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The Debt Crisis: A Postmortem*

1. Introduction

"Crisis," in Greek, means *decision*. From that etymologic view, the debt crisis of the 1980s was not really a "crisis." No country overtly chose to repudiate its debt—those, like Brazil, that went toward doing it came back on their decision—and no creditor really decided to wage a "war" against bad debtors. Instead, the crisis has been lingering from one rescheduling to the next, with no obvious "final settlement" in sight. This feature, however, does not make the 1980s unique. As the comprehensive work by Eichengreen and Portes (1986, 1989) (henceforth, EP) has shown, the 1980s share with the 1930s the same protracted nature and the same failed attempts to find a resolution. As I will show in Section 2, it also shares with the 1930s another important feature: Despite arrears and reschedulings, the creditors did manage to recover an important part of their claims. (I will attempt to explain why in Section 2.3.) Taking as a liquidative value the secondary market price of the debt, I will show that all major debtors (except Brazil) delivered a market return to the commercial banks. EP found the same feature for the U.K. bonds in the 1930s.

Yet, the debt crisis of the 1930s ended a decade later, with a negotiated settlement. A specific event, World War II, it is true, sped up settlements as the governments of the key creditors countries (the United Kingdom and the United States) attempted to find or to preserve alliances with the debtor countries. But more fundamentally, the building up of arrears motivated private creditors to seek an agreement. To what extent can we expect a similar unfolding of the debt crisis of the

1980s? Should we expect the 1990s to bring the final settlements that the 1940s have brought?

Because the 1990s are apparently speeding up disarmament rather than war, one should not expect the process to repeat itself term for term. . . . Yet the building up of arrears has certainly started, and the Brady speech, in disconnecting the accumulation of interest arrears from the signature of an IMF agreement, has made each of them easier. In 1985, arrears were less than $10 billion; they soared in 1990 to about $50 billion (see World Debt Tables, 1991). At the same time, the Brady deal pointed to a shift in the priorities of the U.S. government (the French and the British governments having started, for their part, a competition of their own on who will offer the most favorable terms to the low-income debtors). Will the 1990s be the decade of the grand settlement and—as Eichengreen and Lindert (1989) have ironically suggested—will it be the decade that will open the way to a new wave of debt accumulation?

How far off a settlement do we stand, and what lessons of the debt crisis should we draw before the next debt buildup starts: These are the two questions that I will attempt to address in this paper.

1.1 TOWARD A GRAND SETTLEMENT?

In 1943, Brazil offered its creditors two ways out. One option offered no reduction of principal but an interest rate cut from 6.5 to 3.4%; another option offered a cash payment of about 10% of the face value and a principal and an interest cut on the rest (see Cardoso and Dornbusch, 1989). On July 23, 1989, Mexico and its creditors agreed on a debt relief plan offering the banks three options: (1) reduce the face value of the debt by 35%, (2) reduce the interest rate to 6.25%, or (3) keep the face value and the interest rates unchanged but lend an additional 25% of the face value in the next 3 years. Eventually, (on February 4, 1990), 46.9% of the creditors have chosen the par bond, 40.2% the discount bond, and 13.1% the third option. The parallel between the two deals is striking. Already, Venezuela, the Philippines, Costa Rica, and Uruguay have signed a debt reduction agreement with their creditors. Nigeria is about to, and Argentina and Brazil are also expected to sign one sooner or later.

Does that make the Brady deal the vehicle of a forthcoming "grand settlement"? It takes a long detour to answer this question because the Brady deal (in contrast to the deals that were signed in the 1940s) amounts to having the debtor borrow from International Financial Institutions (IFIs) such as the World Bank or the IMF in order to finance their debt reduction program with the private creditors. If one assumes that the commercial banks stay neutral, the deal is bound to create later

conflicts between the country and the IFIs. I will argue that it would have been more appropriate to give the debtor countries, say, 3 or 5 years to accumulate reserves with which they could have repurchased their debt—at a price *agreed upon ex ante*. As I will show empirically (building on Bulow and Rogoff's key distinction between average and marginal price), few resources are required to repurchase, say, *half* the debt of a typical middle-income debtor—provided that the price appropriately reflects the *marginal* value of writing down the debt.

