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A Hitchhiker's Guide to International Macroeconomic Policy Coordination

by Owen F. Humpage

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Introduction

The last 10 years have witnessed a virtual explosion of articles about international macroeconomic policy coordination. In part, advances in econometric modeling, particularly in techniques for understanding strategic interactions among countries, have encouraged studies in this area. A further, more recent incentive for these studies is a renewed interest among policymakers in world institutions and in mechanisms that require a greater coordination of economic policies. Examples include target zones for exchange rates and a European central bank.

This article offers a hitchhiker's guide to the literature: a fairly nontechnical survey for those who want to follow along, but are not inclined to take the wheel.[1] We focus on the empirical literature that attempts to measure possible gains from macroeconomic policy coordination, offering notes on those assumptions and methodologies that circumscribe their interpretations. In the conclusion, we try to synthesize the overall policy implications of this important literature.

To begin, however, we ask the most basic question: Why do many economists believe international policy coordination is an important objective?

I. Cooperation and Coordination

Two terms continually reappear in our discussion: *international cooperation* and *international coordination.* Following the economics literature on this subject: International *cooperation* refers to the sharing of information. The term implies that each country establishes its macroeconomic objectives and sets its economic policies independently of all other countries, but that all share information about the world economy. This information includes observations on the nature of economic interactions, on the sources and extent of economic disturbances, on intended policy responses, and on the economic outlook in light of these disturbances and intended responses.

International *coordination,* in contrast, refers to the joint determination of countries' macroeconomic policies toward a collective set

■ 1 In deference to Douglas Adams, *The Hitchhiker's Guide to the Galaxy.* New York: Pocket Books, 1979.

of goals. Through policy coordination, countries attempt to maximize joint welfare, rather than their individual welfare. Policy coordination presupposes cooperation, but not vice versa.[2]

The major industrialized countries maintain many forums to encourage macroeconomic cooperation. Economic summits among the industrial countries, and meetings of the International Monetary Fund (IMF) or the Organisation for Economic Co-operation and Development (OECD), are the most formal of these forums. Similarly, one finds many examples of international macroeconomic policy coordination. The Plaza Accord in September 1985 represented an agreement, especially among West Germany, Japan, and the United States, to undertake specific macroeconomic policies to eliminate huge imbalances in their international accounts and to promote a dollar depreciation. Similarly, at the Bonn Summit in 1978, the major industrial countries agreed to policies that would encourage world economic expansion.

Besides these ad hoc arrangements, the world has also seen some more formal attempts at international policy coordination. Fixed-exchange-rate regimes, for example, operate within certain "rules of the game," methods of resolving international interdependencies, which ultimately require a coordination of macroeconomic policies. As is well known, rigidly fixed exchange rates prevent member countries, except the reserve-currency country, from pursuing independent monetary policies.

History shows that countries are eager to cooperate with their allies, but that these same countries are more reserved about their willingness to coordinate macroeconomic objectives. This observation provides a basis against which to consider the result of the following studies. Why do countries cooperate, but do not coordinate except occasionally on an ad hoc basis?

II. International Interdependence

The belief that international cooperation and coordination can make all countries better off in terms of their macroeconomic performance rests on the view that international interdependence among nations creates a type of policy externality, or spillover effect. The policies of one country affect economic developments in others, sometimes positively, sometimes negatively.

Countries understand these external effects, but evaluate them lopsidedly. They consider the implications of foreign policies on their own economic well-being and adjust their own policies accordingly. Nevertheless, acting individually, sovereign nations do not fully consider the implications of their own policies for the economic welfare of other countries. In the worst case, each country might engage in beggar-thy-neighbor policies; that is, enhance its individual welfare at the expense of other countries. The competitive depreciations of the 1930s are a classic example. More generally, however, when countries ignore the consequences of their actions for world welfare, these policies often prove to be suboptimal in the sense that some alternative set of policies, which account for the spillover effects, could make at least one country better off without making any other country worse off.

As an example, consider an argument that seemed to underlie discussions for coordination at the Group of Five meeting in September 1985.[3] Acting unilaterally, as if isolated from the other nations, the United States could eliminate its current-account deficit by tightening monetary and fiscal policies. The cost, however, would be a substantial slowing in real economic activity and perhaps a recession. Similarly, West Germany and Japan could unilaterally eliminate their current-account surpluses through a monetary and fiscal expansion. The cost would be a more rapid inflation rate in both countries.

But these countries are not isolated. The coordination problem results because the individual actions of each country tend to benefit the others. The contraction in the United States would help eliminate the West German and Japanese current-account surpluses by lowering their exports. Similarly, the expansion in West Germany and Japan would help eliminate the U.S. current-account deficit by encouraging U.S. exports. Realizing this

■ **2** Although the distinction between international cooperation and international coordination seems simple and straightforward, confusion easily can result. Most empirical studies of international interdependence use techniques of *game theory*, which describes the strategic interactions of individuals. Game-theoretic literature often uses the term *cooperation* to imply the joint determination of policy, or what the economics literature coins as coordination. See Canzoneri and Edison (1989), Horne and Masson (1988), and Cooper (1985).

■ **3** The Group of Five (G5) refers to France, Japan, the United Kingdom, the United States, and West Germany. The Group of Seven (G7) refers to these five countries plus Canada and Italy.

interdependence creates an incentive for each country to attempt to avoid the costs associated with the corrective policy by "free riding" on the policies of the others. This positive policy spillover results in too little overall corrective policy. The external imbalances might persist.

Cooperation could eliminate the attempt to free ride on the policies of the other countries in this case. Countries would provide more corrective policies and world welfare might be enhanced.

As this example suggests, interdependencies among countries arise because the structures of their economies are intertwined through trade and financial flows.[4] Trade and capital flows among nations create what Cooper (1985) has termed structural interdependencies. U.S. real GNP, for example, depends in part on real net exports. Net exports, in turn, depend on foreign income, on the foreign marginal propensity to import, and on the terms of trade between exporters and importers. U.S. price levels similarly depend on foreign prices as translated through exchange rates. U.S. interest rates are linked to foreign interest rates and to expected exchange-rate movements through arbitrage. These and other similar linkages among countries transmit shocks between the U.S. economy and the rest of the world.

Structural interdependencies among nations' economies have always existed. Cooper (1985, 1986) suggests that largely because of advances in technology and communications, structural interdependencies among countries have increased over the last 40 years, making these linkages all the more important in policy considerations. This consensus view suggests that the potential benefits from international policy coordination are greater now than at any time since World War II.

Fieleke (1988), however, investigates an array of empirical data bearing on the extent to which markets are integrated. His data do not reject the consensus view that the world is becoming more closely integrated, but they do not depict the world as a single market. Similarly, Wyplosz (1988) presents evidence suggesting that the trade linkages between the United States and the European Economic Community are small. He argues that the main linkages are from financial flows. In short, although interdependencies are increasing, one must be careful not to overstate their importance.

Beyond these structural interdependencies, mutual economic objectives can create policy conflicts. The United States and West Germany might both desire stable currencies or a balanced current account. These objectives do not conflict, and cooperation to achieve them is possible. If, however, each country wants its currency to appreciate relative to the other, or if each country desires a bilateral current-account surplus against the other, the desired values for these mutual objectives are inconsistent. The closer one country comes to achieving its objective, the further the other country moves from its goals. Coordination might not be possible.

The existence of interdependencies and consistent mutual objectives is not, in itself, sufficient to require cooperation among countries. As Oudiz and Sachs (1984) suggest, if countries can adjust their domestic policy variables in a manner that fully compensates for the foreign influence, then those countries need not cooperate to attain their national policy targets.[5] The crucial ingredient is that the spillover alters the relationship between domestic policies and their ultimate targets, or that it changes the relationship among the targets in a manner for which no domestic offset is feasible. Moreover, it implicitly assumes that countries do not have enough independent policy instruments to maintain all of the desired policy goals.

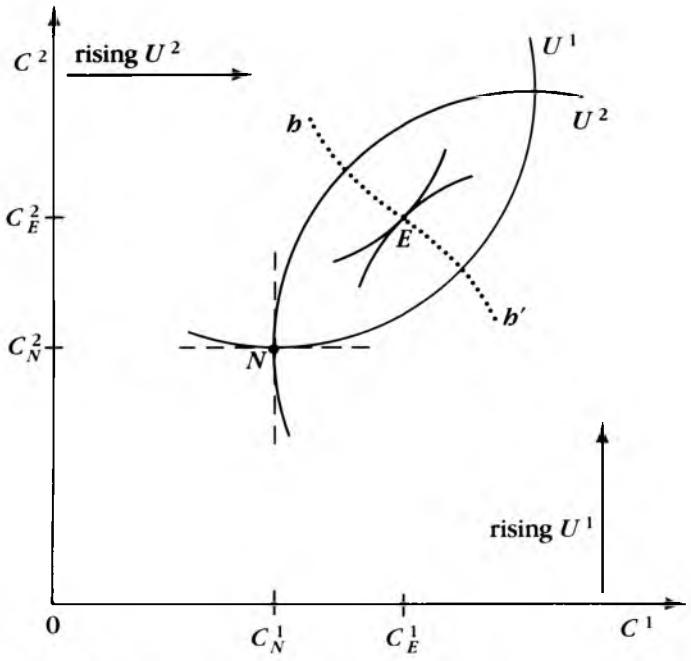
Assume, as is typical of most models used to study macroeconomic policy coordination, that goods prices are sticky and that a short-run tradeoff exists between inflation and output. If a foreign country expands its money supply, a temporary real depreciation of its currency could worsen the current account and real growth in the home country. In response, the home country might attempt to expand its money supply to offset the real depreciation of the foreign currency and the slower real growth. The negative externalities associated with these policies result in too much overall expansionary policy; worldwide inflation would be higher. Thus, the faster foreign money growth alters the relationship among exchange rates, current-account balances, and inflation rates in a manner that the home country cannot offset with a limited number of policy instruments. A coordinated policy response might have produced a better outcome.

■ **4** One also could envision a world in which a set of independent countries faced a common external economic shock, such as an oil-price shock. These countries might benefit more from a joint response than from a unilateral response.

■ **5** "... the inefficiency of uncoordinated policymaking arises not from the mere fact of interdependence; but because one country's policies affect another's targets in a way that is (linearly) distinct from that country's ability to affect its own targets." Oudiz and Sachs (1984), p. 28.

FIGURE 1

A Simple Policy Game



SOURCE: Oudiz and Sachs (1984).

III. Policy Coordination

To understand the nature of the gains from macroeconomic policy coordination, consider the following simple example of a one-time policy game.[6] Assume that the world consists of two countries designated with superscripts, $i = 1, 2$, respectively.[7] Each country seeks to maximize its own welfare, $U^i(T^i)$, which it defines in terms of a vector of m policy targets, $T^i = (T_1, T_2, \ldots T_m)$:

(1) $\quad U^1 = U^1(T^1)$ and $U^2 = U^2(T^2)$.

These policy targets might include a desired inflation rate, a real economic growth objective, and a current-account goal. Different countries attach different welfare weights, and sometimes no weight, to specific policy objectives. West Germany, for example, seems to attach more importance than most countries to maintaining a low inflation rate.

Each of the countries also has a vector of policy instruments, $C^i = (C_1, C_2, \ldots C_n)$, which it manipulates in an effort to attain its policy targets. These policy instruments would include money growth, taxes, and government spending.

In an interdependent world, the policy choices of any one country affect the target variables, and hence the welfare, of the other. Equation (2) is a shorthand notation of an econometric model, incorporating such policy spillovers:

(2) $\quad T^1 = F^1(C^1, C^2, X)$ and
$\quad T^2 = F^2(C^1, C^2, X)$.

Notice that the policy instruments of *both* countries appear in *each* equation.

Absent coordination, each country chooses a monetary and fiscal policy to attain the combination of growth, inflation, and current-account targets that maximizes its *individual* welfare. In so doing, each country considers the other's policy choice, but ignores the impact of its own policy choice on the foreign country's welfare. We can manipulate equations (1) and (2) to express the optimal value of C^1, that is, the value that maximizes equation (1), as a function of C^2 and vice versa. One set of optimal values for C^1 and C^2 will satisfy both of the functions that we have derived simultaneously. This is called the no-coordination equilibrium.

In a one-shot policy game, where players make choices only once, to reach the no-coordination equilibrium, one assumes that each country has perfect knowledge of the model and makes all calculations instantly. Figure 1 depicts such an outcome, where each country's indifference curve cuts through the equilibrium point, N, such that its tangent at N is perpendicular to the tangent of the other country's indifference curve. As this requirement ensures, without policy coordination, this is the best each country can do, given the behavior of the other. Country 1, *knowing that country 2 will choose* $C^2{}_N$, will itself choose $C^1{}_N$, since any other policy choice would put it on a lower indifference curve. In a similar way, country 2 chooses $C^2{}_N$.

Because the indifference curves are not tangent to each other at point N, a different combination of policies could make at least one country better off without making the other worse off. The lens-shaped area, which the indifference curves outline, gives the mixes of policies that would provide a more efficient outcome.

Within the context of a standard one-shot policy game, countries can reach a superior outcome through cooperation. When countries cooperate,

■ **6** This example follows Oudiz and Sachs (1984), who provide useful detail.

■ **7** Superscripts refer to countries 1 and 2, respectively. Subscripts refer to policy targets or instruments, as the case may be.

instead of maximizing welfare as given in equation (1), they maximize a joint utility function,

$$(3) \quad W = b U^1 + (1 - b) U^2,$$

with respect to the policy instruments. For each value of b (the weight attached to the home country's welfare function), this maximization will yield a unique value of the policy instruments. Line bb' in figure 1 depicts these values. A subset of these points will fall in the indifference-curve lens, described above, and will make both countries better off. Participating countries, of course, must negotiate the utility weights; point E in figure 1 represents one such negotiated solution.

