Crises and Recovery

Shaken and Stirred: Explaining Growth Volatility

William Easterly, Roumeen Islam, and Joseph E. Stiglitz

This article explores the relationship between volatility in economic growth and various institutional factors. Its main hypothesis is that in explaining volatility, the traditional macroeconomic literature has overemphasized such factors as wage and price rigidities and underemphasized factors relating to the financial system. The financial system may act as a stabilizer that helps to cushion consumers and producers from the effects of economic shocks, or it may magnify these effects and thus increase growth volatility. Some of these destabilizing effects operate through the cash flow and balance sheets of banks and firms, leading to increased credit rationing. An empirical investigation reveals that wage and price rigidities are not important in explaining growth volatility. It also shows that the financial system generally acts as a stabilizer and reduces growth volatility. But the relationship is nonlinear. As the financial system grows, its risk-enhancing characteristics can result in higher growth volatility.

The world's economic history is replete with recessions and depressions. Crises have been a constant of market capitalism—from the bursting of the British South Sea bubble and the French Mississippi bubble in 1720 (which at least one economic historian claims delayed the industrial revolution by 50 years), to the depressions of the 1870s and 1930s in the industrial economies, to the debt crises of middle-income Latin American countries and low-income African countries in the 1980s, the collapse of output in the formerly socialist economies in the 1990s, and the East Asian financial crisis in 1997–98.[1] Add to these the collapses that have accompanied non-economic shocks—wars, fires, pests, floods, droughts, earth-

William Easterly is senior adviser in the Development Economics Research Group at the World Bank. Roumeen Islam is Director of the World Development Report team in the Development Economics Group at the World Bank. Joseph E. Stiglitz is professor of economics at Stanford University. Some of the ideas in this article were presented as the Michael Bruno Memorial Lecture at the 12th World Congress of the International Economics Association in August 1999. The authors are grateful for comments by participants in that event. They are also grateful to Mattias K. Lundberg and Alexander Lebedinsky for their valuable research assistance.

Annual World Bank Conference on Development Economics 2000

quakes, hurricanes, volcanic eruptions—and it is a wonder that there is economic security anywhere.

Recent economic crises have often gone hand in hand with financial crises, which have become increasingly frequent and severe in developing countries over the past quarter century. These financial crises have had different causes and natures. For example, those characterizing the debt crises of the 1980s were precipitated by profligate governments with large cash deficits and uncontrolled monetary policies. The more recent ones occurred in countries that for the most part were following prudent macroeconomic policies and some of which had quite sophisticated institutional arrangements.

The marked differences between the downturns in Latin America in the early 1980s and those in East Asia in the late 1990s (and the Mexican crisis of 1994–95) mean that we need a general framework for thinking about macroeconomic fluctuations—one that can encompass differences among countries. There are ample reasons for trying to better understand the determinants of economic volatility: volatility is important not just because of its short-run adverse effects on the poor, but also because of its negative correlation with economic growth.

We attempt to set forth a framework for thinking about growth volatility that is general enough to incorporate the important structural, institutional, and policy variations among countries that might account for differences in their macroeconomic performance. We focus particularly on the role of the financial sector. We first discuss the importance of short-run dynamic effects in determining long-run outcomes, and the role of the financial sector, elements that have not been sufficiently incorporated into traditional macroeconomic analysis. We then look at the data, which reveal interesting aspects about the determinants of volatility—most notably, the importance of the financial sector.

Dynamics, Financial Variables, and the Standard Competitive Model

The starting point of modern macroeconomics is the competitive equilibrium model, in which all resources are not only fully employed, but deployed efficiently. Fluctuations in output therefore reflect changes in inputs (say, the desire of workers to work) or changes in technology—the relationship between inputs and output. While these real business cycle theories provide plausible explanations for variability in the rate of growth, they are less successful in providing persuasive explanations of economic downturns in a large, closed economy such as the United States. Can one really believe that these factors caused the Great Depression, or even the Reagan recession? That the reduced employment reflected a sudden desire of workers to enjoy more leisure, a desire that quickly changed again a couple of years later? For small, open economies adverse terms of trade shocks can have much the same effect as negative technology shocks, and this is one of the important differences between the macroeconomics in these economies and that underlying some of the traditional closed economy models.

Employment and output fluctuations inevitably relate to shocks and to the way the economy copes with those shocks. They are determined by the extent to

which the individually rational actions of firms and households and the policy interventions of governments add up to collective behavior that either brings the economy quickly back to full employment and efficient resource utilization or does not. These issues are particularly complicated because what is viewed to be individually rational on the part of firms and households depends on their beliefs about both the behavior of each other and the policy regime of the government. The policy regime in turn may depend on the government's beliefs about the behavior of firms and households. And the shocks themselves are at least to some extent endogenous, determined by outsiders' beliefs about the economic structures. Thus modern macroeconomics is concerned with the dynamics of quite complex systems.

Classical business cycle theory provides a different perspective: it sees the economy as described by a set of difference or differential equations, which exhibits cyclicality. The most famous examples of such equation sets are Paul Samuelson's multiplier accelerator model and J. R. Hicks's business cycle theory. The fundamental objection to these mechanistic approaches—beyond the unpersuasiveness of some of the underlying technological assumptions (such as the accelerator)—is that if they were true, downturns would be predictable. Governments could, through monetary and fiscal policy, take countervailing measures.

For nearly half a century after World War II attention centered on the downward rigidity in money wages and prices as a possible explanation of economic fluctuations. Rigid real wages provided an easy explanation of unemployment—a leftward shift in the demand curve for labor immediately turned into unemployment. And the leftward shift in the demand for labor could be explained by the falling demand for goods, itself explained by rigidities in intertemporal prices—for example, rigidities in the interest rate, which monetary policy seemingly could not bring down or could not bring down enough to stimulate consumption and investment.

Subsequent work has focused on amplifying the reasons for nominal and real wage rigidities (menu costs, efficiency wage theory, portfolio theories of adjustment) and on finding deeper explanations beyond the liquidity trap for the failure of monetary policy to bring down interest rates (for example, risk-averse behavior of banks, especially when confronted with excessively tight regulatory oversight).

Dynamics

Even within that traditional framework, however, much of the standard analysis has failed to emphasize some important first-order effects, such as the dynamic consequences of wages and prices falling. These may result in short-run adverse effects that appear earlier and are more dominant than the comparative static effects, which have been the primary focus of attention. The difference is not just a matter of exposition: the dynamics of adjustment may have an effect opposite that predicted by a comparative static analysis.

For example, it is usually asserted that a fall in prices will raise consumption through the real balance effect. The more precise statement is, "lower prices would

be associated with higher consumption." But there is typically no instantaneous jump in consumption. Falling prices mean that at any level of nominal interest rates, real interest rates rise—and presumably investment falls (overall demand may also fall). Similarly, it is often stated that lower wages may be associated with higher employment. But to go from one level of wages to a lower level, wages need to be falling. If falling wages lead workers to reduce consumption, the net effect on aggregate demand and employment could even be negative.