1.2 LESSONS FOR THE FUTURE

If a settlement of the debt crisis actually happens, it is unlikely to be on the grounds that this will help to deliver a more efficient outcome. Rather, it is likely to reflect a change in the bargaining power of the parties involved. However, the following question is clearly important: How much additional growth should we expect an easing of the debt burden to deliver? Similarly, how much of the slowdown of growth in the 1980s can be assigned to debt? I make (in the first part of section 3) an attempt to address this question empirically. I will show that—out of an extraordinary reduction of 4.9%—about half of the growth slowdown of the large debtors is a world wide phenomenon, 0.8% is due to the decline in their terms of trade, 0.5% is due to lower investment, and "only" 0.9% remains as an "unexplained" productivity slowdown that the debt crisis may have caused. Although this number may appear to be small, I will nevertheless make the point that it is of an order of magnitude that is well above the real cost of writing down the debt by, say, half, as I suggested earlier.

More broadly, one would like to go beyond the specific pattern of growth during the 1980s and use the past two decades to evaluate the capacity of foreign finance to enhance the prospect of growth in a poor country. Should we think that sovereign risk and the risk of default are the prime reasons why access to the world financial markets does not appear to help substantially the developing countries, or should we think instead that it is the low returns to capital accumulation in the poor countries that explain why they could not take advantage of the world financial markets to grow faster (as argued in Lucas, 1990)? These are the questions that—very broadly—I will address in the last part of this paper.

2. Paying and Cancelling the Debt

2.1 HOW MUCH DID THE LARGE DEBTORS PAY IN THE 1980s?

One of the key (perhaps surprising) results that is obtained from the analysis of the 1930s is that the returns on the foreign bonds were often

positive and, in a few cases, not far off the market return. In this section, I will first analyze the returns so far obtained by the creditors in the 1980s.

2.1.1 A Subsample of 20 Countries Of about $1,220 billion of total debt, $950 billion may be characterized as "at some risk," and about 65% of this $950 billion is owed by just 20 countries. It is on this narrow sub-group that I will first focus the analysis. (I turn to the average debtors later.) The 20 countries are Algeria, Argentina, Brazil, Chile, Colombia, Cote d'Ivoire, Ecuador, Egypt, Hungary, Indonesia, Mexico, Morocco, Nigeria, Pakistan, Peru, Philippines, Sudan, Turkey, Venezuela, and Zaire. (We also wanted to include Yugoslavia and Poland, but we had data problems with these countries.) Table 1 shows the 1980 and 1982 debt-to-export and debt-to-GDP ratios. It is extraordinary to note the formidable jump of these debt ratios in only 2 years. This jump is the result of the interest-rate shock together with the acute recession in

Table 1   TWENTY REPRESENTATIVE DEBTORS

	Debt-to-export ratio			Debt-to-GDP ratio			Total debt	Second-ary mar-ket price
	1980	1982	1989	1980	1982	1989	1989	1989
Algeria	130.6	119.2	248.8	47.1	40.4	57.6	26.1	0.76
Argentina	242.4	447.3	537.0	48.4	83.8	129.7	64.7	0.18
Brazil	304.8	395.4	301.6	30.6	36.1	24.1	11.3	0.28
Mexico	259.2	311.5	262.9	30.3	52.5	51.2	95.6	0.41
Nigeria	32.2	100.4	390.1	9.0	14.1	119.3	32.8	0.27
Venezuela	131.9	159.8	211.5	42.1	41.4	79.9	33.1	0.40
Colombia	117.1	204.3	220.8	20.9	26.9	45.8	16.9	0.63
Chile	192.5	335.9	187.7	45.2	76.7	78.3	18.2	0.61
Ecuador	201.6	281.3	392.3	53.8	66.9	112.9	11.3	0.16
Hungary	95.9		158.7	44.8	45.4	75.8	20.6	0.99
Indonesia	94.2	123.6	210.6	28.0	29.2	59.8	53.1	
Morocco	223.8	326.9	328.6	53.1	84.0	95.9	20.9	0.45
Philippines	212.5	297.7	226.4	49.5	62.5	65.7	28.9	0.49
Turkey	332.9	195.8	189.8	34.3	38.2	53.8	41.6	0.93
Zaire	202.2	296.2	370.1	33.5	35.7	96.6	8.8	0.19
Ivory Coast	180.7	276.5	463.9	58.8	111.4	182.2	15.4	0.06
Egypt	208.4	277.8	355.3	95.0	120.9	159.0	48.8	0.39
Pakistan	196.9	215.0	242.6	42.5	38.3	46.9	18.5	
Peru	207.7	294.0	432.2	51.0	49.7	70.8	19.9	0.05
Sudan	499.3	699.3	1051.2	65.7	101.4	82.9	13.0	0.015

the OECD. In order to offset what they viewed (or perhaps pretended to view) as a temporary phenomenon, these already quite indebted countries skyrocketed their debt to levels that were to become unsustainable in the economic environment of the 1980s.