Although this one-shot policy game helps illustrate the basic idea that policy coordination can improve welfare, and although it underpins much of the empirical estimation to date, it is, nevertheless, hopelessly artificial. The strategic behavior of nations more closely resembles a sequence of games or a dynamic game where the state of the world changes in response to repeated economic shocks and policies, where strategies change in response to states of the world and build on past strategies, and where the economic model changes as the players learn about the economy.[8] As discussed in subsequent sections of this paper, much of the more recent literature adopts dynamic techniques, which have produced some important considerations and results that contrast markedly with the one-shot policy experiments.

IV. Econometric Models and Policy Coordination

The measurement of gains from policy coordination and the policy implications that one derives from a policy game as described in the previous section depend crucially on the economic model that was used to generate them. This literature presents a wide variety of econometric models, reflecting different schools of economic thought and opinions about the optimal degree of abstraction. Holtham (1986) provides a useful survey.

Most, but not all, of the analysts rely on large econometric models. Nearly all of the models embody some form of lagged adjustment in wages and prices, a feature that allows monetary policy to affect real output and real exchange rates. Many include forward-looking expectations, at least in asset markets. Substantial differences among the models also result from the approach for assigning parameter values. Some parameters are purely statistical estimates, specific to the time period of their estimation. Others take assigned values, consistent with an economic theory and with generally expected magnitudes. This variety allows findings to be compared across many different techniques and should serve to distinguish between those findings that are artifacts of a specific model and those that are more general.

Nevertheless, certain caveats apply to nearly all of these models and should restrict one's willingness to accept their policy implications. For example, in the one-shot game, the results refer to a specific time horizon and could change substantially if the time horizon was altered. One would expect, for example, that in a model with sticky prices, a monetary expansion might initially result in a real depreciation. Later, however, as prices adjust, the real exchange rate would revert to its long-term value.

Similar comments apply to any trade-off between inflation and real output. A model simulated over a short time frame could produce a set of welfare implications entirely different from those of a similar model estimated over a longer time frame. Policy coordination might prove empirically beneficial in the short run, but not in the long run. This is also the case in the specification of the governments' welfare functions. Ultimately, governments might seek to maximize the standard of living (output per capita), but what are the choices for the short term? The welfare implications depend crucially on this specification.[9]

A second problem is that models of the type used in policy-coordination experiments are vulnerable to the Lucas critique. Lucas (1976) argues that the parameters estimated in econometric models reflect past relationships among economic agents and policymakers. If these relationships changed, historically estimated parameters would no longer provide accurate forecasts, nor would policy simulations provide credible results. A shift from autarky to coordination can profoundly alter governments' reaction functions and interactions between the government and the private sector. The parameters estimated over the no-coordination regime will not accurately reflect outcomes after coordination, and the welfare results of such experiments remain suspect.

■ **8** For a review of game theory, see Friedman (1986).

■ **9** See Holtham and Hughes Hallett (1987).

V. National Sovereignty, Coordination, and Reputation

Macroeconomic policy coordination, by its very nature, compromises national sovereignty. Issues of national sovereignty appear throughout the literature under three distinct guises. The first, monetary policy sovereignty, arises because the objective of policy coordination often is exchange-rate stabilization. As already noted, fixed exchange rates require a convergence of monetary growth (and inflation) rates, constraining domestic policy discretion. The second sovereignty issue refers to the traditional domestic ordering of policy preferences. Policy coordination might require a set of policies not in keeping with traditional preferences; for example, higher rates of inflation in West Germany.

These aspects of sovereignty represent the counterweights against which the benefits of international cooperation are measured. They do not preclude international policy coordination, but countries that engage in international policy coordination expect gains that exceed the perceived losses associated with these sovereignty issues. The fact that nations highly value these aspects of national sovereignty might help to explain why countries prefer to coordinate on an ad hoc basis.

A third sovereignty issue deals with the incentive to cheat. In the one-shot policy game, which figure 1 illustrates, coordination is not feasible without some supranational agency to guarantee compliance. As one can easily see in figure 1, each country has an incentive to revert back to an uncoordinated form of policy setting, once it believes the other country has adopted the coordinated policy option. Because disparate countries like the United States, West Germany, and Japan are not likely to relinquish such broad authority as setting monetary and fiscal policy to organizations like the IMF or the OECD, many argue that international policy coordination is infeasible.

This result stems from analysis in a one-shot policy game. In games that repeat, countries establish reputations, and it is possible to attain solutions that resemble coordinated solutions, but that do not require a loss of sovereignty.[10] Canzoneri and Henderson (1988) and Oudiz and Sachs (1985) discuss a class of game-theory models in which countries will independently adopt what seems to be a coordinated policy, but maintain the option of reverting back to an uncoordinated equilibrium. These models, unlike the one-shot models, assume that governments act to maximize present utility and the expected discounted value of future utility, and that the shocks to the economy repeat. Consequently, at any point in time, policymakers weigh each possible policy option, including that of reneging on a coordinated-like policy, in light of the repercussions each option has for the future.

Basically, these models suggest that countries will independently adopt coordinated-like policies as long as any expected gains from reneging are small relative to the expected losses of shifting away from the coordinated-like policy to an uncoordinated policy for all future periods. One problem with this class of models, however, is that many different solutions resembling coordination might exist (see Friedman [1986]). As noted in Canzoneri and Henderson (1988), nations would need to consult in forums such as the IMF or OECD to focus on a particular coordinated-like solution.

VI. Benefits of Macroeconomic Policy Coordination

Theory offers a strong case for possible gains from macroeconomic coordination, but the existing empirical literature suggests that the benefits from policy coordination are small and asymmetrically distributed. In a pioneering study, Oudiz and Sachs (1984) investigate the gains to the United States, West Germany, and Japan from the coordination of their macroeconomic policies. The exercise relies on simulations of the Federal Reserve Board's Multi-Country Model (MCM) and the Japanese Economic Planning Agency (EPA) model over the period 1984 through 1986, and assumes that governments target real output, inflation, and the current account. The results suggest very small overall welfare gains from policy coordination: no more than 1 percent of GNP, even in the case of a common oil-price shock. Japan benefited most from policy coordination; the United States generally benefited least.

Subsequent studies tend to confirm the main result of Oudiz and Sachs; the overall gains from coordination seem small. Nevertheless, these other studies have suggested some factors that might determine the size of the benefits from coordinated macroeconomic policies. Oudiz and Sachs, for example, believe that the welfare gains would increase with the number of countries that were willing to coordinate their policies.[11]

■ **10** See Friedman (1986).

■ **11** It would also seem that the difficulties and costs of achieving and maintaining a coalition would increase with the number of countries.

McKibbin and Sachs (1988) construct a five-sector model with forward-looking asset markets and sticky prices in goods markets. They assign parameter values to the model, and they simulate various types of exchange-rate regimes, each of which implies different institutional arrangements for the coordination of policies. These exchange-rate regimes include a free float, one in which governments do not coordinate policies; a float with policy coordination among governments; and two types of fixed exchange-rate regimes, differing with respect to the rules governing total world money growth. McKibbin and Sachs find that the welfare gains from a float with policy coordination generally exceed those of an uncoordinated float, but beyond this, the results elude a simple generalization. The welfare ranking of these various monetary regimes differs from country to country (or region), and overall welfare is rather insensitive to the regime choice. McKibbin and Sachs do offer some evidence that the choice of exchange regime might depend on the type of economic shock that the country (or region) experiences.

Canzoneri and Minford (1988) focus on the reasons for the small gains from policy coordination. Their analysis with the Liverpool World Model is particularly interesting, because it compares countries of similar magnitude in a model with large spillover effects from monetary policy. They test to see if the gains from policy coordination are sizable in a model with large spillover effects. Canzoneri and Minford find that the difference between the two solutions, although showing gains from monetary policy coordination, are not very different in terms of their policy implications: "...probably infeasible in an operational sense..." [p. 1149]. Canzoneri and Minford go on to investigate the importance of other factors. Spillovers, the weights on arguments in the preference function, and the size of the shocks all matter, of course, but what seems to be especially important to secure sizable gains from coordination is the simultaneous inheritance of conflicting problems, such as high inflation and recession.

Taylor (1985), using a model that embodies forward-looking wage setting and sticky prices, finds that coordination enhances overall world welfare, particularly when the countries that coordinate their policies exhibit dissimilar preferences for price and output stability. He finds, however, that the gains from policy coordination are not always evenly distributed, and policy coordination makes at least one country (West Germany) worse off. Hence, coordination would require side payments to West Germany. Taylor also suggests that the source of the shocks might be important; demand shocks do not provide benefits from coordination, but supply shocks, under some circumstances, could.

The existence of mutual policy objectives between countries also seems important for the assessment of gains. Holtham and Hughes Hallett (1987) find large gains for policy coordination across a wide range of econometric models when they introduce an exchange rate as a policy objective. Not only is the exchange rate a shared policy objective, but its introduction results in more policy objectives than policy instruments, which increases the potential gains from policy coordination.

Taken together, these studies suggest that policy spillovers among the major industrialized countries, at least as captured by standard large econometric models, are small on average. Nevertheless, these studies do suggest that countries might benefit from macroeconomic policy coordination on an ad hoc basis, especially when confronted with conflicting shocks, when the shocks are large, when countries share common objectives, and when the participants have dissimilar national priorities.

Canzoneri and Henderson (1988) argue, however, that these results do not close the case against macroeconomic policy coordination. The small gains from coordination might result because most studies consider only one-shot games.[12] The disturbance that starts the game is a one-time disturbance. Canzoneri and Henderson argue that if conflicts between countries are continual, and if the affected target variables receive large weights in countries' social welfare functions, then coordination can render much larger gains. Ongoing conflicts arise when the gains of one country come at the expense of the other, such as when both countries attempt to achieve a bilateral current-account surplus.

Similarly, Currie, Levine, and Vidalis (1987), using dynamic techniques, find large gains from international policy coordination when governments have established credibility with the private sector and when economic shocks are permanent. According to these economists, studies that do not find large gains from macroeconomic coordination do so because they fail to consider the important interplay between international cooperation and domestic policy credibility.

■ **12** Many of the one-shot games seem to embody an inherent contradiction in that they adopt models with some degree of forward-looking behavior, and yet they specify a government that attempts to maximize only a current-period utility function.

VII. Model Uncertainty

The standard approach to international policy coordination assumes that the participants have complete knowledge about the workings of the world economy and about its present state (see also Cody [1989]). It assumes that governments understand the nature of economic disturbances and know about the appropriate policy responses to these shocks. Moreover, the models assume that governments have well-established preference functions, defined over relatively few target variables, and that these preferences truly reflect those of society in general.

Much of the recent literature questions these assumptions. Not only could such uncertainties prevent nations from coordinating their economic policies, but coordination under model uncertainty could leave nations worse off in terms of their economic welfare than under no coordination.

Frankel and Rockett (1988) investigate macroeconomic policy coordination when policymakers disagree about the true model.[13] Their experiments include coordinating monetary policy to achieve real growth and current-account objectives, and coordinating both monetary and fiscal policies to achieve real growth, current-account, and inflation objectives. Frankel and Rockett consider combinations of 10 large econometric models.[14] They allow one to represent the true model of the world economy and allow each of the participating governments to adopt a model. Repeating the selection process allows for 1,000 possible combinations. Frankel and Rockett find, however, that policy coordination reduces the economic welfare of the United States and the non-U.S. OECD sectors in roughly half of the cases *relative to the true model.* The results are virtually unchanged in experiments where policymakers, realizing their ignorance about the true model, follow a weighted average of 10 econometric models.

These losses result from assuming the wrong model. Frankel and Rockett find that the gains to any single country from discovering the true model and moving to it are often greater than any gains from coordination.

Domestic policymaking undoubtedly suffers from many of the same types of uncertainty as does international policy coordination. With autarkic policymaking, however, differences in the policy multipliers of various models are generally more a matter of degree than of direction. When the models allow for global interdependencies, however, the policy multipliers often disagree in terms of sign as well as magnitude. For example, all but three of the models presented by Frankel and Rockett show the conventional result on the domestic economy from a change in domestic monetary policy. The magnitude of the nominal income multipliers ranges from 0.1 percent to 3.0 percent for the United States and from slightly positive (less than 0.05 percent) to 1.5 percent for the rest of the OECD. The degree of consistency with respect to the direction and the magnitude of domestic fiscal-policy multipliers is about the same.

The models, however, show a wide variance in the size and direction of the effects on foreign economies from domestic monetary policy.[15] The different results among these models stem largely from how each links monetary policy with the current account. The monetary expansion in models that have sticky prices can cause a real depreciation, which tends to improve the current account. At the same time, however, the increase in money growth also could cause an expansion in real income, which would tend to worsen the current account. The net impact on the current account, then, will depend on the relative weights that a specific model attaches to each of these effects. A worsening in the domestic country's current account will tend to benefit real economic activity in the foreign sector, while an improvement in the home country's current account will tend to worsen the economic outcome abroad.

With a closed economy, a policy decision made with the wrong model probably will err in terms of degree and not in terms of direction. With an open economy, however, the wrong model can advise governments to expand when they should contract. The welfare losses that Frankel and Rockett observed resulted when the governments chose models that differed in the sign of their international policy multipliers from that of the true model [p. 330].

Holtham and Hughes Hallett (1987) find results that tend to confirm those of Frankel and Rockett. They generate 200 cases, roughly half of which produce worse outcomes. This result is not dependent on the assumption about how the gains are split between the countries. Holtham and Hughes Hallett also observe that the models

■ **13** See also Frankel (1988).

■ **14** See Holtham (1986).

■ **15** The models remained fairly consistent in the sign of the foreign response to domestic fiscal policy, but the magnitude of this response seemed to vary substantially among the models.

in their study offer a wide variance in policy prescriptions, but that this variance is greater under no cooperation than under cooperation.