Some strands of research (recent as well as predating Keynes) have focused on differences in adjustment speeds (see, for example, Stiglitz 1999) as well as on distributive effects that arise from price changes, especially those against which individuals cannot be insured (reflecting incomplete contracts). We are increasingly aware that income effects arising from distributional changes can often overwhelm substitution effects arising from price changes. This is especially true when there are asymmetries in the adjustment of real variables. For example, it is easier, less risky, or less costly to contract than to expand the use of some inputs.[2]

The Importance of Financial Institutions

There has been growing recognition that wage and price rigidities may not be the only, or even the most important, departure from the standard competitive equilibrium model relevant for explaining economic fluctuations. Models based on wage and price rigidities become unpersuasive if countries have both flexible wages and flexible prices and still exhibit high volatility in growth. We need to ask whether this high volatility can be explained simply by the fact that the countries are exposed to more shocks (or have a less diversified economy) than others or whether it is explained by other aspects of their structure or policy regimes.

This question leads us to a second difference between the new perspective and traditional macroeconomic analyses. In the traditional analyses institutions (other than labor market institutions that give rise to wage rigidities) play no role. But one of our central theses is that earlier studies have not paid sufficient attention to dynamic effects arising from the wealth and cash flow constraints of firms and financial institutions, such as banks and securities markets. (Under neoclassical theory, these constraints simply do not exist.) Financial institutions have profound effects on the behavior of firms (on how they cope with shocks, for example), and firms have profound effects on the behavior of financial institutions.

FIRM WEALTH EFFECTS. When negative net worth shocks are large enough (such as when there are interest rate shocks), firms may go into distress—that is, they may be in bankruptcy or on the verge of it.[3] Because of the complex credit relationships among firms—most supply credit to customers, suppliers, or both—the bankruptcy of one firm can set off a "bankruptcy chain," weakening other firms that depend on it and possibly pushing some into bankruptcy. Thus the likelihood of bankruptcy becomes a systemic concern (see Orszag and Stiglitz 1999), and negative effects on output and growth may materialize.

As more firms go into distress, the number of nonperforming loans increases and the financial positions of financial institutions deteriorate.[4] Theory and evidence both support the hypothesis that firms act in a risk-averse manner and that the effective degree of risk aversion is affected by their wealth—for example, how close a firm is to bankruptcy.[5] Adverse net worth shocks to financial institutions reduce their ability and willingness to bear risk—that is, the shocks reduce the amount they are willing to lend at any interest rate. Certain groups of borrowers may be excluded from the market as a result, an outcome that may exacerbate the economic downturn.

CASH FLOW CONSTRAINTS. In standard economic theory cash flow (or liquidity) constraints simply do not exist: anyone with good future prospects can get access to funds. But there is evidence, especially for small firms, that cash flows do have large effects on firms' decisions, for example, those on investment and, in extreme cases, even production. Imperfections in the equity market (both adverse selection and incentive concerns) lead to what might be thought of as equity rationing. At the very least, the costs of issuing new equity may be very high, making firms reluctant to engage in this form of finance even when they cannot obtain loans (see Myers and Maljuf 1984; Greenwald, Stiglitz, and Weiss 1984; and Hellmann and Stiglitz 2000). Moreover, under equity rationing firms will be unable to diversify their risk well and will thus be more risk averse.

The size of this "financial sector" effect is determined in large part by the extent of the economy's integration into global capital markets. Weaknesses in the country's own financial institutions may matter little if firms have easy access to banks abroad. But while a high degree of capital account openness could in principle smooth a country's adjustment to a shock, it might also expose the country to another, adverse source of dynamic reaction. Investors observing the weakening condition of firms and financial institutions in response to the shock might decide to pull their (short-term) money out of the country, further weakening both firms and financial institutions (for example, by further weakening the currency) and possibly inducing a crisis.

A negative shock to the capital account will have adverse effects on the terms at which firms can get access to funds (which will adversely affect both liquidity and net worth), effects that may be exacerbated by the presence of credit rationing. The increased uncertainty about firms' balance sheets caused by the economic disturbance may lead to greater credit rationing and to further contractions in demand (investment, including inventories) as firms attempt to increase their liquidity.

By underemphasizing the financial sector, particularly the dynamics within the sector, the standard stories leave out much of the richness of the macroeconomic adjustment process and perhaps much that is of first-order importance. Many of the seeming anomalies (deviations from model predictions) that we observe in the real world can be explained by a model that incorporates a variety of the effects discussed here. For example, consider the seeming anomaly of fluctuations in output in small, open economies for which aggregate demand should not be a central problem (as long as the exchange rate is reasonable). We can explain this phenomenon by focusing on such factors as interruptions in the flow of credit and high interest

rates, which can combine to force many firms into bankruptcy, shifting the market supply curve to the left.

Endogeneity of Institutions and Shocks

Views that recognize the importance of institutions and the dynamics also emphasize the endogeneity of many factors previously taken to be exogenous—including institutions and shocks. Thus countries such as those in East Asia or Western Europe may have more financial depth in part because they experience fewer shocks. Had these countries faced the shocks experienced elsewhere, firms would have been unwilling to undertake the risks associated with high debt strategies, households would have been unwilling to save in financial assets, and governments might have been unwilling to provide the implicit or explicit insurance that made those risks more bearable. But countries in which firms have high debt-to-equity ratios and financial institutions are highly leveraged may "invite" shocks—that is, they may be highly susceptible to changes in the perception of their economic future.

But clearly not everything can be endogenous—or at least cannot be perceived that way by policy economists. Governments can be thought of as adopting a policy regime, such as whether and when to open the capital account or liberalize trade (though from the perspective of political economy, even the policy regime can be thought of as endogenous). Governments can decide whether to deregulate financial institutions. They may be able to decide—within constraints—on the macroeconomic regime. Decisions about these policy regimes should be sensitive to the characteristics of the economy—and the subtleties of dynamics. Certain forms of liberalization may promote economic growth and stability under certain circumstances, while similar policies pursued under other circumstances may slow growth and contribute to instability. More flexible wages and prices may increase economic stability under certain circumstances, while under other circumstances moves to enhance wage flexibility could exacerbate an economic downturn. On average, greater openness may be good, but in particular circumstances it may increase volatility.

To ascertain which of the effects discussed are more important, and how their importance compares with that of the factors traditionally emphasized—wage and price rigidities—we must turn to the data. The data cover both OECD and developing countries from 1960 to1990.

What Do the Data Show?

Mean growth in developing countries is lower than that in OECD economies, and much more volatile (table 1). These two findings are consistent with the empirical studies showing that the partial correlation between growth and the volatility of growth is negative (for example, Ramey and Ramey 1995).[6] Employment also is much more volatile in developing than in developed economies.

Table 1. Real Output Growth and Volatility in Real Growth and Employment

	Developing countries		*High-income OECD countries*			
Variable	*Mean*	*Number of observations*	*Mean*	*Number of observations*	*t-statistic for difference in means*	*P-value*
Growth	0.007	163	0.027	23	–5.659	0.000
Standard deviation of growth	0.061	163	0.026	23	9.779	0.000
(Median standard deviation of growth)	0.052		0.022			
Standard deviation of employment	0.098	83	0.035	21	6.652	0.000

Source: Authors' calculations.