2.1.2 How Much Did They Pay? In order to get summary measures of the amount of resources that have been transferred by the debtor to the creditors, call P_t the payments that have been transferred (in net terms) by the *debtors* to the creditors. These payments are *minus* the transfers reported in the World Debt Table (see the working paper version of this paper—available on request—for an introduction to these data and for a discussion of their critique by Lindert, 1989). We have calculated:

$$V_0 = \sum_{t=1}^{T} \frac{P_t}{\prod_{s=1}^{t} (1 + i_s)} \tag{1}$$

in which $t = 0$ is 1982, T is 1989, and i_s is the LIBOR at time s. The calculation yields V_0, the present value of all transfers that have been made by the debtors to their creditors. *If* the interest rate on the debt were exactly equal to LIBOR, one would have:

$$D_0 - \frac{D_t}{\prod_{s=1}^{t} (1 + i_s)} = V_0 \tag{2}$$

and V_0 would exactly measure the *reduction* of the debt (in present value terms) that the payments P_t would have brought. The discrepancies arise because of measurement problems (which are addressed in our working paper) and because a spread over LIBOR was charged to the debtors.

We first present for each country a key indicator that reveals best the extent to which the debt was actually serviced. It is the ratio V_0/D_0 that measures the share of the initial debt that has been *repaid* (in net terms) over the years 1982–1989. The results are in Table 2. We distinguish three groups of countries. Countries in Group A transferred, *in the aggregate*, a significant amount of resources to their creditors. Countries in Group B essentially stayed at financial autarky and neither reduced nor increased (in present value terms) their total exposure. Finally, countries in Group C became increasingly indebted.

An extraordinary feature of Table 2 is how well the commercial banks have done. In 11 out of 20 cases, they managed to recover more than 40% of their initial exposure in only 7 years. Even in Group C, they managed to recapture in three out of five countries more than 35% of their claims.

We also see that the six countries in Group A repaid a significant amount (more than 30%) of their total outstanding debt. In these cases, it is not the debt borrowed from one creditor that helped pay the debt due to another.

Group B contains a subsample of countries that essentially stayed in financial autarky. In that group, Chile, Ecuador, Hungary, Indonesia, and Morocco serviced a large part of their commercial debt using the IFI's money to repay their commercial creditors. Except for Morocco, all of these countries, along with Turkey, were perceived as good risks, and their secondary market price showed a small discount.

Let us focus for the moment on the countries in Group A, for which

Table 2   PERCENTAGE OF 1982 LONG-TERM DEBT PAID IN 1983–1989

	Present value calculations	
	Total debt	Commercial debt
Group A		
Algeria	0.31	0.46
Argentina	0.40	0.62
Brazil	0.38	0.29
Mexico	0.62	0.48
Nigeria	0.30	0.91
Venezuela	0.75	0.77
Group B		
Colombia	0.015	0.19
Chile	0.18	0.35
Ecuador	0.12	0.56
Hungary	0.06	0.54
Indonesia	−0.025	0.28
Morocco	0.009	0.52
Philippines	0.17	0.66
Turkey	0.09	0.24
Zaire	−0.03	0.25
Group C		
Ivory Coast	−0.06	0.40
Egypt	−0.14	0.35
Pakistan	−0.09	0.56
Peru	−0.16	0.30
Sudan	−0.16	0.06

Table 3   DEBT REPAID IN 1983–1989 WHEN TAKING ACCOUNT OF
         LIQUIDATION VALUE (1989 PRICES) AS A FRACTION
         OF 1982 DEBT

	Total debt	Commercial debt
Algeria	1.13	0.98
Argentina	0.82	1.02
Brazil	0.47	0.51
Mexico	0.79	0.78
Nigeria	1.37	1.13
Venezuela	1.15	1.24

a substantial amount of net repayments have been made. In order to get a more comprehensive assessment of the return on debt, let us also take account of the liquidating value of the debt in 1989, such as measured by the secondary market price at the end of 1989 (which was a low point for the market). One gets Table 3.

