rule is money-growth neutral, the only transmission channel available is through the increased volatility of interest rates over time.

- *People with savings in nominal domestic financial assets* will be made worse off if they are risk averse, as the return on their savings will fluctuate more from period to period.
- *People borrowing working capital* will be worse off if they are risk averse. They may benefit from the increased volatility if they are able to take advantage of borrowing during periods of low interest rates.

### **What is the typical methodology used to analyze the distributional impact through each channel?**

The typical methodology used to analyze exchange rate reform will capture the distributional impact of all channels. The introduction of this chapter summarizes five approaches to the measurement of the distributional impact: the before-and-after, cross-country, reduced-form, structural, and full package approaches. The first three provide a measure of the impact of the reform on poverty and income inequality aggregated over all transmission channels. The structural and full package approaches decompose the individual contributions of the transmission channels to poverty and income inequality.

Agénor, Izquierdo, and Fofack (2003b) provided an analysis of the impact of a permanent reduction (by 30 percent) in domestic credit from the central bank to the government. It will be useful to examine the data, programming, and computational demands of this full package approach. There are three distinctive features of the approach.

- The authors constructed a CGE model with a great deal of disaggregation in labor-market choices. They consider five types of goods: tradable goods and nontradable goods from the rural sector, as well as formal (both tradable and public nontradable) and informal goods from the urban sector. There are two types of labor, skilled and unskilled. The unskilled workers are employed in producing all goods, while the skilled workers are employed only in urban formal sector production. Wages and prices adjust to clear labor and commodity markets.
- The authors created a financial sector with numerous financial instruments. Households can hold money, domestic bank deposits, or foreign bank deposits and are always in stock equilibrium and flow equilibrium. Firms can borrow, and the cost of this borrowing is an important component of production costs. A commercial banking system intermediates between savers and borrowers, and interest rates are determined endogenously.
- There are six types of households (corresponding to the five types of labor and a “capitalist” household), and each has a flow of income determined by equilibrium in the model.

In the model, the authors implemented the 30 percent drop in the level of domestic credit from the central bank to the public sector. There are two transmission channels of importance. First, the cutback in credit requires a reduction in public sector spending. Second, the fall in the monetary base causes deflationary pressure. These lead to a rise in the interest rate on loans that, through the demand for working capital, causes a reduction in output. There is also a portfolio reallocation toward domestic and foreign deposits.

This full package model predicts increases in both poverty and inequality in the short term, with the rises in poverty largely eliminated in the long term. Income inequality remains higher in the long run as measured by the Gini coefficient.

The features of this full package model mean that the data demands for the calibration of the model are large. Not only is it necessary to have a social accounting matrix (SAM) of the requisite dimension, but a flow-of-funds matrix for these financial instruments is also needed. In their

paper, Agénor, Izquierdo, and Fofack (2003b) skirted these issues by calibrating a “virtual country,” with poverty indicators derived for “virtual households.” They outlined, however, how the financial CGE could be derived from a SAM and a flow-of-funds matrix for the country in question. They also described how to link the model to a household survey for a specific country to derive more accurate poverty indicators. It is not clear from the paper how difficult these more realistic calibrations will be, but this last step will be necessary if the results are to be made fully comparable to Ferreira and others (2003) or Robilliard, Bourguignon, and Robinson (2001).

Devarajan, Go, and others (2002) provided an analysis for a government expenditure shock that could easily be linked with a monetary expansion, but this is not done explicitly in the paper. In addition, the structure of Ferreira and others (2003) could be used to examine a reform in the money-issuance rule.

### **What are the main risks? How serious are they?**

Monetary reform is a policy that creates systemic risk. While different actors will face different quantitative shocks, large classes of actors will be affected simultaneously and in the same direction. Thus, coping strategies that work well in the context of an idiosyncratic risk will be ineffective.

The most likely risk from a reform that reduces growth in the money supply involves the possible rise in nominal interest rates. This will advantage lenders, disadvantage borrowers, and make the use of working capital more expensive. Also quite likely, at least in the short term, is a reduction in employment and income as marginally profitable firms are forced to scale back production or shut down.

The most likely risk from a reform that stabilizes (rather than increases) interest rates is that the volatility in the economy will be transferred to output and consumer prices. This greater uncertainty will represent a systemic risk, and domestic insurance mechanisms will be ineffective. International borrowing, if possible, will provide a coping strategy.

### **Monitoring and evaluation**

The existence of household surveys before and after a reform offers excellent opportunities to monitor the changes in poverty and income inequality: Sahn (1987); Frankenberg, Smith, and Thomas (2002); and McKenzie (2003b) provide good examples of such an evaluation. In each of these cases, however, it is difficult to attribute the changes in poverty or income

inequality exclusively to monetary policy changes. There were many concurrent macroeconomic and microeconomic policies implemented in Sri Lanka, Indonesia, and Mexico, respectively, and it is imprecise to attribute all the changes observed in poverty to the money supply policy alone.

## NOTES

1. Monetary policy can also be expansionary or contractionary through changes in credit availability if the nominal interest rate is unable to adjust.
2. For this purpose, the authors define a financial crisis as a nominal depreciation of at least 25 percent that also represents an increase in the rate of depreciation of at least 10 percent.
3. Three useful sources on the empirical implications of the introduction (or elimination) of capital controls are Johnson and Mitton (2001), Kaplan and Rodrik (2001), and Ariyoshi and others (2000).
4. Kenen (1986) provides a succinct summary of this “adjustment” advice.

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