Table 2. Some Empirical Differences between Developing and High-Income OECD Countries

	Developing countries		*High-income OECD countries*			
Variable	*Mean*	*Number of observations*	*Mean*	*Number of observations*	*t-statistic for difference in means*	*P-value*
Standard deviation of real wage index	2.119	90	1.883	21	0.833	0.410
Standard deviation of real wage changes	1.197	85	0.321	21	8.116	0.000
Standard deviation of fiscal balance	3.916	111	2.438	23	3.978	0.000
Credit to private sector/GDP	25.280	148	64.023	22	–6.441	0.000
Standard deviation of credit to private sector/GDP	9.179	148	21.206	22	–5.101	0.000
M3/GDP	38.065	148	65.805	21	–4.766	0.000
Standard deviation of M3/GDP	10.572	148	12.320	21	–0.785	0.440
(Imports/exports)/ GDP	79.285	154	60.972	24	2.399	0.022
Standard deviation of inflation	0.219	148	0.043	23	6.234	0.000
Private capital flows/GDP	1.722	146	0.372	22	2.743	0.009
Standard deviation of private capital flows/GDP	2.662	138	2.311	22	0.808	0.420
Standard deviation of terms of trade changes	0.123	117	0.041	23	9.688	0.000
Standard deviation of money growth	0.219	148	0.077	20	6.757	0.000

Source: Authors' calculations.

There is a paradox, however: developing countries have greater volatility in real wages than do OECD economies (table 2). In the comparison of these two groups of countries there is little to support an explanation of employment and output fluctuations based purely on nominal wage rigidities—developing countries have more flexible real wages, yet they also have greater volatility in output and employment.

This may suggest that the demand effects of real wage changes dominate the supply effects, or that there is reverse causation from output volatility to real wage volatility (we address this issue in the regressions).

What then could explain the greater growth volatility in developing countries? There is little empirical or theoretical work on what determines volatility in growth rates.[7] Theoretical considerations suggest that greater openness to trade might expose a country to more external shocks while leaving it less vulnerable to internally generated shocks. Greater openness of the capital account might in principle provide a mechanism for smoothing consumption and production in the face of shocks, but at the same time could expose a country to greater volatility as exogenous shifts in capital flows disrupt economic activity. Greater dependence on credit might make a country more vulnerable. In most of these cases the results on theoretical grounds alone are ambiguous; only a closer look at the data can reveal which effect dominates.

There are many candidates for explaining the higher volatility of developing economies. Among them, money growth, private capital flows, inflation, fiscal balances, and terms of trade are all more volatile in developing than in OECD countries. We consider these factors more systematically below.

Differences in Volatility across Regions

Not only are there significant differences in volatility across levels of economic development, there are also significant differences across regions. East Asia, especially the fast-growing group of six economies (the East Asia 6—Hong Kong, Indonesia, Malaysia, Singapore, Taiwan [China], and Thailand), has grown more quickly than the other developing regions (table 3). Until the recent crisis the East Asia 6 had achieved this growth without greater volatility: while the standard deviation of growth is higher in this group than in the developed world, it is considerably lower than the average for developing countries. In East Asia as a whole growth has been significantly higher, and volatility marginally higher, than the average for all developing countries.

This casual examination of the data corroborates much, but not all, of the conventional wisdom. East Asia, especially the East Asia 6, has far greater financial depth than do other developing regions. In fact, the East Asia 6 have slightly greater financial depth (as measured by credit to the private sector as a percentage of GDP) than the OECD countries, while the other developing regions have substantially less than the OECD countries. But the greater financial depth in East Asia comes at the cost of significantly higher volatility in financial activity, higher even than that in developed countries. The pattern is the same for money supply (M3) as a share of GDP. Both the level and the standard deviation of M3 as a share of GDP are higher among OECD than developing countries, and higher in East Asia (especially the East Asia 6) than other developing regions.

In trade openness East Asia, especially the East Asia 6, surpasses the developed countries. The reason is only partly size—that developed countries have

Table 3. Some Empirical Differences among Developing Regions

Variable	*East Asia*	*East Asia 6*	*Sub-Saharan Africa*	*South Asia*	*Latin America*
GDP growth	0.027	0.050	0.006	0.023	0.015
Standard deviation of GDP growth	0.062	0.031	0.064	0.033	0.050
Standard deviation of employment growth	0.119	0.125	0.131	0.119	0.088
Standard deviation of real wage index	2.108	2.390	1.916	2.074	1.592
Standard deviation of real wage growth	0.995	0.849	1.248	1.053	1.126
Standard deviation of fiscal balance	3.721	3.946	4.008	3.608	3.850
Credit to private sector/GDP	35.654	69.927	17.328	14.253	31.242
Standard deviation of credit to private sector/GDP	14.005	30.235	6.259	5.414	9.836
(Imports + exports)/GDP	94.071	135.318	68.509	44.759	80.979
M3/GDP	48.430	82.767	25.239	29.788	39.200
Standard deviation of M3/GDP	13.796	26.071	6.827	7.081	10.151
Standard deviation of inflation	0.107	0.116	0.154	0.085	0.232
Standard deviation of growth in M1	0.155	0.141	0.171	0.098	0.257
Private capital flows/GDP	2.260	2.105	1.619	0.504	2.067
Standard deviation of private capital flows/GDP	2.322	2.104	2.570	0.809	3.317
Standard deviation of terms of trade changes	0.068	0.064	0.145	0.114	0.117

Source: Authors' calculations.

smaller trade shares because they have larger economies—since this distinction holds when we add China to the East Asia 6. The ratio of trade to GDP is 118 for these seven economies, 123 for the East Asia 6, and 61 for OECD countries. Latin America is also more open than the OECD countries on average, while South Asia and Sub-Saharan Africa are less open. All these developing regions face greater volatility in terms of trade than do the developed countries. Among them, East Asia has by far the least volatility, and Sub-Saharan Africa the most.

There is little difference across the regions in the volatility of government activity (fiscal balance), but great differences in inflation and changes in money supply. Not surprising, the differences between OECD and non-OECD countries are driven by Latin America, where the volatility of both inflation and money growth are twice that in other developing regions.

Finally, the data cannot unambiguously justify the reputation of Latin America for wage rigidity. While Latin America has more stable wage levels than other regions, it has more volatility in wage growth than the OECD countries. Conversely, East Asia (especially the East Asia 6) has more stability in wage growth, although more volatility in wage levels.

Determinants of Volatility

Broadening our analysis to the variation in the entire cross-country sample, we find that openness to trade and volatility in terms of trade and in capital flows are all associated with volatility in per capita growth (table 4). All indicators of financial sector development are negatively associated with volatility, while volatility in money supply (M3) as a share of GDP is positively associated with volatility in growth. Wage and price flexibility and inflation variability are also associated with volatility in growth, as is variability in policy, whether fiscal or monetary.