Ghosh and Masson (1988) criticize Frankel and Rockett because their procedure implicitly assumes that policymakers do not take model uncertainty into account. Frankel and Rockett's policymakers simply choose a model that may or may not be the correct one. Brainard (1967) shows that the optimal policy setting in a model with uncertain parameters differs from the optimal setting for policy in the same model with known parameters. Extending this work, Ghosh and Masson argue that rational policymakers attach probabilities to their model parameters and that model uncertainty, measured by the variance of the parameters, can increase incentives for coordination.[16]

To illustrate this, they first present a model, with no uncertainty, in which policy coordination is not necessary because each player can adjust for the policy spillovers of the other; the coordinated and noncoordinated solutions are then the same. With model uncertainty, an additional policy spillover enters the problem because the policy choices of one country affect the uncertainty experienced by the other in a manner that cannot be offset. Each country "... incorrectly estimates the efficiency of [or the variance associated with its] instrument and chooses an inappropriate degree of intervention." [p. 235] The coordinated and noncoordinated outcomes then differ. In simulations of their econometric model, Ghosh and Masson find that uncertainty increases the gains from coordination, but that the gains are modest.

A key aspect is that all policymakers share the same probabilities about alternative models and that these probabilities are equal to the actual probabilities. It is not clear that coordination would be possible or optimal if this were not the case.[17] These probabilities could likely change with the economic state of the world and might not be the same for different policymakers, since policymakers do have different views of the world.

VIII. Consistency

Thus far we have discussed international macroeconomic policy coordination in a context that assumes no interaction between the government and the private sector. Some recent studies take issue with this assumption and suggest that when governments coordinate macroeconomic policies, private-sector behavior can change in such a way that the country is worse off than in the absence of coordination.

This line of criticism extends ideas concerning the time-consistency aspect of government policy, which Kydland and Prescott (1977) originally presented. At its heart is the idea that coordination might create incentives for governments to engage in activities detrimental to the best interests of the private sector. Private agents predicate their activities on expectations about government actions. Consumers, for example, base decisions about work and savings, in part, on tax rates, and they negotiate nominal wages on an assumed inflation rate. Before we can establish that coordination unequivocally improves welfare, we must consider how coordination might alter private expectations about the likelihood of governments to achieve inflation goals, to raise taxes, or to alter other implied agreements with the private sector.

Rogoff (1985) considers the effect of policy coordination on nominal wage demands. In his model, he allows that money is not neutral with respect to employment and to real exchange rates. Individual governments desire higher employment levels than private markets, but the inflation consequences of seeking higher employment constrain them. In the absence of international policy coordination, part of the inflation constraint results from a real exchange-rate depreciation. When countries coordinate their policies—that is, both nations expand money growth to increase employment—a real depreciation does not follow. Coordination eliminates one of the constraints on government and raises the inflation associated with a given reduction in unemployment. Wage-setters realize this, however, and raise their nominal wage demands to compensate themselves for the higher expected inflation rate under international policy coordination. International policy coordination then imparts an inflationary bias to policy and exacerbates central banks' credibility problems with the private sector. Rogoff concludes that, because time-consistent nominal wages are higher, cooperation might not increase nations' welfare.

■ **16** When model uncertainty stems from the international transmission of the effects of countries' economic policies, an incentive exists for coordination; when uncertainty stems from the impact of domestic policies on domestic variables, the implications for coordination are ambiguous. As already noted, most uncertainty among economic models seems to center on the international transmission of policy responses.

■ **17** On this point, see Frankel (1988), pp. 32-33.

Kehoe (1986) also questions whether policy coordination necessarily will improve social welfare. He argues that, in the absence of policy coordination, governments might face incentives that effectively commit them to certain behavior. For example, competition to attract capital might force governments to impose very low taxes on capital. The private sector can make decisions, affecting its present and future well-being, knowing that the mobility of capital restricts the ability of individual governments to impose high taxes on capital. Under policy coordination, however, governments need no longer compete and could have an incentive to raise taxes on capital. With policy coordination, then, the private sector will not adopt the same set of decisions with respect to savings and investment.

The conclusion that macroeconomic policy coordination *necessarily* will affect government incentives and private expectations in a manner detrimental to social welfare might not be valid. Oudiz and Sachs (1985) offer an example in which policy coordination actually enhances welfare. In their example, in the absence of policy coordination, governments engage in competitive currency depreciations, which the forward-looking currency market anticipates. Policy coordination removes these incentives and improves welfare in their model.

As Canzoneri and Henderson (1988) note, these articles do reach a common conclusion despite their dissimilar results: macroeconomic policy coordination can affect government credibility relative to the private sector, with important implications for social welfare. This is not an indictment of policy coordination, since the same problem exists in autarky, but it highlights the need for an institutional framework that minimizes time-inconsistency problems.

One can find some work along these lines in the literature on the European Monetary System (EMS). Giavazzi and Pagano (1988) consider the interplay between central-bank credibility and international arrangements. They show how high-inflation countries can derive welfare gains from pegging their nominal exchange rate with a low-inflation country. Inflation then results in a real exchange-rate appreciation that constrains the tendency of the high-inflation country to inflate. Especially interesting for the question at hand, Giavazzi and Pagano then consider institutional arrangements, compatible with the EMS, to deal with the current-account problems such a peg might impose on the high-inflation country. These arrangements include periodic real depreciation and temporary membership. Collins (1988) considers alternative models of the EMS and shows that the form in which participants resolve their international interdependencies, the "rules of the game," affects the average rate of inflation and the divergence among participants.

Woven through these time-consistency discussions is the thread of an argument pulled from the fabric of public choice. That thread questions more generally if governments act to maximize a utility function that accurately reflects the preferences of the private sector or, instead, if governments seek to foster a different set of objectives. If governments do seek to maximize utility functions different from those of the private sector, one cannot conclude that macroeconomic policy coordination is welfare-enhancing, since the resulting government coalition could push policies further from the social optimum.[18]

IX. Cooperation Instead of Coordination

Although the issues remain unresolved, for the most part, the literature casts doubt on the case for macroeconomic policy coordination. Nevertheless, we do witness governments voluntarily participating in international forums to their mutual benefit. Have the models and arguments missed something?

Countries might not be able to achieve a high degree of policy coordination with respect to specific policies and a wide range of targets, but they may be able to coordinate in terms of less-demanding criteria. Frenkel, Goldstein, and Masson (1988), in an analysis that seems particularly relevant to recent policy discussions, consider two such criteria: smoothing monetary and fiscal policies, and adopting target zones. Both policy options seek to avoid sharp swings in the real exchange rates.

They simulate these policies in an IMF multicountry model, MULTIMOD, which includes equations for the United States, West Germany, and Japan; for the other G7 countries; and for the other (non-G7) industrial countries. Their model allows for perfect foresight in capital markets and for sticky prices in goods markets. A monetary expansion also improves the current-account balance in the short term as the relative price effects dominate the income effects.

The results of the simulations, though preliminary, do not support policies aimed at smoothing monetary or fiscal policies. Smoothing policy does not generally tend to smooth fluctuations

■ **18** See Vaubel (1986).

in economic variables, and seems to increase the volatility of interest rates in the model. Frenkel, Goldstein, and Masson argue that economic shocks, other than those associated with abrupt policy changes, seem most responsible for exchange-rate variations. Unsmoothed policy changes might offset such shocks, but smoothed policies could not.

Their simulations also do not lend support to proposals for exchange-rate target zones. Indeed, their results suggest that target zones could prove counterproductive because monetary policy might then face conflicting objectives. If, for example, the real exchange rate appreciated because of a shift in asset preferences away from the dollar, the United States might temporarily offset the appreciation through a monetary expansion. As the U.S. inflation rate accelerated following the monetary expansion, however, the real exchange rate would appreciate again. This finding suggests that target zones, relying only on monetary policy, may not be feasible.[19]

Apparently aware of such criticisms, some proponents of target zones suggest that countries direct fiscal policy toward maintaining target-zone arrangements and direct monetary policy toward promoting real growth. Frenkel, Goldstein, and Masson find that this policy fares only slightly better than the purely monetary scheme. They also note that the more elaborate targeting proposal assumes a higher degree of fiscal-policy flexibility than seems feasible given the existence of large budget deficits in the United States and abroad.

Canzoneri and Edison (1989), noting that policy coordination might be infeasible, allow countries to share information about the shocks and about policy instruments. In their simulation, policy choices are either monetary targets or interest-rate targets, and the shocks stem from the size of U.S. budget deficits. Their results suggest that countries can derive large gains, relative to the gains from policy coordination, simply from sharing information about shocks and policy instruments. Unfortunately, their models suggest, at least in the case of sharing information, that the benefits of cooperation might accrue only to a single player.

X. Conclusion

When we compare these individual, often abstract, and technical studies of international policy coordination, they begin to reveal an image that we can reconcile with the observed behavior of nations. Nations seem to cooperate regularly and freely, but they coordinate policies infrequently, only when all participants clearly see the ends, and understand the means, of such efforts. This literature does not seem to offer much support for formal, international institutions that require continual policy coordination, such as fixed exchange rates or a narrowly defined target zone.

A recurring empirical finding of this literature is that the benefits from policy coordination are small. This finding suggests that, although international interdependencies are increasing, policy spillovers do not seem critical to the economic well-being of the largest industrial countries today. The types of economic shocks that could enhance the returns from macroeconomic policy coordination do not occur with sufficient frequency to justify any ongoing commitment that might sacrifice national policy independence. Moreover, economists do not agree on the magnitude, or even the direction, of some key international policy repercussions. Model uncertainty makes coordination difficult, and coordination with the wrong model could lower world welfare.

The literature suggests that nations can secure most of the gains associated with international coordination—small though these gains might be—through the sharing of information about world conditions, shocks, and policies. International cooperation is relatively costless in terms of national sovereignty. Perhaps this explains the willingness of countries to meet often in forums that allow for the exchange of information.

The literature also suggests that policy coordination on an ad hoc basis is feasible and could be beneficial. Indeed, we do observe nations coordinating their macroeconomic policies from time to time. The literature suggests that the benefits of coordination seem to increase when countries face problems that pose policy dilemmas, such as simultaneous inflation and unemployment, and when the gains of one nation come at the expense of others. The benefits from this type of coordination could be large, particularly if the form of the coordination tends to enhance the credibility of governments relative to the private sector. Coordination that adversely affects the private sector's perceptions of government will affect expectations and could reduce welfare.

19 Feldstein (1989) makes a similar argument.

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Public Infrastructure and Regional Economic Development

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Introduction

Recent attention given to the serious deterioration of the nation's public infrastructure raises the question of whether public capital significantly affects economic development. Local policymakers and researchers concerned with regional issues have claimed for years that public infrastructure investment is one of the primary means to implement a strategy of regional growth. In fact, one of the ways local governments compete for new firms is through investing in various types of public facilities.

Yet, very little is known about even the most basic relationships between public and private investment, such as the propensity to substitute between public and private capital, the relative timing of public and private investment, and the effect of public investment on firm and household decisions, to mention a few. Recent research by Aschauer (1989) and Munnell (1990) reports a positive correlation between public infrastructure and productivity aggregated to the national level. However, this research has not identified empirically the linkages by which public infrastructure affects productivity by addressing questions such as the ones posed above. From a research standpoint, one of the benefits of examining the effect of infrastructure at the regional level as opposed to the national level is that the linkages between physical infrastructure and those that use it are more direct when the analysis focuses on smaller geographical areas.

The purpose of this paper is to summarize previous work that has examined the effect of public infrastructure on various types of economic activity at the state and local levels. Section I defines public infrastructure and discusses various ways to measure it that are useful for analytical purposes. Section II examines the effects of public infrastructure on regional growth by first reviewing regional growth theory and then presenting empirical evidence of this relationship. Section III raises the issue of whether the observed effect of public infrastructure on regional growth results from its effect on productivity or from its effect on factors of production. The subsequent discussion focuses on public infrastructure as an input into the firm's production process. Section IV briefly examines the effect of public infrastructure on household location decisions. Finally, the "causation" of public and private investment is discussed in section V. The paper concludes with an overall assessment of the relationship between public infrastructure and regional growth.

I. Definition and Measurement of Public Infrastructure

Definition

This paper focuses on the public works component of public infrastructure. This category includes roads, streets, bridges, water treatment and distribution systems, irrigation, waterways, airports, and mass transit—installations and facilities that are basic to the growth and functioning of an economy. The term public infrastructure includes a range of investments broader than public works investment. To distinguish between the various functions of different types of infrastructure, several definitions and classifications are used throughout the literature.

For example, Hansen (1965), in looking at the role of public investment in economic development, divides public infrastructure into two categories: economic overhead capital (EOC) and social overhead capital (SOC). EOC is oriented primarily toward the direct support of productive activities or toward the movement of economic goods and includes most of the public works projects listed above. SOC is designed to enhance human capital and consists of social services such as education, public health facilities, fire and police protection, and homes for the aged.

Other classifications of public infrastructure include investments by the private sector. Mera (1973), examining the economic effects of public infrastructure in Japan, extends Hansen's definition of EOC to include communication systems, railroads, and pollution-abatement equipment. Mera also expands the SOC list of investments to include administrative systems. In some studies, the term infrastructure also includes the spatial concentration of specific sets of economic activities, similar to what urban and regional economists refer to as agglomeration economies.

Common to all of these classifications of public infrastructure are two characteristics that distinguish them from other types of investment. First, public infrastructure provides the basic foundation for economic activity. Second, it generates positive spillovers; that is, its social benefits far exceed what any individual would be willing to pay for its services. These positive spillovers occur for at least three reasons. First, some components of public infrastructure, such as roads and waterways, are nonexcludable services. Users can share these facilities up to a point without decreasing the benefits received by other users. Second, some infrastructure investments, exemplified by water treatment facilities and pollution-abatement equipment, reduce negative externalities (for example, pollution) generated by the private sector. Third, many infrastructure projects, such as power-generating facilities, communication networks, sewer systems, and highways, exhibit economies of scale. Because the large costs of these investments can be spread among many users, the unit cost of production continually falls as more users gain access to the system.