With these liquidation values, one now sees that all countries in Group A, except Brazil, would have essentially repaid all their debt if it had been liquidated at 1989 prices. The same conclusion would have been reached with the five "good-risk" countries in Group B.

Let us now analyze the subgroup of *all* middle-income severely indebted countries such as defined by the World Debt Tables (1990). (They consist of Argentina, Bolivia, Brazil, Chile, Congo, Costa Rica, Cote d'Ivoire, Ecuador, Egypt, Honduras, Hungary, Mexico, Morocco, Nicaragua, Peru, Philippines, Poland, Senegal, Uruguay, and Venezuela.) One gets the results that are shown in Table 4. On average, one sees that the creditors as a whole would have recaptured 58% of their claims if the debt had been liquidated at its 1989 value.

By the end of 1989, the group of middle-income debtors was then, so to speak, 40% off solvency. On the other hand, from the end of 1980 to

Table 4   DEBT REPAID IN 1983–1989 AS A FRACTION OF 1982 DEBT BY
         THE SEVERELY INDEBTED MIDDLE-INCOME COUNTRIES

	Present value of net transfers (PVNT)	PVNT + 1989 liquidation value
Aggregate debt	0.27	0.58
Debt due to commercial banks	0.45	0.77

the end of 1982, the debt of this subgroup jumped by 41%. This shows that the 1980 level of indebtedness would have been just right! (In 1981 and 1982 alone, the severely indebted middle-income countries borrowed in net terms an extra $81 billion of long-term debt—out of a 1980 level of $212 billion—67% of which was used to meet the rising interest bill.) On the other hand, low-income debtors did not generate positive transfers, but their aggregate debt is "only" 25% of the total.

2.1.3 Why Did They Pay? Every year, the group of severely indebted middle-income countries transferred to its creditors about 3% of its GDP (i.e., about 14% of its exports). This number gives an indirect measure of the losses that the debtors have feared they would suffer otherwise. What is the nature of these losses? To what extent are they likely to shift over time? Here again, the 1930s offer an interesting reference. There was, at the time, no clear evidence of major trade sanctions against defaulting debtor countries. Also, trade *credits* were as much an issue of concern for the debtor countries as they have been today. At the time, however, *banks* were in the (profitable) business of offering trade credit (while bondholders, a separate group, were attempting to recapture their claims): "On several occasions, the representative of the bankers reaffirmed that they were unable to associate themselves with any attempt of the Council (of the Bondholders) to oppose export credit to a defaulting country" (EP, 1989). For their part, the indebted countries did everything they could to continue their service of their commercial debts. This is a key point to which we shall return later.

Reputation, on the other hand, was *not*, it seems, a prime motive for sustaining debt service (cf. Bulow and Rogoff, 1989, for a theoretical explanation). *All* Latin American countries—whether they serviced their debt, as Argentina faithfully did, or not—lost their access to foreign finance in the 1930s. No reward was granted to the good debtor. Actually, as EP have shown, those countries that defaulted early on appear to have experienced higher growth than the others. After the war, although the issue is less unambiguous, it does not seem that the good debtors enjoyed significantly better terms of credit than the others (see Jorgensen and Sachs, 1989; Lindert and Morton, 1989, and the dissenting view of Ozler, forthcoming).

Let us stick here to the idea that the fear of losing trade *credit* lines (and not trade opportunities) is the main reason why the debtors are willing to avoid outright default. In order to get an empirical view on this issue, let us first briefly set up a benchmark out of which the dependency of the service of the debt on the cost of debt repudiation can be spelled out.

Assume that a country produces an output, Q_t (the numeraire), which it (partially) consumes domestically and otherwise sells abroad.

Call X_t the volume of exports and $C_2(t)$ the domestic consumption of the numeraire; one can write:

$$Q_t = X_t + C_2(t).$$

In exchange for its exports, the country can purchase at a price p_t some imported goods and can repay an amount R_t of its debt.

Call $C_1(t)$ the (domestic) consumption of the imported good. One can write:

$$X_t = p_t C_1(t) + R_t.$$

Putting together the two previous identities, one can write:

$$p_t C_1(t) + C_2(t) = Q_t - R_t.$$

We shall refer to financial autarky (or simply "autarky") as the case when $R_t = 0$.