To assess the relative impact of these factors, we regressed growth volatility (the standard deviation of the per capita growth rate) on a range of independent variables. Depending on the specification, our sample includes observations on 60–74 countries in a panel created by aggregating over the periods 1960–78 and 1979–97 (table 5; see the appendix for descriptive statistics of the sample).

Using a standard Hausman test, we found two variables to be endogenous—credit to the private sector and the standard deviation of private capital flows. These were

Table 4. Bivariate Correlations with Volatility in Growth of GDP Per Capita

Variable	*Coefficient*	*t-statistic*	*P-value*	R^2	*Number of observations*
Trade and financial openness					
Standard deviation of terms of trade changes	0.12006	3.284	0.001	0.073	139
(Imports + exports)/GDP	0.00013	2.040	0.043	0.023	177
Standard deviation of (imports + exports)/GDP	0.00106	3.661	0.000	0.072	176
Standard deviation of private capital flows/GDP	0.00237	3.834	0.000	0.086	159
Standard deviation of all capital flows/GDP	0.00214	3.280	0.001	0.062	166
Financial sector development					
Change in private credit/gross domestic investment	–0.17660	–8.633	0.000	0.315	164
Standard deviation of M3/GDP	0.00106	3.015	0.003	0.052	169
Stock market value traded/GDP	–0.04741	–1.819	0.072	0.036	92
Credit to private sector/GDP	–0.00041	–3.336	0.001	0.063	169
Long-term private debt issues/GDP	–0.17815	–2.166	0.037	0.113	39
Private bond market/GDP	–0.03451	–3.615	0.001	0.272	37
Public bond market/GDP	–0.02361	–2.626	0.013	0.165	37
Price variability and flexibility					
Inflation	0.03331	4.298	0.000	0.101	167
Standard deviation of real wage index	0.00368	1.654	0.101	0.025	109
Standard deviation of real wage changes	0.01127	3.481	0.001	0.106	104
Policy volatility					
Standard deviation of fiscal balance/GDP	0.00215	2.327	0.021	0.039	134
Standard deviation of inflation	0.04166	4.722	0.000	0.119	167
Standard deviation of money growth	0.06865	5.380	0.000	0.149	167
Other					
Per capita growth	–0.58696	–7.036	0.000	0.211	187
Dummy variable for OECD countries	–0.03515	–4.144	0.000	0.085	186

Source: Authors' calculations.

instrumented by a range of variables, including indicators for French or English legal origin, initial GDP per capita in each period, the urban share of the population, life expectancy, the standard deviation of terms of trade changes, indicators for oil and other commodity exports, and a measure of political stability (number of assassinations per million people). The set of instruments is both valid and sufficient: a Sargan test confirmed that the instruments are exogenous to the error in the second-stage regression, and an overidentification test ensured that the model is adequately identified. The likelihood ratio test for heteroskedasticity indicated that the errors differ systematically across countries. We correct for both heterogeneity and endogeneity (correlation between the regressors and the idiosyncratic error) using the method suggested by Baltagi (1995).[8] The dummy variable for developing countries is significant only in the ordinary least squares specification, suggesting that we capture in the error correction models some of the structural factors that make developing economies more volatile.

Table 5. Determinants of Volatility in Growth

Variable	*Ordinary least squares*		*Error correction two-stage least squares*[a]					
Developing country dummy	0.008971	(2.37)**	0.001962	(0.41)	–0.001844	(–0.35)	0.000869	(0.17)
(Imports + exports)/GDP	0.000062	(2.43)**	0.000068	(1.98)*	0.000081	(2.16)**	0.000065	(1.84)*
Standard deviation of change in log real wage index	0.005861	(0.13)	–0.001801	(–0.04)				
Standard deviation of growth in M1	0.020729	(2.17)**	0.017451	(1.87)*	0.019222	(2.13)**		
Private capital flows/GDP	0.000133	(0.13)	0.000417	(0.31)	–0.000155	(–0.11)	0.000021	(0.02)
Standard deviation of private capital flows/GDP	–0.001136	(–0.88)	0.000230	(0.09)	0.000739	(0.36)	0.001303	(0.66)
Credit to private sector/GDP	–0.000200	(–1.25)	–0.000789	(–3.15)***	–0.000968	(–3.95)***	–0.000956	(–4.08)**
Credit to private sector/ GDP squared	0.000001	(0.98)	0.000004	(2.62)**	0.000004	(2.98)***	0.000004	(3.12)**
Intercept	0.028857	(4.20)***	0.048315	(5.41)***	0.056339	(6.08)***	0.056471	(6.35)**
F-test of all parameters (degrees of freedom)	(9,89)	(7.93)***	(9,59)	(8.51)***	(8,71)	(13.15)***	(7,73)	(10.52)**
Likelihood ratio test for heteroskedasticity (degrees of freedom)[b]	(59)	(709.62)***	(59)	(699.14)***	(71)	(930.42)***	(73)	(933.77)**
Sargan test (degrees of freedom)[c]			(9,88)	(0.60)	(9,114)	(0.96)	(9,118)	(1.16)
Overidentification test (degrees of freedom) [d]			(19)	(0.00)	(21)	(0.00)	(22)	(0.00)
Number of groups		60		60		72		74
Number of observations		98		98		124		128

* Significant at the 10 percent level.
** Significant at the 5 percent level.
*** Significant at the 1 percent level.
Note: T-statistics are in parentheses. We present robust standard errors for all results—that is, the variance of the error terms is allowed to vary systematically across countries but we assume that they are uncorrelated over time within countries. Because of the limited number of observations, it was necessary to drop certain variables, such as those relating to stock market development. We tried several other specifications related to our hypotheses but found additional variables to be insignificant (for example, inflation variability, external debt, terms of trade volatility, various measures of fiscal policy volatility, various measures of institutional development, the volatility of nominal exchange rates, and relevant interaction of nonlinear terms). We also checked for size effects, but they were insignificant. Standard errors corrected for clustering within countries
a. Credit to the private sector, credit squared, and the standard deviation of private capital flows are endogenous. Instruments include dummy variables for French or English legal origin, initial GDP per capita in the period, the urban share of the population, life expectancy at birth, the standard deviation of terms of trade changes, dummy variables for oil exports and for other commodity exports, and the number of political assassinations per million population.
b. The null hypothesis is that the errors are homoskedastic across countries (Chi-squared).
c. The null hypothesis is that the instruments are not correlated with the residual (*F*-test).
d. The null hypothesis is that the instruments adequately identify the model (Chi-squared).
Source: Authors' calculations.

The results show that openness does expose a country to greater volatility in growth.[9] Surprisingly, private capital flows and the standard deviation of private capital flows do not affect growth volatility in the multivariate instrumental variables regressions.[10] Also surprisingly, volatility in real wages (indicating wage flexibility) does not seem to be significantly associated with volatility in output. On balance, we find evidence neither for the claim that wage and price rigidity is the cause of fluctuations nor for the claim that wage and price volatility increases output volatility through demand effects.