For the purposes of this paper, the scope of public infrastructure is limited to public works investment. Public works projects, in addition to exhibiting many of the public infrastructure characteristics listed above, are also under direct government control and thus can be effective public policy instruments in promoting economic development.

Measurement

One reason for the lack of empirical work on the effect of public infrastructure on economic development is the paucity of consistent and accurate measures of infrastructure that are suitable for empirical analysis. Unlike measures of private input usage in manufacturing, there are no reliable and consistent government sources of information on public infrastructure, particularly for individual states and metropolitan areas.

Two basic approaches have been suggested for measuring public infrastructure. One method is to measure physical capital in monetary terms by adding up past investment. An alternative approach is to use physical measures by taking inventory of the quantity and quality of all pertinent structures and facilities. Each approach has its advantages and disadvantages.

The standard method of measuring private capital stock is to use the monetary approach, often referred to as the perpetual inventory technique. The measure of capital under this method is the sum of the value of past capital purchases adjusted for depreciation and discard. Two assumptions are essential in using this scheme. First, the purchase price of a unit of capital, which is used to weight each unit of capital, reflects the discounted value of its present and future marginal products. Second, a constant proportion of investment in each period is used to replace old capital (depreciation). The first assumption is met if a perfectly competitive capital market exists. The second assumption is fulfilled if accurate estimates of the asset's average service life, discard rate, and depreciation function are available.

TABLE 1

Levels of Public Capital Stock per Capita and Rankings by Total Public Capital Stock for 40 Selected SMSAs in 1985

SMSA	Capital Stock per Capita	Ranking by Total Capital Stock
New York City	$1,216.0	1
Buffalo	871.7	18
San Francisco	871.5	4
Seattle	858.7	12
Memphis	842.4	23
Milwaukee	823.9	15
Cleveland	762.8	13
Los Angeles	753.0	3
Baltimore	716.6	7
Detroit	714.6	5
Pittsburgh	713.7	10
Minneapolis	687.1	11
Rochester	663.8	26
Chicago	661.7	4
Kansas City	649.6	20
Cincinnati	613.4	22
Jersey City	610.1	34
New Orleans	592.3	24
Philadelphia	584.0	6
Portland	563.1	20
Atlanta	561.9	14
Akron	552.6	33
Louisville	546.4	29
Newark	529.4	17
Dayton	517.2	30
Toledo	500.9	31
Grand Rapids	493.5	36
Denver	492.7	19
Indianapolis	485.1	27
Richmond	484.1	35
Columbus	475.4	28
Youngstown	467.4	37
Houston	467.0	9
Dallas	446.3	8
Birmingham	443.2	32
St. Louis	443.0	16
San Diego	406.4	21
Reading	376.1	39
Canton	330.2	38
Erie	322.7	40

NOTE: Size and rankings of total public capital stock are measured in 1967 dollars.
SOURCE: Author's calculations.

A frequent criticism of the perpetual inventory approach for public capital stock is that the government is not subject to competitive markets, and public goods are not allocated through a price mechanism. In some cases, user charges such as gasoline taxes finance local public infrastructure investment, but this reflects average costs more than marginal costs.

A considerable portion of the analysis related to economic development is based on a neoclassical production function in which inputs are used up to the point where the value of their marginal product is equal to their cost of use. In such a context, current input capital should be measured as the maximum potential flow of services available from the measured stock. Such a measure of capital can be constructed with the perpetual inventory technique by using a depreciation function that reflects the decline in the asset's ability to produce as much output as when it was originally purchased. This approach is used by the Bureau of Economic Analysis (BEA) for national-level estimates of both private and government assets and in many national and regional studies of total factor productivity.

This approach has been used recently by Eberts, Fogarty, and Garofalo (see Eberts, Dalenberg, and Park [1986] for details) to construct estimates of five functional types of public infrastructure for 40 metropolitan areas from 1958 to 1985. Public outlays for each city since 1904 were obtained from *City Finances* and other U.S. Bureau of the Census publications, and were aggregated using average asset lives, depreciation, and discard functions used by the BEA and other sources to obtain capital stock measures. The size and rankings of total public capital stock for each standard metropolitan statistical area (SMSA) in 1985 (measured in 1967 dollars) are presented in table 1 as an illustration of the estimates such a method would yield. The per capita estimates of public capital stock reveal a wide variation across SMSAs in the amount of capital invested and presumably in the amount of infrastructure services offered within these areas. In addition, the growth rates of public and private capital stock for the 40 SMSAs are shown in table 2. These estimates illustrate the general slowdown in public capital stock accumulation. The notable exceptions to this trend are in the faster-growing regions of the country.

Capital stock estimates have also been constructed for other levels of aggregation. Costa, Ellson, and Martin (1987) use similar techniques to construct public capital stock for states, although with a much shorter time period. Boskin, Robinson, and Huber (1987) estimate capital

TABLE 2

Percentage Change in Public Capital for Selected SMSAs, 1955-1985

SMSA	1955-1965	1965-1975	1975-1985
New York City	22.5	13.0	-4.4
Los Angeles	31.1	15.9	1.6
Chicago	22.3	8.5	5.1
San Francisco	34.7	29.5	8.8
Detroit	14.8	13.6	1.0
Philadelphia	12.9	11.4	0.5
Baltimore	19.7	25.0	17.6
Dallas	10.2	35.9	46.7
Houston	51.4	40.6	63.9
Pittsburgh	-2.0	-3.9	-1.8
Minneapolis	33.5	35.3	22.2
Seattle	10.4	22.1	8.7
Cleveland	10.3	7.5	0.8
Atlanta	44.7	59.3	68.0
Milwaukee	31.8	16.9	4.9
St. Louis	9.7	5.5	1.5
Newark	11.9	2.1	-3.4
Buffalo	21.1	9.8	10.3
Denver	27.5	37.1	47.0
Kansas City	10.3	21.9	13.1
San Diego	89.2	31.7	27.3
Cincinnati	5.9	9.2	2.6
Memphis	54.2	35.9	9.0
New Orleans	44.3	15.5	6.4
Portland	9.0	20.4	21.0
Rochester	10.3	18.8	2.7
Indianapolis	26.4	24.6	14.0
Columbus	17.9	25.2	15.2
Louisville	33.2	23.4	2.9
Dayton	27.6	20.8	10.0
Toledo	4.8	8.8	4.9
Birmingham	11.1	25.0	10.8
Akron	15.6	15.7	8.2
Jersey City	14.9	-9.9	-10.2
Richmond	9.8	24.5	15.1
Grand Rapids	3.0	23.5	28.9
Youngstown	28.8	-2.8	-7.4
Canton	2.2	7.2	8.2
Reading	-5.1	7.7	6.8
Erie	0.5	1.9	-8.9

NOTE: SMSAs are listed from largest to smallest public capital stock.
SOURCE: Author's calculations.

stock series aggregated across all state and local governments, to critique the BEA's methodology in constructing its state and local public capital stock series aggregated to the national level.

Leven, Legler, and Shapiro (1970) advocate using physical measures of public infrastructure to avoid problems related to the use of prices in the monetary approach. In order to account for differences in capacity and quality, as the price and depreciation measures do to some extent in the first method, they propose to collect information on the physical characteristics of these assets that reflect capacity and quality. In the case of highways, for example, they cite a study that converts physical characteristics of highways to estimates of the traffic flow capacity.

Although their approach avoids the issue of asset prices, there are problems with this approach as well. One issue is the monumental task of collecting adequate measures of the physical size and quality of each type of public infrastructure. For the private sector, it would be virtually impossible because of the diverse types of capital in use. For the public sector, the task is somewhat less formidable because public capital, as Leven, Legler, and Shapiro suggest, can be classified into a few dozen basic types.

Another issue is how to enter these various measures into a regression analysis that relates public infrastructure to economic activity. Entering more than a half dozen public infrastructure measures simultaneously into a regression equation would introduce a number of estimation problems, including multicollinearity. Furthermore, how would one interpret the separate effects of miles of roads versus cargo capacity of ports, for example? In addition, it may prove useful at some point to construct broader classifications of infrastructure, for example combining roads, highways, and bridges into a transportation network, which would be difficult to do under this approach. Also, it would be more convenient in regression analysis to have quality differences incorporated within a single measure. Both requests would require some type of aggregation scheme, perhaps more arbitrary than using prices or user costs.

One alternative is to develop a hybrid approach. The monetary estimates of public capital could be benchmarked by using the physical quantity and quality measures of public infrastructure. This approach would improve the accuracy of comparisons across metropolitan areas and over time by essentially adjusting the price of capital for differences in quality and quantity.

II. Public Infrastructure and Regional Economic Development

Economic development depends primarily on locational advantage, whether it is between cities, states, or countries. Firms seek areas that offer greater opportunities for economic profit. Public infrastructure can enhance these opportunities either by increasing productivity or by reducing factor costs; that is, by augmenting the efficiency of private inputs employed by firms or by providing an attractive environment within which households are willing to accept lower wages in order to reside.

Regional Models

Regional and national economic growth depends on processes that are more complex than simply the aggregation of independent decisions of firms and households. The decisions of economic agents are inextricably intertwined, and this interdependency must be taken into account in order to explain the process of development. The traditional, neoclassical view of regional development ignores this interdependence and relies heavily on the notion that capital is perfectly mobile between regions. As described by Romans (1965), capital tends to flow toward those regions offering the highest price and away from regions offering the lowest price, maintaining at all times an equilibrium of price equality after subtracting transport costs. The price of capital is determined by supply and demand. The supply in a region continually adjusts via imports and exports to changes in regional demand so as to maintain interregional price equality.

Richardson (1973) and other regional economists dismiss this framework as too simplistic. Instead, they maintain that regional investment decisions are characterized by the durability of capital, the sequential and interdependent nature of spatial investment decisions, the importance of indivisibilities in the regional economy, spatial frictions on interregional capital flows, and the distinction between private-sector capital and public infrastructure. The interdependence between public-sector investment and private-sector investment is paramount to understanding the regional development process and for prescribing regional economic development policy.

Leven, Legler, and Shapiro (1970) provide a simple picture of the feedback relationships between public and private investment decisions. Their model recognizes that an important share of the regional capital stock consists of social and public capital and that the scale and spatial distribution of public capital may have a significant impact on subsequent private investment decisions and on the location decisions made by firms and households. Since the initial size and distribution of the public capital stock is at least partly predetermined by the prior spatial distribution of households and economic activities in the region, an interdependent system emerges.

Once growth in such a system is under way, the process can easily become self-sustaining and cumulative. However, if the initial population and level of activity are small, and their spatial distribution costly and inefficient, a region may remain in a low-level equilibrium trap (Murphy, Shleifer, and Vishny [1989]). In such a case, attempts to promote regional growth may need the exogenous injection of public and social capital expenditures to generate an expansion rather than merely as a response to changes in the level and spatial distribution of population and economic activity. The difficulty with this approach, as Richardson points out, is that we know very little about the generative impact of various types of public infrastructure on private investment decisions. Furthermore, we know little about the effect of a region's economic conditions on infrastructure's contribution to output.

Hansen (1965) theorizes that the potential effectiveness of economic overhead capital will vary across three broad categories of regions: congested, intermediate, and lagging. Congested regions are characterized by very high concentrations of population, industrial and commercial activities, and public infrastructure. Any marginal social benefits that might accrue from further investment would be outweighed by the marginal social costs of pollution and congestion resulting from increased economic activity. Intermediate regions are characterized by an environment conducive to further activity—an abundance of well-trained labor, cheap power, and raw materials. Here, increased economic activity resulting from infrastructure investment would lead to marginal social benefits exceeding marginal social costs. Lagging regions are characterized by a low standard of living due to small-scale agriculture or stagnant or declining industries. The economic situation offers little attraction to firms, and public infrastructure investment would have little impact.

A number of policy implications emerge from this regional growth theory. The most obvious policy conclusion is that subsidies for infrastructure investment are more likely to pay off in the long run than investment incentives to firms and

other subsidies to private capital. Furthermore, following Hansen (1965) and Hirschman (1958), the main task of infrastructure subsidies for underdeveloped areas is to generate the minimum critical size of urbanization that can serve as a core for economic development. For these lagging regions, however, infrastructure may not be enough to attract firms; additional means such as wage subsidies may be necessary. Finally, a major outcome of a spatial approach to regional growth analysis is the need for more coordination between government agencies at all levels and for the integration of all infrastructure decisions in an overall regional development strategy.

Before the wisdom of such policies can be assessed, a number of questions must be answered. For example, how do we identify the mechanisms by which infrastructure investment generates regional growth? What types of infrastructure investment are crucial for promoting regional growth? Partial answers are found in the literature.

Empirical Findings

A direct test of Hansen's hypotheses about the effects of public infrastructure on regional development is provided by Looney and Frederiksen (1981). Unfortunately from the perspective of U.S. policy, they examine economic development in Mexico. Their findings support Hansen's intuition, however: economic overhead capital has a significant effect on gross domestic product for intermediate regions but not for lagging regions; social overhead capital exhibits the opposite effect, as Hansen predicted.

Costa et al. (1987) support Hansen's hypothesis of differential impacts of infrastructure on regional growth using U.S. data. They find that the larger the stock of public capital relative to private capital within a state, and the larger the stock of public capital per capita, the smaller the impact of public capital stock on manufacturing production. Eberts (1986) also finds regional differentials in the effectiveness of public capital on manufacturing output. He reports that public capital was more effective in SMSAs in the South than in the North and in SMSAs with a lower amount of public capital relative to private capital and labor.

Duffy-Deno and Eberts (1989), examining 28 metropolitan areas from 1980 through 1984, find that public capital stock has positive and statistically significant effects on per capita personal income. The effects come through two channels: first, through the actual construction of the public capital stock; and second, through public capital stock as an unpaid factor in the production process and a consumption good of households. This second effect is twice as large as the first effect using ordinary least squares (OLS) estimation, but the relative magnitudes of the two effects are roughly reversed using two-stage least squares (2SLS).

Other evidence of the differential effects of public infrastructure among regions comes from analysis of the operation of U.S. federal regional development programs on the growth rates of personal income for different categories of distressed areas. Martin (1979) finds that investment in public capital yields few gains for low-income areas, but that business development and planning/technical assistance are more effective in high-unemployment areas.

Mera (1975) provides one of the most comprehensive analyses of the effect of public infrastructure on regional economic growth for the United States. He hypothesizes that the growth of regional economic activity is determined primarily by the growth of public infrastructure and technical progress in the region. The growth of labor and private capital, which are allocated through price differentials, responds to growth differentials in social capital and technical progress. He examines the growth characteristics of the nine U.S. census regions from 1947 to 1963. Mera concludes that more-developed regions are growing because of the growth of public infrastructure, while less-developed regions are growing primarily because of the growth of technology.

Garcia-Mila and McGuire (1987) estimate the contribution of state educational and highway expenditures to gross state product. Using pooled cross-section time-series data from 1970 to 1983, they estimate a Cobb-Douglas production function with these two public inputs along with manufacturing capital stock and production employees as the private inputs. They find that highway capital stock and educational expenditures have a positive and significant effect on gross state product, with educational expenditures having the larger impact.

Other studies support these findings. For example, Helms (1985) shows that government expenditures on highways, local schools, and higher education positively and significantly affect state personal income. A study of the effects of public investment in rural areas by the CONSAD Research Corporation (1969) attempts to assess the effect of public works investment on the growth of real income in 195 small Missouri municipalities. This study finds that public works infrastructure accounted for 30 percent of the gain in real income between 1963 and 1966.

Of the major investment projects considered, federal highways, barge docks, vocational schools, and recreational facilities contributed the most to income growth.

III. Public Infrastructure and Firms

Is the effect of public infrastructure on regional growth a result of an overall increase in firm-level productivity or an increase in the region's attractiveness to labor and capital? Hulten and Schwab's (1984) research on regional productivity differentials lends some insight into this distinction. They test the hypothesis that the economic decline of the Snowbelt was due to differences in economic efficiency relative to the Sunbelt, by calculating regional differences in total factor productivity (TFP). They find little support for this hypothesis, determining instead that these interregional differences are largely a result of differences in the growth rate of capital and labor. Thus, the implication from these findings is that regional differences in the quality and quantity of public infrastructure may have a greater effect on the migration decisions of factors of production than on productivity differentials.

There is another reason to look at factors of production rather than at Hicks-neutral productivity changes in analyzing the effect of public infrastructure. If public infrastructure is indeed an input (as will be discussed later in this section), then relating public infrastructure to a measure of TFP, which includes only labor and private capital as inputs, may be a misspecification of the relationship. Munnell (1990) raises this issue for explaining TFP at the national level. When public capital is entered into the TFP calculations as a third input, she finds that the variation in TFP over time reflects more a change in public infrastructure than a change in technological innovation.

Very little attention has been given to the technological relationships between public infrastructure and other inputs in a firm's production process. The extant literature addresses this issue primarily from a theoretical standpoint. Three basic questions are considered:

1) How does public infrastructure enter the production process: as a factor-augmenting atmosphere-type input or as an unpaid input?
2) What implications do these two types of public inputs have on the efficient allocation of resources?
3) What effect do public inputs have on a firm's profits, and thus on an area's locational advantage?

Infrastructure as a Public Input

The basic premise of the theoretical literature is that public infrastructure may increase firm productivity either through increasing the efficiency of private inputs employed by firms or through its own direct contribution to production as an input into the production process. Economists have taken both approaches. Meade's (1952) classification of external economies distinguishes between these two approaches. Meade refers to the first type of public input as the creation of atmosphere. It is analogous to Samuelson's pure public good and is exemplified by free information or technology. In this case, an increase in the level of public inputs results in increased output for all firms through neutral increases in the efficiency with which the private inputs are used. Any firm entering a region immediately benefits from the existing level of public input without affecting the benefits from the public input received by other firms.

In more formal terms, public inputs are considered to enter the production function as factors that augment the productivity of each of the private inputs. If a firm is assumed to operate in a perfectly competitive environment, then each private factor of production receives a payment equal to the value of its contribution to output. Factors, whose productivity has been enhanced by public inputs, receive compensation higher than they would receive in the absence of public inputs. For example, suppose that government-supported research and worker training programs targeted at the electronics industry increase the productivity of labor and capital employed by an electronics firm. Workers and owners of capital receive higher compensation because of increased productivity. However, since the firm's entire revenue has been distributed among the private factors of production, no revenue is left to pay for public inputs. Thus, public inputs will not be supplied without government intervention.

Meade refers to the second type of public input as an unpaid factor. An example is free access roads. This input has private-good characteristics, except that it is not provided through a market process and thus is not paid for on a per-unit basis and does not have a market-determined price. Its private-good characteristics generally result from congestion. In the case of highways, as the number of firms in a region expands, increased use of the highways results in congestion, which effectively reduces the total amount of highway services available to each firm. Thus,

from the firm's perspective, the level of public input is fixed, unless the facility is continually underutilized.

Having many characteristics of a private input, the unpaid-factor type of public input is entered into the production process in the same way as private inputs. Unlike the first case, the public input does not augment the productivity of the private inputs. Rather, it contributes independently to the firm's output. Because firms, by definition, do not pay directly for the public input, they initially earn profits or rents according to the value of the marginal product of the public input. It is usually assumed that the rent accrues to some ownership factor such as capital or entrepreneurship. As with a private unpriced input, these profits from the public good will attract other firms into the industry (or area). As additional firms enter the industry, the per-firm usage of the public input declines relative to other inputs. Before and after entry into an industry, capital or the factor collecting the accrued rent is paid the value of its marginal product plus the rent to the unpriced factor. The influx of firms increases the ratio of private inputs to public inputs, causing the marginal product of public inputs to rise relative to private inputs. Local governments, acting as agents for these firms, increase the allocation of public investment relative to the private inputs because of its high marginal productivity. Additional firms move into the region until the rents are dissipated and capital earns a competitive rate of return.

Optimal Allocation of Public Inputs

The two types of public inputs have different implications concerning the efficient allocation of resources, the level of provision of the public inputs, and the appropriate financing arrangements. For the first case, Samuelson's conditions for the allocation of pure public goods apply. Kaizuka (1965) and Sandmo (1972) show that resources are allocated efficiently when the total savings of all firms brought about by substituting a public input for a single private input are equal to the resource cost of using that private input to produce the public input. However, because of the free-rider problem, government must supply the intermediate input. The revenue necessary for government to provide the service must be raised by some form of taxation or user charges.

Negishi (1973) demonstrates that for a pure public input, an optimal level of public good will be produced if the government supplies a level of public inputs that maximizes the joint net profit of industries. The firm's ability to determine the allocation of public investments is defended by Downs (1957), who argues that a firm's lobbying activities sufficiently influence government decisions. However, when household preferences for public expenditures are represented by majority rule voting, public goods are in general not optimally supplied. Pestieau (1976) shows that only under very restrictive assumptions will majority voting lead to an optimal supply of the public input. In most cases, it will oversupply public inputs.

The same optimality conditions hold for the case of an unpaid factor of production, but the level of provision is different. Negishi shows that for an unpaid factor, the public good most likely will be oversupplied when the government tries to maximize the joint net profit of firms in the long run. He offers the following explanation. Since returns to public goods are imputed to capital in the case of the unpaid factor, capital tends to concentrate excessively in industries that can enjoy more gains from public expenditures than other industries. Unless public goods and capital are perfect substitutes, the capital intensity of the industry raises the productivity of public goods, which implies that more of the public good is required to maximize the industry's profits. Thus, allocation is inefficient even without the additional complication of household preferences and majority rule voting.

Financing Public Infrastructure

These theoretical results highlight the importance of the total fiscal package, not simply taxes or public investment, in firm location decisions. As previously mentioned, firms with access to public infrastructure earn rents according to the value of the contribution of public infrastructure to production. In the unpaid factor case, a portion of these rents (if not all rents) may be taxed or paid out as user charges in order to finance public infrastructure. The amount of rents remaining with the firm as a result of public unpaid factors depends on the taxing scheme adopted and on properties of the production process or utilization of public inputs.

For any given level of public investment, the amount of rents accruing to firms depends on the sharing arrangements between taxpayers inside and outside a local jurisdiction. For example, if public infrastructure is financed entirely by individuals outside the area (through federal grants, for example), then a firm receives

the entire rent, which in turn creates a greater incentive for that firm and others to locate in the area. On the other hand, if the entire burden of financing the public infrastructure investment falls on individuals within the local area, then profits would be much smaller, creating less of an incentive for firms to locate or remain there.

Another arrangement is for households to assume a larger proportion of the financing costs of public investment than warranted by the direct benefits they receive. Some communities pursue this approach through tax moratoriums and lower tax rates for firms, with the idea that the benefits to the community from creating new jobs outweigh the increased burden of financing the investment.

An additional feature of the fiscal package is that taxes need not equal the total rents accruing to firms (and even to households). Benefits from public investment projects characterized by economies of scale and sharing properties will exceed the cost of the project. Since many components of public infrastructure, such as highways and water distribution and treatment facilities, exhibit these properties, it is reasonable to assume that public investment may have a net positive effect on firm productivity and thus on firm location.

Empirical Findings

A number of basic questions emerge from the theoretical foundations of the relationship between infrastructure and firm-level behavior:

1) How does public capital enter into the production process?
2) What effect does public infrastructure have on a firm's productivity? How does this vary with the type of firm and type of infrastructure?
3) Are private and public capital related as substitutes or complements?
4) What effect does public infrastructure have on firm location decisions?

Only recently have researchers estimated the technical relationships between public infrastructure and other production inputs. Previously, the literature looked primarily at peripheral issues such as the effects of federal programs on economic growth in distressed areas or the effects of various government expenditures on firm location. These are undoubtedly important questions, but their particular focus does not provide much insight into the technical relationships outlined above. Another problem with the earlier studies is that, with the exception of Mera (1973, 1975), they use public expenditures or the number of government employees as proxies for public infrastructure.

More recent studies have tried to address these issues directly by estimating production functions with public capital-stock estimates included as inputs. Eberts (1986) estimates the direct effect of public capital stock on manufacturing output and the technical relationships between public capital and the other production inputs. Public capital stock is estimated using the perpetual inventory technique, described in section I, for each of 38 U.S. metropolitan areas between 1958 and 1978. With this method, capital is measured as the sum of the value of past investments adjusted for depreciation and discard. Public capital stock includes highways, sewage treatment facilities, and water distribution facilities within the SMSA. He estimates a translog production function with value added as output, hours of production and nonproduction workers as the labor input, and a value measure of private manufacturing capital stock as private capital.

Eberts finds that public capital stock makes a positive and statistically significant contribution to manufacturing output, supporting the concept of public capital stock as an unpaid factor of production. Its output elasticity of .03 is small relative to the magnitudes of the other inputs: 0.7 for labor and 0.3 for private capital. It follows that the magnitude of the marginal product of public capital is also relatively small.

The small estimated contribution of public capital may be viewed in two ways. If one considers public capital stock to be a pure public good, then the marginal product of public capital stock reveals the manufacturing sector's valuation of the total stock of public investment in place in the SMSA. If local governments allocate public funds in response to the preferences of the local voters, then the marginal valuation should be equal to their tax share. Thus, it is not unreasonable that a typical firm pays 4 percent of its total value added to local taxes—a value close to the marginal product of public capital.

Another way to interpret the results is to assume that the manufacturing sector uses only a specific portion of the stock. For instance, firms may be spatially concentrated in one area of the metropolitan area and thus intensively use only the roads and sewer systems in that part of the region. If one assumes that the per-unit cost of constructing one unit of private capital is the same as the per-unit cost of constructing one unit of public capital, then the marginal products of the two capital inputs should be equal. Estimates show, however, that the marginal product of private capital is seven times that of the marginal product of public capital. This difference may

result from assuming that the manufacturing sector uses the total capital stock instead of some portion of it. If one assumes that the use of the total public capital stock by manufacturing firms is approximately proportional to manufacturing employment's share of the total population, then the use of the public capital stock is overestimated by roughly seven times. Multiplying the marginal product of public capital stock by seven brings it in line with the marginal product of private capital.

With respect to technical relationships, Eberts finds that public capital and private capital are complements, while the private capital/labor pair and the public capital/labor pair are substitutes. Public and private capital are interpreted to be complements when an increase in the level of public capital reduces the price of private capital by increasing its relative abundance. Dalenberg (1987), using the same data as Eberts but estimating a cost function, also finds public capital and private capital to be complements.

Deno (1986) also estimates technical relationships, but uses investment data instead of capital stock data. Using pooled data for U.S. metropolitan areas from 1972 to 1978, he estimates labor and private investment demand equations derived from a Cobb-Douglas production function. He finds that local public investment and private capital are complements. In addition, he finds that a 1 percent increase in public investment is associated with a 0.01 percent increase in net private investment in the short run and a 0.2 percent increase in the long run. Furthermore, he concludes that public investment has a significantly greater positive effect on net private capital formation in distressed cities than in growth cities. In subsequent work, Deno (1988) finds the output elasticities of water, sewer, and highway infrastructure for the full sample of 36 SMSAs are 0.08, 0.30, and 0.31, respectively. These estimates were obtained using a profit function approach for the period 1970 to 1978.