Our key result relates to the financial sector variables. Greater credit or a deeper financial system is significantly associated with less volatility in all specifications, but the relationship appears to be nonlinear. The squared term is significant and enters with a positive sign. While developed financial systems offer opportunities for stabilization, they may also imply higher leverage of firms and thus more risk and less stability. It appears that the consumption and production smoothing possibilities provided by a deep financial system might reduce growth volatility on average, particularly when shocks are small, *but up to a limit.* As the financial system grows relative to GDP, the increase in risk becomes more important and acts to reduce stability. There is a nonlinear relationship from the regression between credit to the private sector as a share of GDP and the standard deviation of growth, holding the other variables at their means. Very large financial sectors (which are of course rare) can magnify shocks to the economy, much like capital inflows and outflows can magnify boom-bust episodes.

Results from the same regression, but with initial GDP per capita rather than the dummy variable for developing countries, are basically similar (table 6). But openness loses significance. The use of an interaction term with initial GDP per capita reveals that openness may increase growth volatility but that this effect is significantly attenuated in richer countries.

Interestingly, variables such as the standard deviation of private capital flows and, in some specifications, private capital flows are not significant when variables representing the depth of the financial system are included. The reason may be that volatility in capital flows affects the economy primarily through its effect on the financial system and on financial variables. The significance of the credit variables is robust to various specifications.

Several regressions were run to test the significance of the financial variables when measures of institutional development or governance are included. International Country Risk Guide and Business Environment Risk Intelligence indicators of institutional development and indicators of democracy were all insignificant, and their inclusion did not affect the results (these results are available from the authors).

Downturns

As important as overall variability in output is, perhaps even more important are the large events—the periodic economic downturns that have long characterized market economies. To investigate what structural and institutional characteristics of economies

might explain downturns, we perform a probit analysis on a similar data set (table 7).[11] A downturn is defined as negative per capita growth, which takes on the value 1, while positive growth takes on the value 0. On average, countries experience declining real GDP roughly 20 percent of the time. Non-OECD countries are in a downturn 22 percent of the time, and OECD countries slightly more than 9 percent of the time.[12] Not surprisingly, countries that are growing faster have a lower probability of experiencing a downturn—the change in growth rate required for a recession is larger, and thus the shocks required to put the economy into recession are also larger.

The dummy variable for developing countries is significant—when we control for other variables, developing countries are far more likely to experience growth downturns than are industrial economies. This suggests again that there is something about the structure of developing economies that makes them more vulnerable to growth crashes, something that is not captured by the right-hand-side variables. Economies that are more open seem less likely to go into a growth downturn, even though they have greater variability in output as a result of a higher incidence of shocks. We are not sure what to make of this mixed result.

Greater financial sector depth, as measured by the ratio of credit to GDP, increases the likelihood of a downturn. But the squared term for financial sector depth is not significant in the probit regression. Equity markets have the predicted effect: such markets provide better risk diversification than do debt markets and thus reduce the

Table 6. Determinants of Volatility in Growth, with Initial GDP Per Capita

	Model			
Variable	*(1)*		*(2)*	
Initial GDP per capita	0.000311	(0.18)	0.005069	(2.07) **
(Imports + exports)/GDP	0.000055	(1.34)	0.000986	(2.69) ***
(Imports + Exports)/GDP times initial GDP per capita			–0.000107	(–2.56) **
Standard deviation of change in log real wage index	0.003414	(0.06)	–0.015017	(–0.30)
Standard deviation of growth in M1	0.017042	(1.69) *	0.017335	(1.70) *
Private capital flows/GDP	0.000294	(0.20)	–0.000759	(–0.51)
Standard deviation of private capital flows/GDP	0.001198	(0.35)	0.002708	(0.82)
Credit to private sector/GDP	–0.000846	(–2.84) ***	–0.000866	(–2.66) ***
Credit to private sector/GDP squared	0.000004	(2.50) **	0.000004	(2.28) **
Intercept	0.048115	(3.66) ***	0.006441	(0.36)
F-test of all parameters (degrees of freedom)	(9,59)	(52.48) ***	(10,59)	(53.20) ***
Likelihood ratio test for heteroskedasticity (degrees of freedom)[a]	(59)	(6774) ***	(59)	(7103) ***
Sargan test (degrees of freedom)[b]	(8,89)	(0.44)	(8,89)	(0.43)
Overidentification test (degrees of freedom)[c]	(19)	(0.00)	(20)	(0.00)
Number of groups		60		60
Number of observations		98		98

* Significant at the 10 percent level.
** Significant at the 5 percent level.
*** Significant at the 1 percent level.
Note: T-statistics are in parentheses. Standard errors corrected for clustering within countries.
a. The null hypothesis is that the errors are homoskedastic across countries (Chi-squared).
b. The null hypothesis is that the instruments are not correlated with the residual (*F*-test).
c. The null hypothesis is that the instruments adequately identify the model (Chi-squared).
Source: Authors' calculations.

Table 7. Probability of a Downturn

Variable	Model a	b	c	d
Dummy variable for developing countries	0.519350 (3.48)***	0.481812 (3.12)***	0.536428 (3.67)***	0.489651 (3.14)***
Years since last downturn	0.019759 (1.56)	0.019814 (1.52)	−0.005692 (−0.48)	−0.003480 (−0.30)
Five-year moving average growth	−0.268670 (−6.30)***	−0.263142 (−6.15)***	−0.047695 (−1.55)	−0.052766 (−1.85)*
Credit to private sector/GDP	0.016989 (1.74)*	0.016645 (1.63)	0.018288 (1.79)*	0.019123 (1.79)*
Credit to private sector/GDP squared	−0.000071 (−0.89)	−0.000080 (−0.94)	−0.000072 (−0.86)	−0.000120 (−1.41)
Private capital flows/GDP	0.001520 (0.06)	−0.008840 (−0.39)	−0.033246 (−1.48)	−0.045774 (−1.89)*
Log change in real wages	−2.554385 (−2.94)***	−2.629325 (−3.11)***	0.530893 (0.87)	0.559962 (0.87)
Capital restrictions	−0.175419 (−0.94)	−0.163978 (−0.87)	−0.344664 (−1.80)*	−0.259596 (−1.45)
(Imports + exports)/GDP	−0.004631 (−2.17)**	−0.004638 (−2.18)**	−0.005904 (−2.68)***	−0.005789 (−2.95)***
Stock market value traded/GDP	−2.194500 (−2.50)**	−2.241041 (−2.12)**	−3.855537 (−3.13)***	−1.836889 (−2.33)**
Intercept	−0.982504 (−2.76)***	−0.925632 (−2.61)***	−1.070404 (−2.91)***	−1.083129 (−2.69)***
Chi-squared test of all parameters (10 degrees of freedom)	(124.99)***	(101.79)***	(53.03)***	(47.51)***
Chi-squared test of credit to private sector/GDP and credit to private sector squared	(6.71)**	(5.02)*	(9.43)***	(3.19)
Log-likelihood	−198.59	−199.90	−229.58	−235.59
Number of countries	54	54	54	54
Number of observations	630	630	630	630