At the state level, Costa et al. (1987) estimate the contribution of public capital stock to manufacturing output by estimating a translog production function. Their analysis differs from that of Eberts in two key ways, in addition to the unit of analysis. First, Costa et al. estimate the production function using cross-sectional data for 1972, while Eberts combines cross-sectional and time series data in his estimation. Second, Costa et al. distribute the BEA estimate of capital among states in proportion to the gross book value of fixed assets at year-end 1971. The private capital stock used by Eberts, on the other hand, is based on the same perpetual inventory technique used to construct the public capital stock.

Costa et al. also find that public capital stock makes a statistically significant contribution to manufacturing output. However, the magnitudes of their public capital elasticities are higher than what Eberts found, which may be partly explained by their inclusion of more categories of public investment. Another difference between the results of these studies is that Costa et al. find private and public capital to be substitutes and public capital and labor to be complements, while Eberts and Deno find the opposite. One explanation for the difference may be in the calculation of these relationships. Costa et al. use the log form of the production function to derive the cross-partial derivative, while Eberts converts back to the original production relationship to compute the technical relationships.

Mera (1973) estimates the technical relationships between various types of infrastructure and other inputs for Japan. Using pooled data of nine regions in 10 years from 1954 to 1963, he estimates a Cobb-Douglas production function for each of three major economic sectors and four types of infrastructure. He reports the following findings: (1) when the infrastructure variable is entered as a separate factor of production, its production elasticity ranges from 0.1 to 0.5, most frequently around 0.2; (2) the transportation and communication infrastructure appears to have a sizable effect on mining, manufacturing, and construction; (3) in most cases, the rates of return from infrastructure are similar to those of private capital; but (4) the elasticity of substitution between private capital and infrastructure is undetermined in this study.

Studies of the determinants of firm location usually concentrate more on the effect of taxes than on the effect of expenditures on location decisions. However, those studies that have included various measures of public infrastructure have found that certain forms of infrastructure are attractive to firms. Some of the strongest results were reported by Fox and Murray (1988), who found that the presence of interstate highway systems had a positive and highly significant effect on the location of individual establishments in the state of Tennessee. Bartik (1985), using a national sample, also found that the number of new branch plants was higher within states with more miles of roads. Eberts (1990) offers evidence that public infrastructure positively affects the number of firm openings in metropolitan areas.

IV. Public Infrastructure and Households

Public infrastructure may also affect the migration decisions of households by enhancing the area's amenities. However, the existing literature related to household location decisions does not focus much on public infrastructure. Labor migration studies tend to concentrate primarily on demographic characteristics and wage differentials to explain migration flows. Urban quality-of-life comparisons, which deal with the same underlying decision process, come closer to addressing this issue, but their major focus is on attributes such as air quality, climate, and so forth.

One exception is the migration study by Fox, Herzog, and Schlottmann (1989). They estimate the effect of local fiscal expenditures and revenue on household decisions to migrate across metropolitan areas. Using Public Use Microdata Samples, which record a household's place of residence in 1975 and 1980, they determine that fiscal variables are more important factors in pushing people from an area than in attracting them toward one. They explain this result in terms of information. Information on fiscal structure is more readily available in an area where a person has been living than for areas under consideration as migration destinations.

V. "Causal" Relationships Between Public and Private Investment

Most of the studies that address the stimulative effect of public investment presume that public investment "causes" or precedes private capital. Yet, scant attention has been given to testing this relationship. Eberts and Fogarty (1987) explore the causal relationship between public and private investment. Their premise, following the cumulative model of regional growth, is that the timing of investment indicates the role of public investment in promoting local economic development. If public investment precedes private investment, then it would appear that local areas actively use public outlays as instruments to direct local development. On the other hand, if the sequence of events occurs in the opposite direction, it would appear that local officials merely respond to private investment decisions.

Using data on public capital outlays and manufacturing investment from 1904 to 1978 for 40 U.S. cities, Eberts and Fogarty find a significant causal relationship between public outlays and private investment in 33 of the 40 metropolitan areas examined. The direction of causation goes both ways. Private investment is more likely to influence public outlays in cities located in the South and in cities that have experienced tremendous growth after 1950. Public outlays are more likely to influence private investment in cities that experienced much of their growth before 1950.

Looney and Frederiksen (1981), in their study of Mexico, support the findings of Eberts and Fogarty for older U.S. cities—that public investment appears to be the initiating factor in the development process, rather than a passive or accommodating factor. They do not attempt to determine whether causal directions differ across types of regions, however.

VI. Overall Assessment

The importance of public infrastructure in promoting economic development has been widely recognized among policymakers. Economists have only recently begun to assess the effects of infrastructure on regional economic development beyond simply a stimulus of construction activity. The consensus among economists is that public infrastructure stimulates economic activity, either by augmenting the productivity of private inputs or through its direct contribution to output. Furthermore, by enhancing a region's amenities, public infrastructure may also attract households and firms, which further contributes to an area's growth.

Results show that public capital stock significantly affects economic activity. The magnitudes of the effects for public capital are much less than for private capital, however. Results also show, with some exception, that public capital and private capital are complements, not substitutes. This relationship may be interpreted to mean that the existence of public infrastructure is a necessary precondition for economic growth.

Evidence suggests that the effect of public infrastructure on regional development depends on the type of investment and on the economic conditions of the region. Studies of Japan and Mexico, in particular, show that investment in communications and transportation appears to have the most significant impact on regional growth. In the United States, public investment appears to have a greater effect on economic activity in distressed cities than in growth cities, in Sunbelt cities than in Northern cities, and in those areas with less public capital stock relative to private capital and population.

The critical question is at what point, if any, does an additional increase in public infrastructure cease to have any effect on economic development? Alder (1965) sums up the effect of transportation on economic development: "It is frequently assumed that all transport improvements stimulate economic growth. The sad truth is that some do, and some do not...." In a broader context, it can be concluded that some types of infrastructure investment will have significant effects, while others will not.

Many local and state governments in the United States are faced with the monumental task of replacing and upgrading their present public capital stock. But the challenge is more than simply maintaining existing structures. The challenge facing these governments is to meet the future infrastructure needs of a U.S. economy that is undergoing dramatic changes with the restructuring of both manufacturing and service industries and the spatial redistribution of these activities. Innovations in areas such as telecommunications and computer automation, to mention only two, are changing the way businesses operate, and infrastructure investment must adapt to this changing technology. Results from studies reported in this paper underline the importance of maintaining, improving, and expanding public capital stock in order to support future economic growth.

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Using Market Incentives to Reform Bank Regulation and Federal Deposit Insurance

by James B. Thomson

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Introduction

Reform of the financial services industry became a hotly debated issue in the 1980s, and this debate continues to rage in the 1990s. Much of the debate has been generated by a growing recognition that fundamental reforms are needed in our bank and thrift regulatory systems to respond to market-driven changes in the financial services industry. Deposit-insurance reform has taken center stage in the political arena, as the Financial Institutions Reform, Recovery and Enforcement Act (FIRREA) of 1989 formally commits $159 billion of taxpayer money to resolve the thrift crisis and mandates that a study of federal deposit insurance be undertaken.

The overall objective of reform in the financial services industry should be to maximize the efficiency and stability of the banking and thrift systems while minimizing the exposure of the federal safety net, and hence the taxpayer, to losses generated by insured banks and thrifts. A plethora of reform proposals have been advanced by the banking industry, bank regulators, and the academic community. These reform proposals typically can be divided into proposals that rely on increased regulation and less discretion for bank management,[1] and proposals that rely on market-oriented solutions and increased management discretion within supervisory guidelines.[2]

The purpose of this paper is twofold. First, it presents the case for adopting market-oriented reforms to the regulatory system and to the financial safety net.[3] Second, it summarizes the literature from one perspective and presents a cohesive view on the topic. Section I reexamines the issue of whether banks are special and the

■ **1** Reform proposals that rely on increased government regulation include Corrigan (1987) and Keehn (1989). These authors propose the use of regulation as a substitute for market discipline, and hence reforms to the federal safety net. In their separate proposals, Corrigan and Keehn would allow bank holding companies to engage in virtually any financial activity so long as there is legal separation between the nonbanking activities and the insured banks in the holding company. In principle, this would capture some of the efficiencies of an integrated financial services industry without increasing the size and scope of the safety net. However, Kane's (1989b) application of principal-agent theory to regulatory agencies calls into question the substitutability of regulation and market discipline.

■ **2** Proposals that rely on increased market discipline include Cates (1989), Ely (1985, 1989), Kane (1983, 1985, 1986), Benston et al. (1986, ch. 9), Benston et al. (1989), Benston and Kaufman (1988), the Federal Reserve Bank of Minneapolis (1988), Hoskins (1989), Thomson and Todd (1990), and Wall (1989).

■ **3** For an opposing view, see Campbell and Minsky (1987), Guttentag and Herring (1986, 1988) and Randall (1989).

issue of stability in banking markets, both regulated and unregulated. In addition, section I looks at principal-agent problems associated with bank regulation (Kane [1988b]). Section II proposes reforms to our system of regulatory taxes and subsidies. Conclusions are presented in section III.

I. Stability in Banking Markets

Those who propose reforms that rely on an increased role for regulation in determining limits on bank powers and activities—and hence a reduced role for management discretion, shareholders' control, and market discipline—assume that financial markets are inherently unstable or that banks are "special" in the sense that the social costs of bank failures significantly exceed the private costs (Corrigan [1987] and Tallman [1988]). Therefore, proponents of increased regulation are willing to trade efficiency for stability. Moreover, in principle, increased regulation protects the public purse from losses by restricting the participation of insured depository institutions in activities that are deemed to be excessively risky.

The reforms outlined in this paper assume that the opposite is true; that, left to their own devices, financial markets are stable in the sense that in the long run they exhibit an orderly process of change, and that, if there is a trade-off between efficiency and stability, it exists only in the short run.[4] Moreover, it is the system of regulatory taxes and subsidies, in our view, that makes banks "special," and not any intrinsic characteristic of banking.[5]

Are Banks Special?

The banks-are-special argument typically is based on one of two notions: either that bank failures have a high social cost or that all runs on individual banks are contagious and, therefore, the banking system is unstable. Since the issue of banking-system stability is dealt with in the following section, we will concentrate on the social cost of bank failures here. To argue that banks are special because there are high social costs associated with their failures, one must demonstrate two things: first, the social costs of bank failures are significantly greater than the private costs of bank failures (that is, there is an economically significant externality associated with the failure of a bank); and second, the social costs of bank failures are significantly higher than the social costs of failures of other firms.

What has been the cost of bank failures? Benston et al. (1986, ch. 2) show that for the entire period from 1865 to 1933 (the time period between the National Banking Act and the creation of the FDIC), total losses were $12.3 billion, or about 1 percent of total commercial bank assets. Losses to depositors were only about $2.4 billion, or about 0.21 percent of commercial bank deposits. Even in the Great Depression (1930-1933), the losses to depositors were only about 0.81 percent of total commercial bank deposits. So, in an environment of no federal deposit insurance and lighter regulation, the private costs of bank failures appear to have been small.

The issue of the "specialness" of banks rests on social costs, however, and not on private ones. Unfortunately, the social costs of bank failures are difficult to quantify, because measures of the size of the externalities associated with bank failures are highly subjective or do not exist.

The first of these externalities is the loss of banking services in the community or the disruption of special banking relationships. Banking relationships are considered valuable because one service performed by banks is information intermediation. In the first case, rarely does a community lose all of its banking services when an individual bank fails. Kaufman (1988) argues that in those few cases where the only bank in the area fails, it is often replaced by another bank or financial institution, often in the same location. Furthermore, liberal chartering of new banks and the relaxation of intrastate and interstate branching restrictions should take care of this problem when it does arise.

Second, most firms have relationships with more than one financial institution, and many of the lending officers of the failed institution find jobs with other banks in the area, often with the bank that replaces the failed institution (Benston and Kaufman [1986]). Moreover, as Schwartz (1987) argues, it is difficult to believe that financial institutions interested in acquiring the liabilities of failed banks would not also be interested in capturing their creditworthy customers, especially if banking relationships have value.

■ **4** The trade-off between efficiency and stability in the short run can occur only when there are no principal-agent problems associated with bank regulation or, in other words, when bank regulators are "faithful agents" as defined by Kane (1989b). Otherwise, the trade-off between efficiency and stability would not hold even in the short run. The author thanks Edward Kane for this analysis.

■ **5** For a comprehensive look at the arguments and evidence as to why banks are not special, and a list of articles on the subject, see Saunders and Walter (1987).

The second externality may be the disruption of the payments system.[6] Because banks are the conduit for payments in this country, the failure of a major depository institution could cause the failures of other banks on the payments system, topple the payments system itself, or at least shut it down for an unacceptable period of time. However, there is no reason that the failure of any institution, let alone a large one, should result in the collapse of the payments system.

Even today, the loss on assets associated with large bank failures is typically small, certainly not approaching 100 percent.[7] Therefore, banks with payments-related exposure to the failed institution should realize only a small loss, and the threat of loss from payments-system defaults should cause banks to limit their exposure to other banks that are considered to be excessively risky. After all, banks routinely do this today in the federal funds market. In addition, the lender of last resort can immunize the rest of the payments system from the failure of a single bank by lending (with a "haircut") to banks against their claims on the failed institution until those claims are realized.[8] The Federal Reserve's role in providing liquidity to financial markets during the October 1987 stock market crash illustrates how a properly functioning lender of last resort can prevent spillover effects from bank failures or from crises in individual financial markets.

The third component of social costs is the causal relationship between declines in the banking industry and in the level of general economic activity. Do declines in the banking sector cause declines in economic activity, or is the opposite true? A review of the historical evidence by Benston et al. (1986, ch. 2) and Schwartz (1987) suggests that bank failures are caused by the declines in general economic activity, whether the declines are national or regional.