* Significant at the 10 percent level.
** Significant at the 5 percent level.
*** Significant at the 1 percent level.
Note: T-statistics are in parentheses.
a. Contemporaneous values of credit to the private sector, credit squared, private capital flows, and stock market value traded. Dependent variable = 1 if growth is negative from $t-1$ to t.
b. Lagged values of credit to the private sector, credit squared, private capital flows, and stock market value traded. Dependent variable = 1 if growth is negative from $t-1$ to t.
c. Contemporaneous values of credit to the private sector, credit squared, private capital flows, and stock market value traded. Dependent variable = 1 if growth is negative from t to $t+1$.
d. Lagged values of credit to the private sector, credit squared, private capital flows, and stock market value traded. Dependent variable = 1 if growth is negative from t to $t+1$.
Source: Authors' calculations.

economy's vulnerability to a downturn. The coefficient of the variable measuring the depth of the equity market has the predicted sign and is highly significant. This result, combined with the finding of a positive and marginally significant effect of credit on the likelihood of downturns, suggests that financial systems in which debt is more prominent than equity are more vulnerable to growth collapses. This again emphasizes the importance of financial variables in the analysis of volatility.[13]

Real wage flexibility (as measured by the change in the log of real wages) reduces the likelihood of a downturn, but this result is not robust to different lag specifica-

tions. That the length of an economic expansion does not have a statistically significant effect on the probability of a downturn may suggest that there is no mechanical business cycle. This confirms work on the United States, where Furman and Stiglitz (1998) have shown that there has been no regular business cycle (no dependence of the probability of a downturn on the length of the expansion) since World War II (see Stiglitz 1997).

Conclusion

This article can be thought of as a reexamination of the standard paradigm relating to economic stability. We began with the underlying hypothesis that a variety of dynamic effects and institutions important for understanding volatility have traditionally been omitted or underemphasized in standard economic models—and that some of the most important "omitted" variables are those relating to the financial sector. Analyses that neglect this broader range of variables may be badly off course in predicting an economy's short-run performance.

Our empirical results support this hypothesis. Wage rigidity, at the center of traditional Keynesian analysis, seems on average to play little role in output variability. In contrast, financial variables are consistently significant in explaining both variability and the likelihood of a downturn. Of course, volatility will also differ across economies depending on their structure, the nature of the shocks they face, and the government's policy regime. Openness and policy variability were also found to be significant determinants of growth volatility.

There are a host of microeconomic variables—such as firm net worth and cash flows—that we would have liked to bring into the empirical analysis of volatility. Unfortunately, data on such variables are scanty, available for only a few countries, over a limited period, and for a small sample of firms. Yet the theoretical analyses suggesting their importance are consistent with many aspects of the recent global financial crisis.

If correct, the results of our theoretical and empirical analyses have strong policy implications:

- Countries are often advised to make labor institutions more flexible—to allow more rapid lowering of real wages so that the demand for labor can adjust more rapidly to supply. But wage adjustments have aggregate demand effects, and the adverse effects of these may more than offset the positive effects arising from wage flexibility. Controlling for other variables, we find that on balance, real wage flexibility has neither negative nor positive effects on volatility.
- Countries are told that opening the capital account will allow risk diversification, stabilizing the economy. In fact, benefits on this score can be offset by the fact that capital movements are highly variable and can be highly procyclical, in some cases inducing downturns, in others exacerbating fluctuations arising from other sources. We find no evidence for either the stabilizing or the exacerbating role of capital flows. The sensible thing for

Appendix 1. Definitions and Sources of Data

Variable	*Definition*	*Source*
Growth	Annual change in log per capita income, constant 1995 U.S. dollars.	World Bank, World Development Indicators database
Real (industrial) wages	Total wage bill divided by total employment.	United Nations Industrial Development Organization database
Credit to private sector/GDP	Credit to the private sector includes loans, purchases of nonequity securities, and trade credits and other accounts receivable that establish a claim for repayment.	World Bank, World Development Indicators database
M1/GDP	M1 is the sum of currency outside banks and demand deposits other than those of the central government.	International Monetary Fund, International Financial Statistics database
M3/GDP	M3 is the sum of currency and deposits in the central bank (M0), plus transferable deposits and electronic currency (M1), plus time and savings deposits, foreign currency transferable deposits, certificates of deposit, and securities repurchase agreements (M2), plus travelers checks, foreign currency time deposits, commercial paper, and shares of mutualfunds or market funds held by residents	International Monetary Fund, International Financial Statistics database
(Imports + exports)/GDP	Imports plus exports divided by GDP.	World Bank, World Development Indicators database
Inflation	Annual change in the consumer price index.	World Bank, World Development Indicators database
Private capital flows/GDP	Private capital flows consist of private debt and nondebt flows. Private debt flows include commercial bank lending, bonds, and other private credits; nondebt private flows are foreign direct investment and portfolio equity investment.	World Bank, World Development Indicators database
Terms of trade changes	Change in the export price index minus change in the import price index, weighted by openness.	World Bank, World Development Indicators database
Stock market value traded/GDP	Stock market value traded refers to the total value of shares traded during the period.	Beck, Demirgüç-Kunt, and Levine (1999)
French or English legal origin	Dummy variables.	World Bank data
GDP per capita	Constant 1995 U.S. dollars.	World Bank, World Development Indicators database
Urban share of population	Population in urban areas as share of total population.	World Bank, World Development Indicators database
Life expectancy at birth	Number of years a newborn would live if prevailing patterns of mortality at the time of its birth were to stay the same through its life.	World Bank, World Development Indicators database
Employment	—	World Bank, World Development Indicators database
Fiscal balance	Current revenue less total expenditure (central government).	World Bank, World Development Indicators database

Appendix 1. cont.

Variable	*Definition*	*Source*
Oil exporting country	Dummy=1 if the value of oil exports is more than half the value of total exports of goods and services.	World Bank data
Commodity exporting country	Dummy=1 if the value of primary commodity exports (other than oil) is more than half the value of total exports of goods and services.	World Bank data
Long-term private debt issues/GDP	Equity issues by the private sector divided by GDP.	Beck, Demirgüç-Kunt, and Levine (1999)
Private bond market/GDP	Total amount of outstanding debt securities issued by private entities divided by GDP.	Beck, Demirgüç-Kunt, and Levine (1999)
Public bond market/GDP	Total amount of outstanding debt securities issued by public entities divided by GDP.	Beck, Demirgüç-Kunt, and Levine (1999)
Assassinations per million	Political assassinations per million population.	Political Risk Services, *International Country Risk Guide*
Capital restrictions	Dummy=1 if restrictions exist on capital account payments.	International Monetary Fund, *Yearbook of Exchange Controls*