Therefore, although there are economic and social costs associated with individual bank failures, these costs do not appear to be significantly larger than those for other firms. As Saunders and Walter (1987) point out, the costs of individual bank failures are much different from the costs to the economy from a collapse of the banking system, and those who argue that bank failures have high social costs often fail to recognize that difference. Thus, the argument that banks are special because of social externalities associated with their failures does not appear to be valid.

Bank Runs and Stability

Opponents of market-based banking reforms argue that the very nature of bank and thrift deposit liabilities (that is, they are redeemable at par on demand) makes free-market banking systems inherently unstable.[9] They argue that, without federal deposit guarantees, the banking system is subject to contagious bank runs. As the argument goes, deposit insurance removes or reduces the incentives for bank runs and thus stabilizes the banking system. Regulation, in turn, is needed to protect the federal deposit insurance agency, and ultimately the taxpayer, from the moral hazard embedded in federal deposit guarantees.[10]

To analyze this claim of instability, one needs to distinguish between rational and irrational bank runs. Kaufman (1988) argues that a rational bank run is one that occurs because depositors have good information that their depository institution has (or may) become insolvent. This type of run should not be contagious and, in fact, is the method the market uses to weed out weak institutions. Because rational bank runs are essentially a market-driven closure rule, they act as a form of market discipline on bank management and shareholders (Benston and Kaufman [1986]).

Kaufman (1988) describes an *irrational* bank run as one that occurs because poorly informed depositors mistakenly believe that their depository institution has (or may) become insolvent. Institutions that are truly solvent can stop an irrational run by demonstrating their solvency. Although these runs theoretically could be contagious, it is unlikely that they would be (except,

■ **6** Payments-system concerns are the motivation for the safe-bank proposals of Litan (1987) and others.

■ **7** Although loss rates have ranged as much as 50 percent of assets in small-bank failures, the failure of these banks is not a threat to the payments system.

■ **8** Lending with a haircut refers to the practice of making short-term collateralized loans for less than the estimated market value of the collateral. That is, the lender estimates the value of the collateral and then "takes a little off the top." This is usually done when the market value of the collateral is measured with uncertainty.

■ **9** The theoretical foundation for this viewpoint is found in Diamond and Dybvig (1983). In their model of a simple economy, Diamond and Dybvig find that government deposit insurance improves social welfare by removing the possibility of systemic bank runs. However, McCulloch and Yu (1989) show that private contracts could perform the same function as deposit insurance in the Diamond and Dybvig world. Furthermore, McCulloch and Yu find that neither the private contracts nor government deposit insurance can improve social welfare in the Diamond and Dybvig world if private capital markets exist outside the official banking sector.

■ **10** For a detailed discussion of bank runs and their positive implications for economic stability, see Kaufman (1988).

possibly, to other insolvent institutions) because other banks and thrifts have incentives to provide liquidity to solvent institutions experiencing runs. In fact, private bank clearinghouses performed this function prior to the creation of the Federal Reserve System (Gorton and Mullineaux [1987]).

Moreover, a properly functioning lender of last resort can prevent irrational bank runs from becoming systemic bank runs by providing liquidity to solvent institutions experiencing runs. In so doing, the central bank further relieves pressures on solvent institutions, while removing any potentially destabilizing effects of irrational bank runs, yet without precluding rational bank runs on insolvent institutions (Meltzer [1986] and Schwartz [1987, 1988]). One should note that bank runs were historically a statewide or systemic problem primarily in unit banking systems, where regional and therefore industry diversification of assets was artificially restricted by regulations. Thus, irrational bank runs may simply be an unintended side effect of branching restrictions, rather than a natural source of instability in free-market banking systems.

By suppressing or overriding market closure mechanisms, federal deposit insurance has reduced or removed one of the self-correcting forces that ensures the efficiency and long-run stability of banking markets. Kane (1985, ch. 3) and Thomson (1986, 1989) argue that the way federal deposit insurance is priced and administered results in government subsidization of the risks undertaken by insured banks and thrifts. This, in turn, leads to perverse incentives for risk-taking by insured institutions and decreases the stability of the financial system.

Moral Hazard and Regulation

To mitigate the moral hazard (that is, the incentives for the insured to increase their risk in order to maximize the combined value of their equity and deposit guarantees) intrinsic in deposit-insurance guarantees, strict regulations were adopted that limited the scope of activities in which banks could participate and the types of products (both asset and liability) they could offer. In other words, regulations were used as a tax to offset the perverse effects of the subsidy inherent in federal deposit insurance (Buser et al. [1981]). These regulations sought to alleviate the moral hazard problem by removing a large degree of management and shareholder discretion in the operation of depository institutions.

An unintended side effect has been that these regulations have made managers and shareholders less responsive to market incentives and have reduced the flow of capital from poorly managed institutions to well-managed ones (because all institutions are equally insured). This system most assuredly resulted in fewer bank failures from the mid-1930s through the late 1970s, but did so at the expense of the long-run stability of the financial system, as evidenced by the escalation of problems in the banking and thrift industries in the 1980s.[11] The movement of capital from marginal firms in an industry to the strongest and best-managed firms is another of the self-corrective forces that would ensure the long-run stability of our banking system.

While regulation may reduce the moral hazard associated with deposit guarantees, Kane (1988b, 1989b) shows that principal-agent problems cause other forms of moral hazard to arise.[12] In the principal-agent framework, bank and thrift regulatory agencies are viewed as self-maximizing bureaucracies whose primary task is to act as the agent for taxpayers to ensure a safe and sound banking system and to minimize the taxpayer's exposure to loss. In addition, regulators must cater to a political clientele who are intermediate or competing principals. Furthermore, regulators are sometimes motivated by their own self-interest.[13]

In Kane's (1989e) principal-agent framework, political pressures and self-interest considerations create perverse incentives for regulators that may cause them to "paper over" emerging problems in an industry instead of dealing with them early and forcefully with the hope that, by buying time to deal with each crisis, the ultimate cost of resolving it will be smaller. Policies such as "too big to let fail," capital forbearance programs, and the adoption of regulatory accounting principles (RAP) for thrifts are some of the more visible manifestations of the problem (Kane [1989b]).

■ **11** Schwartz (1987, 1988) argues that the 60 years of relative stability in our financial system were due to price stability and not to either deposit insurance or bank regulation. She argues that one cost of price-level instability is troubled depository institutions, regardless of whether they are regulated.

■ **12** For a general discussion of agency costs and pricipal-agent problems and their applications in corporate finance, see Jensen and Meckling (1976) and Jensen and Smith (1985).

■ **13** Of course, throughout this paper, it is assumed that all politicians and bureaucrats firmly believe that their actions are motivated exclusively by the public interest. The analysis provided here emphatically does *not* accuse public servants of intentionally acting in bad faith but, rather, assumes that they do not always articulate or understand their real motives.

Regulation and Stability

Government-regulated systems, such as those operative in our banking and thrift industries, attempt to achieve stability by setting up a delicate and complex web of regulatory taxes and subsidies. In the case of banks, regulation has attempted to achieve stability by limiting competition between banks and nonbank financial institutions, both through prohibitions on activities banks can engage in (Glass-Steagall restrictions) and by subsidizing bank funding (through federal deposit insurance). Regulators are charged with the task of stabilizing the banking system by delivering an optimal mix of regulatory subsidies and taxes.

As Kane (1985, ch. 5) points out, the ability of regulators to deliver an optimal mix of regulatory taxes and subsidies becomes increasingly difficult over time as competitive forces in financial markets gradually erode existing regulations and alter the size and mix of regulatory taxes and subsidies.[14] Existing regulations often are weakened, or are made completely inappropriate, or become counterproductive. In addition, subsidies inherent in fixed-rate deposit insurance, access to discount-window credit, and free finality of payments over the Federal Reserve's wire transfer system increase in size. This effect is accentuated by exogenous shocks to the financial system, such as surges of inflation or technological changes.

These market-driven changes in our system of regulatory taxes and subsidies are the beginning of the ongoing process of regulation, market avoidance, and reregulation: a process that Kane (1977, 1988a) calls the "regulatory dialectic." The response of government-regulated systems to market-driven changes in the size and mix of regulatory taxes and subsidies is to accommodate the shocks. Changes to the regulatory structure tend to lag developments in the marketplace and are typically piecemeal, usually with the purpose of either validating market innovations or reregulating areas where market forces have made existing regulations obsolete.[15] This may include regulations designed to limit or prohibit new activities that are deemed too risky (for example, thrifts' investments in high-yield bonds), the removal of regulations that are unenforceable or politically costly to continue (for example, deposit-rate ceilings), or the modification of existing regulations (for example, risk-based capital standards for banks and RAP accounting standards for thrifts).

Essentially, the regulatory response is to deal with the symptoms of a shock without making the basic structural adjustments necessary to allow the banking system to adjust fully. This often results in policies aimed at protecting the regulator's weakest client firms at the expense of the efficient firms in the industry and, hence, the stability of the banking system. An example is the capital forbearance policies adopted by both the bank and thrift regulators during the 1980s (Barth and Bradley [1989, table 3], Caliguire and Thomson [1987], and Thomson [1987a]). Moreover, regulatory interventions in the banking system tend to thwart market-oriented forces often enough that normal market outcomes are difficult to achieve within the limited scope of activities that the regulators are willing to permit. Consequently, increased subsidies from the public purse become necessary to permit regulated entities to achieve the returns on equity that enable them to remain competitive. This system minimizes the number of failures of individual, regulated firms in the short term, but increases the efficiency loss and the aggregate public exposure to loss in the long term. Kane (1989b) points to the current thrift debacle as a vivid example of this type of regulatory behavior.

The result is a set of financial institutions that are special or unique only in terms of the regulatory taxes and subsidies to which they are subject. In other words, it is the restrictions on organizational form, where they can do business, and what businesses they can be in, coupled with access to federal deposit guarantees, to the Federal Reserve's discount window, and to the Federal Reserve-operated payments system that make depository institutions special. Additionally, banks and thrifts are less efficient and less able to adapt to changes in the economy than they would be if they were more subject to market incentives, and the resulting banking system is less stable in the long run than one governed by market principles.

■ **14** Regulatory subsidies arise because banks and thrifts are not charged the fair value of the risk-bearing services provided to them by the federal safety net. Regulatory taxes represent the reduction in the value of a bank or thrift due to constraints placed on its profit-maximization function through regulation.

■ **15** The difference between the market and regulatory adjustment process is equivalent to the difference in exchange-rate adjustments under floating and fixed exchange rates. Under a floating-exchange-rate regime, supply and demand factors in markets cause nearly continual adjustment of the exchange rate. Under a fixed-exchange-rate regime, the official exchange rate is maintained for long periods of time, with large adjustments made periodically.

II. Market-Oriented Reforms

The alternative to increased regulation is a system of reforms that relies more heavily on market forces to shape the structure of the financial services industry.[16] Market-oriented reforms, such as a reduction in the scale and scope of the federal safety net, improved information systems (including the adoption of market-value accounting and early dissemination of information), and the adoption of a timely, solvency-based closure rule for banks and thrifts, would increase the efficiency and long-run stability of the banking system. Rather than blocking or attempting to circumvent market forces, these reforms would rely on market forces to reestablish the trade-off between risk and return in financial services, so that those who benefit from the gains of risky strategies would also bear the losses when these strategies did not pan out. Therefore, there would be less of a need for regulations, as distinct from reliance on market forces, to protect the public purse from losses.

In its most extreme form, market-oriented reforms would establish a free-market banking system with no remaining vestiges of the federal safety net (discount-window access, deposit insurance, and direct access to the Federal Reserve payments system). The market would determine the structure and scope of financial intermediaries' activities, and market-determined closure rules would prevail. The role of the government would be limited to collecting and disseminating information and to enforcing property rights by resolving contractual disputes. However, reforms to the federal safety net necessary for a free-market banking system are unlikely to be implemented. Kane (1987), echoing Downs (1957), argues that subsidies, like those embodied in the financial safety net, tend to become viewed as entitlements by the subsidized industry. Industry trade associations and other special interest groups lobby Congress vigorously to protect their narrow interests, while society's interests are sufficiently diffuse that they cannot defeat special interest lobbies.

One caveat to note is that the following proposed reforms have transitional or "switching" costs that must be dealt with. This is especially true of deposit-insurance reforms. These transitional costs would be less of a problem if the reforms were applied to an industry that is already healthy. Obviously, this is not the case for either our banking industry or the thrift industry.

It must be recognized that the transitional costs, which include the cost of recapitalizing, reorganizing, or closing insolvent and unsound institutions, cannot be avoided forever regardless of whether reforms are adopted. Moreover, as demonstrated so vividly by the thrift crisis, the sooner these costs are dealt with, the smaller they are likely to be (Kane [1989b, ch. 3] and Barth and Bradley [1989]). Therefore, the realization of the switching costs should not be seen as an impediment to reform, but rather as an important first step in implementing any set of reforms. FIRREA represents a partial realization of these switching costs; however, considerably more needs to be done before a comprehensive package of deposit insurance and regulatory reforms can be implemented.

Deposit-Insurance Reform

Restoring market discipline as an effective constraint on bank and thrift activities is the main purpose of deposit-insurance reform. The coverage and pricing of federal deposit guarantees must be changed so that federal bank and thrift insurance funds do not subsidize risk in the financial system.

To restore market discipline to banking, federal deposit insurance coverages must be limited, and remaining coverage must be correctly priced.[17] At the very least, deposit insurance should be cut back to strict observance of the current statutory limit of $100,000. Furthermore, this limit should be applied per depositor, rather than to each insured deposit account. Coverage should not be extended in any circumstance to explicitly uninsured depositors, unsecured creditors, or stockholders of banks and their parent holding companies. In other words, the failures of all insured institutions should be handled in a manner that reduces the regulators' and insurers' incentives to minimize insured deposit payouts while maximizing long-term exposures to uninsured claims.

Kane (1985, ch. 6) proposes that strict enforcement of the current limit would require some changes to the failure-resolution policies of the FDIC and might require statutory constraints on

■ **16** This section draws heavily on Benston et al. (1986), Benston and Kaufman (1988), and Kane (1985, 1986, 1987, 1989a, 1989b, 1989c, 1989d).

■ **17** Merton (1977, 1978) shows how option pricing can be used to model and value deposit guarantees. Using Merton's results, Thomson (1987b) shows how information regarding the market prices of uninsured and partially insured deposits can be used to construct risk-based deposit-insurance premiums for insured deposit balances. Ronn and Verma (1986) show how option pricing can be used to derive estimates of the value of deposit insurance using stock-market data and different closure assumptions.

the authority of the FDIC to rescue large insolvent financial institutions.[18] These constraints would preclude the use of failure-resolution techniques such as open-bank assistance and purchase-and-assumption transactions, which provide de facto coverage to de jure uninsured claimants.[19] Such changes would give the "too big to let fail" doctrine the decent burial it deserves and would restore some measure of market discipline to banking.

However, to truly reap the benefits of deposit-insurance reform, the statutory limits on coverage should be reduced to levels significantly below the current $100,000 ceiling. Kane (1986) and Thomson and Todd (1990) suggest that a reduction in the limit from $100,000 to $10,000 (indexed to the Consumer Price Index) would be consistent with a social desire to provide a safe haven for the savings and transactions balances of small savers while reestablishing large depositors as a source of discipline on banks' risk-taking. Thomson and Todd (1990) point out that a $10,000 ceiling exceeds the average (arithmetic mean) insured deposit account in both banks and thrifts (about $8,000) and that depositors with balances in excess of $10,000 already have access to U.S. Treasury bills, which are close substitutes for federally guaranteed bank deposits.

In addition to lowering the insured deposit ceiling, several authors have suggested that a coinsurance feature could be added for additional deposit balances above the full-insurance level.[20] For example, if the deposit insurance ceiling were set at $10,000, the FDIC could provide 90 percent coverage for balances between $10,000 and $50,000 and 70 percent coverage for balances in excess of $50,000. Other, apparently more drastic, variations on this theme are possible; the original (1933) interim deposit insurance scheme provided for only 50 percent coverage for balances in excess of $50,000, for example. Presumably, if mandatory closure rules were adopted, private insurance markets would develop to provide coverage for the coinsurance deductible portion of the deposit for those depositors who desired full protection.

An important feature of coinsurance is that it would establish minimum recoveries on deposit balances in excess of the fully insured limit. This would remove an important constraint on the FDIC's ability to resolve bank failures quickly without extending forbearances to uninsured depositors. With coinsurance, the federal deposit guarantor would not need to estimate in advance the losses to the uninsured depositors. It would simply apply the coinsurance haircut to depositors' balances. If the institution's total losses did not exceed the haircut amount, the receiver would rebate to the uninsured depositors their share of the difference. Thus, coinsurance would alleviate financial hardship for uninsured depositors by paying them a predetermined portion of their deposits up front.

The Role of the Discount Window

For deposit-insurance reform to be truly effective, the Federal Reserve should avoid using its discount window to support the solvency (capital replacement) of, or to delay the closing of, an insolvent bank or thrift (Kane [1987]). Benston et al. (1986, ch. 5) maintain that solvency support or capital replacement lending by Federal Reserve Banks is simply another way for regulators to extend de facto guarantees to uninsured depositors and other creditors of depository institutions: it provides an opportunity for these claimants to liquidate their claims at par, thereby increasing the ultimate cost (loss upon liquidation) to either the lender of last resort, the deposit insurance fund, or the receiver.

This loss arises because, if good assets are pledged to the lender of last resort to fund early redemption at par of some (usually the largest) uninsured claims, then the pool of good assets remaining to cover eventual payments to insured depositors and other uninsured claimants is reduced. The effect of this practice is analogous to the effect of a leveraged buyout (LBO) announcement on outstanding corporate bonds of the LBO target: the pool of assets available to cover outstanding bonded debt service is reduced to cover LBO debt service. Rating agencies have no choice but to downgrade outstanding bond issues, and those bonds decline in secondary market value.

■ **18** For expressions of skepticism that regulators would allow big banks to fail, even if explicit deposit-insurance coverage were reduced or, in advance, said to be strictly enforced, see Trigaux (1989) and Passell (1989).

■ **19** The failure-resolution policies of the FDIC are the process through which implicit guarantees are issued to uninsured depositors, general creditors, subordinated creditors, and even stockholders. For a discussion of FDIC failure-resolution policies, see Benston et al. (1986, ch. 4), Caliguire and Thomson (1987), Kane (1985, ch. 2), and Todd (1988b).

■ **20** Coinsurance was a feature in the original FDIC Act (see Todd [1988a]). Kane (1983) suggested coinsurance as part of a six-point deposit-insurance reform proposal. Baer (1985) suggested it as part of a proposal for mixed private and public coverage of deposits. More recently, Cates (1989), the Federal Reserve Bank of Minneapolis (1988), and the Federal Reserve Bank of Cleveland (Hoskins [1989]) have embraced the concept of coinsurance.

To prevent the use of the discount window for purposes other than *liquidity* support for solvent institutions (the originally intended and the only theoretically sound purpose, according to Todd [1988a]), the following guidelines should be followed. First, the discount window should be available only to demonstrably solvent institutions, with the loans fully secured by sound and fairly evaluated collateral. Heavy and frequent borrowers at the window should be required to demonstrate their solvency, and loans should not be extended or renewed once an institution is determined to be insolvent.

Second, discount-window advances should be made at unsubsidized rates with a penalty for loans made to heavy or frequent borrowers. Finally, the discount window should not be seen as a substitute for the maintenance of a reasonable amount of liquidity by even solvent financial institutions, except in extraordinary circumstances.

Information and Market-Value Accounting

Kane (1989b, ch. 6) asserts that better information systems are needed to increase the effectiveness of both government regulation and market-oriented regulation of depository institutions. Currently, our regulatory system suppresses information about depository institutions, which results in information flows to market participants that are both noisy and "lumpy."[21] Noisy and lumpy information flows do not allow markets to make several small corrective adjustments as new information comes in; instead, they cause the market to make larger and more dramatic adjustments as market participants attempt to process new information. This, in turn, leads to the appearance that markets overreact to new information as it arrives.

To improve the informational efficiency of markets, several authors have advocated the use of market-value accounting (Kane [1985, chs. 5 and 6; 1987, 1988a], Benston et al. [1986, ch. 8], Benston et al. [1989], and Benston and Kaufman [1988]). Traditional accounting systems like GAAP (generally accepted accounting principles) and RAP result in unnecessary noise in the information system because they allow firms to carry assets and liabilities at their par value (usually, historical cost) and do not reflect the subsequent changes in their market value. Therefore, Thomson (1987a) argues that GAAP and RAP may not be good measures of the true solvency of a bank or thrift, that both GAAP and RAP tend to be high-biased measures of solvency for banks and thrifts experiencing solvency problems, and that the degree of error in GAAP and RAP measures increases as solvency deteriorates.

Berger et al. (1989) correctly point out that market-value accounting systems themselves are not perfect, as there are many assets and liabilities on the balance sheets of banks and thrifts for which estimates of market value are not readily available. However, Benston and Kaufman (1988) and Mengle (1989) argue that it is possible to adjust asset and liability values for changes in interest rates and that, as markets develop for securitized bank assets, the ability to make reasonable, market-based adjustments to the value of similar assets in bank portfolios increases. Market-value accounting is not a panacea and still results in noisy information streams. Nonetheless, it is a less-noisy information stream than the one that flows from both GAAP and RAP. Over time, market-value accounting should become less noisy as financial markets evolve.

In addition to the use of market-value accounting, Benston et al. (1986, ch. 7) suggest that the regulatory community move from suppression to timely dissemination of information. FIRREA takes an important step in this direction as it mandates that cease-and-desist orders, supervisory agreements, and other regulatory actions are to be published by the appropriate supervisory agency. Hoskins (1989) goes even further in advocating that banks and thrifts should have the right to release their examination ratings and reports to the public.[22] Finally, annual audits by independent accounting firms should be required for all financial institutions. For small, well-capitalized institutions for whom this rule could prove to be a financial hardship (for example, consolidated entities with less than $100 million in assets), outside audits could be required only every second or third year.

Both of these changes in the current information system would increase the effectiveness and efficiency of market-based oversight of depository institutions and would increase the stability of the financial system. Markets would be better able to discriminate among financial institutions and to force corrective action much sooner than

■ **21** The information flows are lumpy in the sense that large amounts of information are arriving at discrete intervals, as opposed to smaller amounts of information arriving nearly continuously.

■ **22** Mandatory release of examination ratings and reports by the regulators is a sufficient, but not necessary, condition for the timely dissemination of information about the condition of insured institutions. If banks and thrifts are allowed to release their examination ratings and reports to the public, then institutions with high ratings would have incentives to signal their condition to the market.

is currently possible, thereby reducing the probability of bank runs (Pennacchi [1987]). Consequently, systemic stability would be improved, as the size and the volatility of the market correction would be smaller. Better information systems also would reduce the ability of regulators to conceal problems in the financial services industry as they emerged.

Deregulation and Timely Closure of Insolvent Institutions

Under a market-based incentive system, the role for supervision and regulation would be radically different. Regulators would be assigned the task of enforcing a few basic rules (for example, minimum capital requirements, periodic reporting and public disclosure requirements, outside audits, and market-value accounting), and monitoring efforts would be directed at ensuring that those rules were observed. Any individual or financial institution able to meet these minimum guidelines would be granted a bank charter. Institutions that failed to meet these guidelines would be required either to close or to adjust their operations to comply.[23]

This approach, proposed by Benston and Kaufman (1988) and Benston et al. (1989), recognizes that a bank's management has the skills, information, and incentives to make optimal use of its resources, while bank regulators do not. As long as supervisors tolerated failure (either through market closure or a solvency-based closure rule), any financial service or activity could be performed by any financial institution, as long as it could do so within the minimum operating guidelines.

Unlike the current approach toward bank regulation, which often seeks to suppress market forces, this approach attempts to complement and enhance market discipline. Allowing managers and stockholders to make the decisions governing the operation of their institution, including scope of activity and institutional structure, would make them more responsive to market incentives. The perverse incentives currently facing managers and owners of weak and barely solvent institutions would be neutralized by supervisory interference as the condition of the institution deteriorated.[24] The most extreme case of supervisory interference would be the closure or forced sale of institutions that deteriorated to the point where they violated the minimum operating standards.

This approach would lead to a more efficient and stable financial system than pure regulation. Fewer resources would be expended in the enforcement and evasion of outdated rules by regulators and regulatees, respectively, and those who took the risks would bear the consequences of those decisions. Organizational form and activities would be dictated by markets.

Since market forces would be allowed to operate unfettered, efficiency and stability would be enhanced: private capital would be reallocated by market forces to the best-managed institutions and away from the weak and poorly managed ones, which would be allowed to fail. Timely release of information to markets under the supervisory approach would allow financial distress in an institution to be detected more quickly, constraining the growth of marginally solvent and insolvent institutions. Market recognition of financial distress would lead to an orderly outflow of funds and an increase in the cost of funds for troubled institutions, which, in turn, would lead to more orderly and timely closure of insolvent institutions and a reduction in their ultimate failure-resolution costs.

III. Conclusion

At the August 9, 1989 signing ceremony for FIRREA, President Bush proclaimed, "We will keep the federal deposit insurance system solvent and help serve those millions of small savers who make America great ..." while "...ensuring the taxpayers' interests will always come first ...."[25] Accomplishing both of these objectives will require great effort in any case, but might be impossible without market-oriented reforms of the financial structure such as those described here.

Moreover, as Kane (1989c, 1989e) argues, the Bush plan from which FIRREA evolved was not based on a comprehensive theory of how the

■ **23** Prior to 1933, the solvency test applied in bank closing cases was *either* incapacity to pay obligations as they matured or balance-sheet insolvency. Since then, the Office of the Comptroller of the Currency has tended to use *only* the former "maturing obligations" test, although the statutory basis for the latter-"balance-sheet" test remains intact. Compare 12 U.S.C. Section 191 (balance-sheet or maturing obligations) with Section 91 (usually interpreted as "maturing obligations" only).

■ **24** The Benston and Kaufman (1988) and Benston et al. (1989) proposals set up several different trigger points for increasing supervisory interference as the institution slides toward insolvency and allows regulators to close the institution before it becomes insolvent.

■ **25** See "Bush Remarks: 'First Critical Test' Has Been Passed," *American Banker*, August 10, 1989, p. 4.

losses in the thrift industry occurred and were allowed to grow so large. Consequently, because the Bush plan (and, by inference, FIRREA) fails to correct the incentive-incompatibility problems in the current deposit-insurance contract that caused the current thrift crisis, there is a high probability that taxpayers will be faced with another deposit-insurance crisis in the near future.

It is hoped that the study of federal deposit insurance mandated by FIRREA, and currently under way at the U.S. Treasury Department, will address the fundamental structural flaws in the federal safety net and, in particular, in federal deposit insurance. The purpose of any reforms to the federal safety net and to our system of bank regulation should be to increase the efficiency and long-run stability of the banking system while protecting the public from financial loss. The market-oriented reforms put forth in this paper would go a long way toward achieving these goals.[26]

■ **26** The reforms set forth in this paper are aimed at increasing market discipline primarily through increased depositor and stockholder discipline on insured banks and thrifts. Another way to increase market discipline on banks is through the use of subordinated debt (see Baer [1985], Benston et al. [1986, ch. 7], and Wall [1989]) and surety bonds (see Kane [1987]). For conflicting evidence of the ability of subordinated-debt holders to discipline bank risk-taking, see Avery et al. (1988) and Gorton and Santomero (1990). Ely (1985, 1989) would use banks to discipline each other through a system of cross-guarantees for their liabilities.

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