Appendix 2. Descriptive Statistics

Variable	*Mean*	*Standard deviation*
Volatility regressions (subset of 98 observations)		
Standard deviation of GDP per capita growth	0.034	0.016
(Imports + exports)/GDP	62.141	50.896
Standard deviation of growth in real wage index	0.043	0.033
Standard deviation of growth in M1	0.140	0.200
Private capital flows/GDP	1.096	1.575
Standard deviation of private capital flows/GDP	1.342	1.310
Credit to private sector/GDP	42.582	32.059
English legal origin	0.357	0.482
French legal origin	0.531	0.502
Initial GDP per capita	6,315.871	7,776.980
Urban population share	55.263	23.453
Life expectancy at birth	66.060	8.577
Standard deviation of terms of trade changes	0.084	0.054
Oil exporter	0.031	0.173
Other commodity exporter	0.143	0.352
Assassinations per million	0.038	0.161
Probits (all 630 observations)		
Downturn from t – 1 to t	0.138	0.345
Downturn from t to t + 1	0.137	0.344
Developing country	0.494	0.500
Length of expansion	8.121	7.377
Five-year moving average growth	3.216	2.611
Credit to private sector/GDP	57.812	30.401
Lagged credit to private sector/GDP	56.271	29.547
Private capital flows/GDP	1.123	2.935
Lagged private capital flows/GDP	1.001	2.717
Growth in real wage index	0.011	0.092
Capital restrictions	0.706	0.338
(Imports + exports)/GDP	61.602	30.565
Stock market value traded/GDP	0.097	0.199
Lagged stock market value traded/GDP	0.084	0.176

policymakers would be to devise new financial strategies that hedge against the risks of sudden outflows while maintaining access to finance.

- Openness enhances economic growth, and higher economic growth reduces volatility and thus the vulnerability to economic downturns (openness also has a direct effect in making downturns less likely).[14] But we find that openness also contributes significantly to volatility in per capita GDP growth.

Standard macroeconomic models give short shrift to financial institutions, often seeming to suggest that the entire financial sector can be embedded in a money demand equation. Our analysis confirms that financial institutions play a central role in economic volatility and downturns—that financial depth (as measured by private credit as a share of GDP) reduces volatility up to a point, but that too much private credit can increase volatility. The financial sector can also exacerbate downturns, particularly if debt increases relative to equity.

Notes

1. The historical references are from Kindleberger (1978, pp. 212–13).

2. Traditional Keynesian theory focused on asymmetries in the adjustment of wages and prices; here we argue that asymmetries in the adjustment of real variables are every bit as important.

3. Technically, a firm is in bankruptcy only if its creditors have gone to court to seek redress or the firm has gone to court to seek protection from creditors. We use the term *distress* more generically to refer to situations in which the firm's net worth is negative or its cash flow (including what creditors are "voluntarily" willing to lend or roll over) is insufficient to meet its debt obligations.

4. These unpaid liabilities inhibit the activities of both firms and their creditors. The debt overhang is a liability to firms, yet it is not really an asset to financial institutions, which necessarily must take a conservative position in discounting the likelihood of being repaid.

5. The reason in theory is that imperfections in equity markets (which themselves can be explained by informational imperfections; few would question the hypothesis of limitations in equity markets for most developing countries) limit the extent to which risks can be shared and shifted, and agency problems in large corporations lead to incentive schemes that induce risk-averse behavior in managers (see, for example, Leland and Pyle 1977, Stiglitz 1982, and Greenwald and Stiglitz 1991). The evidence consists of a large catalogue of firm behaviors that are hard to reconcile with the standard neoclassical model with risk-neutral firms but are consistent with the theory of the risk-averse firm (see the discussion above as well as Stiglitz 1982 and Greenwald and Stiglitz 1991).

6. Studies also show that climatic, political, and terms of trade instability lowers growth rates (Guillaumont, Guillaumont, and Brun 1999 for Africa, Barro and Sala-i-Martin 1994, and Mendoza 1994). The Inter-American Development Bank (IADB 1995) estimated that the effects of greater volatility in terms of trade, the real exchange rate, and monetary and fiscal policy in Latin America have translated into a reduction in growth rates of around 1 percent a year.

7. For Latin America, the Inter-American Development Bank (IADB 1995) and Hausmann and Gavin (1996) have shown that external shocks (to the terms of trade and to capital flows) and the volatility of economic policy are associated with volatility in growth rates. The IADB report also argues that financial system weaknesses and exchange rate policies have been important determinants of growth volatility (pegging the exchange rate rather than choosing a more flexible regime tends to be associated with increased volatility in output).

8. This is a generalized two-stage least squares procedure using the within effects (standard deviations) and between effects (country means) as instruments on data transformed by a weighted average of the within and between variance components. The elements of the omega (weighting) matrix are computed as $\Omega^{-1/2} = (P/\sigma_{fe}) + (Q/\sigma_{be})$, where Q refers to the country variable means, P to the standard deviations, $_{fe}$ to the standard errors from the fixed effects regressions, and $_{be}$ to the standard errors from the between-effects regressions. See Over (1999) for further details.

9. This is consistent with the finding of Easterly and Kraay (1999) that small states are more volatile when they are more open. But openness still has a direct positive effect on mean growth that outweighs its effect through increasing volatility.

10. Countries with greater access to private capital at any time may be expected to have lower income volatility. When the estimation also includes values of private capital flows adjusted for errors and omissions, the results are unaltered.

11. Because data on stock market value traded are available only from 1970 on, this financial variable was excluded from the volatility equations, and the probit regressions were run on data from 1976 on (see the appendix for details).

12. This finding applies both to the complete sample of 170 countries and to the smaller subsamples used in the regressions.

13. External debt was tested as an explanatory variable but was not significant.

14. In the standard theoretical model greater openness induces greater efficiency, a one-time gain in productivity, but does not lead to sustained increases in economic growth. But the conventional wisdom, and much of the econometric literature, argue that openness has not only one-time efficiency effects but also long-term growth benefits, perhaps as a result of the discipline provided by enhanced competition, as a result of the increased awareness of new technologies, or as a result of the availability of a broader array of intermediate inputs. Endogenous growth models also predict a significant effect of openness on growth.

References

Aizenman, J., and N. Marion. 1998. "Volatility and Investment: Interpreting Evidence from Developing Countries." *Economica* 66 (262): 157–79.

Ball, L., N. G. Mankiw, and David Romer. 1988. "The New Keynesian Economics and the Output-Inflation Trade-Off." *Brookings Papers on Economic Activity* 1: 1–82.Baltagi, Badi H. 1995. *Econometric Analysis of Panel Data.* Chichester, N.Y.: Wiley.

Baltagi, Badi H. 1995. *Econometric Analysis of Panel Data.* Chichester, N.Y.: Wiley.

Barro, Robert J., and Xavier Sala-i-Martin. 1994. "Quality Improvements in Models of Growth." NBER Working Paper 4610. National Bureau of Economic Research, Cambridge, Mass.

Beck, Thorsten, Asli Demirgüç-Kunt, and Ross Levine. 1999. "A New Database on Financial Development and Structure." Policy Research Working Paper 2146. World Bank, Development Research Group, Washington, D.C.

Bruno, Michael, and William Easterly. 1998. "Inflation Crises and Long-Run Growth." *Journal of Monetary Economics* 41 (1): 3–26.

Corbo, V., S. Fischer, and S. Webb, eds. 1992. *Adjustment Lending Revisited: Policies to Restore Growth.* Washington, D.C.: World Bank.

De Long, J. B., and Lawrence H. Summers. 1988. "How Does Macroeconomic Policy Affect Output?" *Brookings Papers on Economic Activity* 2: 433–80.

Easterly, William. 1990. "Portfolio Effects in a CGE Model: Devaluation in a Dollarized Economy." In Lance Taylor, ed., *Structuralist Computable General Equilibrium Models for the Developing World.* Cambridge, Mass.: MIT Press.

Easterly, William, and Aart Kraay. 1999. "Small States, Small Problems?" Policy Research Working Paper 2139. World Bank, Washington, D.C.

Easterly, William, and Ross Levine. 1997. "Africa's Growth Tragedy: Policies and Ethnic Divisions." *Quarterly Journal of Economics* 112 (November): 1203–50.

Furman, J., and Joseph E. Stiglitz. 1998. "Economic Crises: Evidence and Insights from East Asia." *Brookings Papers on Economic Activity* 2: 1–135.

Gavin, M., R. Hausmann, R. Perotti, and Ernesto Talvi. 1996. "Managing Fiscal Policy in Latin America and the Caribbean: Volatility, Procyclicality, and Limited Creditworthiness." Working Paper 326. Inter-American Development Bank, Office of the Chief Economist, Washington, D.C.

Greenwald, B., and Joseph E. Stiglitz. 1991. "Examining Alternative Macroeconomic Theories." In Edmund Phelps, ed., *Recent Developments in Macroeconomics.* Brookfield, Vt.: Edward Elgar.

Greenwald, B., Joseph E. Stiglitz, and A. Weiss. 1984. "Informational Imperfections in the Capital Market and Macroeconomic Fluctuations." *American Economic Review* 74 (2): 194–99.

Guillaumont, P. J., S. Guillaumont, and Jean-François Brun. 1999. "How Instability Lowers African Growth." *Journal of African Economies* 8 (1): 87–107.

Hausmann, R., and M. Gavin. 1996. "Securing Stability and Growth in a Shock Prone Region: The Policy Challenge for Latin America." Working Paper 315. Inter-American Development Bank, Office of the Chief Economist, Washington, D.C.

Hellmann, Thomas, and Joseph E. Stiglitz. 2000. "Credit and Equity Rationing in Markets with Adverse Selection." *European Economic Review* (44) 2: pp. 281–304.

Hellmann, Thomas, K. Murdock, and Joseph E. Stiglitz. 1996. "Deposit Mobilization through Financial Restraint." In N. Hermes and R. Lensink, eds., *Financial Development and Economic Growth.* New York: Routledge.

IADB (Inter-American Development Bank). 1995. *Economic and Social Progress in Latin America: 1995 Report—Overcoming Volatility.* Baltimore, Md.: Johns Hopkins University Press.

International Monetary Fund. Various years. *Yearbook of Exchange Controls.* Washington, D.C.

Islam, N. 1995. "Growth Empirics: A Panel Data Approach." *Quarterly Journal of Economics* 110 (November): 1127–1170.

Kane, E. 1990. "Incentive Conflict in the International Regulatory Agreement on Risk-Based Capital." NBER Working Paper 3308. National Bureau of Economic Research, Cambridge, Mass.

Kindleberger, Charles P. 1978. *Manias, Panics, and Crashes: A History of Financial Crises.* New York: Basic Books.

Leland, H. E., and D. H. Pyle. 1977. "Informational Asymmetries, Financial Structure, and Financial Intermediation." *Journal of Finance* 32 (2): 371–87.

Mayer, Colin. 1988. "New Issues in Corporate Finance." *European Economic Review* 32 (June): 1167–83.

Mendoza, E. G. 1994. "Terms-of-Trade Uncertainty and Economic Growth: Are Risk Indicators Significant in Growth Regressions?" International Finance Discussion Paper 491. Board of Governors of the U.S. Federal Reserve System, International Finance Division, Washington, D.C.

Myers, S. C., and N. Maljuf. 1984. "Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have." *Journal of Financial Economics* 13 (June): 187–221.

Newbery, D. M., and Joseph E. Stiglitz. 1982. "Risk Aversion, Supply Response, and the Optimality of Random Prices: A Diagrammatic Analysis." *Quarterly Journal of Economics* 97 (1): 1–26.

Orszag, P., and Joseph E. Stiglitz. 1999. "Bankruptcy, Credit Constraints, and Economic Policy." World Bank, Washington, D.C.

Over, M. 1999. "XTIVREG: Baltagi's Suggested Feasible Procedure for G2SLS and EC2SLS." World Bank, Development Economics Research Group, Washington, D.C.

Political Risk Services. 1987. *International Country Risk Guide.* Syracuse, N.Y.

Pritchett, Lant. 1998. "Patterns of Economic Growth: Hills, Plateaus, Mountains, and Plains." Policy Research Working Paper 1947. World Bank, Development Research Group, Washington, D.C.

Ramey, G., and V. A. Ramey. 1995. "Cross-Country Evidence on the Link between Volatility and Growth." *American Economic Review* 85 (December): 1138–51.

Stiglitz, Joseph E. 1982. "Information and Capital Markets." In W. F. Sharpe, C. Cootner, and P. H. Cootner, eds., *Financial Economics: Essays in Honor of Paul Cootner.* Englewood Cliffs, N.J.: Prentice Hall.

———. 1994. *Whither Socialism?* Cambridge, Mass.: MIT Press.

———. 1997. "The Long Boom? Business Cycles in the 1980s and 1990s." Paper presented at Georgetown University Macroeconomics Seminar, 4 September, Washington, D.C., and at Centre for Economic Policy Research conference The Long Boom, Stanford University, Stanford, Calif., 5 September.

———. 1999. "Toward a General Theory of Wage and Price Rigidities and Economic Fluctuations." *American Economic Review* 89 (2): 75–80.

———. Forthcoming. "Whither Reform?" In Boris Pleskovic and Joseph E. Stiglitz, eds., *Annual World Bank Conference on Development Economics 1999.* Washington, D.C.: World Bank.

Stiglitz, Joseph E., and M. Uy. 1996. "Financial Markets, Public Policy, and the East Asian Miracle." *World Bank Research Observer* 11 (2): 249–76.

Talvi, E. 1995. "Fiscal Policy and the Business Cycle Associated with Exchange Rate–Based Stabilizations: Evidence from Uruguay's 1978 and 1991 Programs." Working Paper 313. Inter-American Development Bank, Office of the Chief Economist, Washington, D.C.

———. 1996. "Exchange Rate–Based Stabilization with Endogenous Fiscal Response." Working Paper 324. Inter-American Development Bank, Office of the Chief Economist, Washington, D.C.

United States, Executive Office of the President. 1997. *Economic Report of the President.* Washington, D.C.: Government Printing Office.

World Bank. 1992. "Adjustment Lending and Mobilization of Private and Public Resources for Growth." Policy and Research Series, no. 22. Country Economics Department, Washington, D.C.

———. 1999. "Coping with the Crisis in Education and Health." *Thailand Social Monitor* (World Bank, Bangkok) 2 (July).