Let us assume that the utility of the country at any time t can be measured through an additively separable utility function:

$$V_t = \sum_{s=t}^{\infty} \beta^{(s-t)} u(C_s) \qquad \text{with } u(C) = \frac{C^\gamma}{\gamma}, \qquad \gamma \leq 1, \tag{3}$$

in which $C = C_1^\alpha C_2^{1-\alpha}$ is a Cobb–Douglas function of the volume C_1 of the imported good and C_2 of the domestic good. Up to a multiplicative constant $\alpha^\alpha (1 - \alpha)^{1-\alpha}$, which we ignore without loss in what follows, one can then write that the optimal choice of C_t (when R_t is taken as given) is $C_t = p_t^{-\alpha}(Q_t - R_t)$. For simplicity, we shall assume that the terms of trade of the country are a constant $p_t = 1$, so that $C_t = Q_t - R_t$ simply measures the "aggregate" consumption that the country has access to when it repays R_t to its creditors.

Assume now that the country, if it were to default, would have to pay up front (rather than at credit) a fraction $x \leq 1$ of the imports it already purchased. At the time t when it defaults, let us consequently assume that the country must pay $x \alpha Q_t$ to its trade partners in order to avoid trade disruption. This lump sum up-front payment is to be interpreted as a way to clear out unpaid trade credits (proportional to the amounts of imports $C_1(t) = \alpha Q_t$). But let us also assume that, once

this one-shot loss is paid, the country has no further obligation and can stay at financial autarky (and consume $C_t = Q_t$). The reservation level of the country can then be written as:

$$\underline{V_t} = u[Q_t(1 - \alpha x)] + \sum_{s=t+1}^{\infty} \beta^{(s-t)} u(Q_s). \tag{4}$$

Call $R_t = \lambda_t Q_t$ the fraction of its resources that the country will be required to pay to its creditors. R_t must be chosen so that:

$\forall t \; V_t \geq \underline{V_t}.$

To put some back of the envelope figures behind these numbers, assume first that $\gamma = 0$ (i.e., $u(x) = \text{Log } x$).

In that case, one simply gets that, *for any interval of time* $(a, a + 1)$ during which the credit ceiling is binding:

$$\sum_{s=t}^{\infty} \beta^{(s-t)} \text{Log}(1 - \lambda_s) = \text{Log}(1 - \alpha x)$$

which immediately yields that λ_t is a constant, λ, such that:

$$\text{Log}(1 - \lambda) = (1 - \beta)\text{Log}(1 - \alpha x). \tag{5}$$

When, say, $\beta = 0.85$, $\alpha = 0.3$, and $x = 1/3$ (which corresponds to paying up front 4 months of imports) one finds $\lambda = 1.5\%$. The number to be explained is $\lambda \approx 3\%$ of GDP, so we solve here about half of the problem.

If instead one solves a similar equation when $\gamma = -2$ (which corresponds to an intertemporal elasticity of substitution of 1/3), we then have to solve (assuming Q is constant):

$$\frac{1}{(1 - \lambda)^2} = \beta + \frac{1 - \beta}{(1 - \alpha x)^2}. \tag{6}$$

With the same values of the parameters one now finds $\lambda = 1.7\%$. So we're going toward solving (60% of) the puzzle.

These calculations leave aside, however, all bargaining considerations. But, perhaps there were actually none to the extent that credit lines are offered by a very large number of small participants, which

puts the country in no situation to bargain (see Cohen 1991a, Ch. 3). They also leave aside the fact that investment could (dramatically) dampen the fluctuation of income at the time when the trade credit lines are cut. From this perspective it may be that—beyond the one-shot loss—a more *permanent* risk of trade disruption is also there, which induces the country to not sever its links with the financial community.

At any rate, if one trusts the credit line story—which is the one routinely repeated when the issue of repayment is discussed—then one sees how vulnerable the creditors might be. Indeed, just as in the 1930s, trade credits are not exactly supplied by the same creditors as those that supplied the rest of the debt. So the risk of a panic is really what drives trade creditors off in case of a debt crisis. If, say, the country could stay on good terms with the suppliers of "credibility" (IMF and World Bank) while defaulting on its commercial debt, it may turn out that *not* servicing the commercial debt would become harmless.

Incidentally, in the models that we spelled out previously, we have shown that the service of the debt—*when the credit ceiling binds*—was proportionate to the direct sanctions (x) that the creditors can impose on the country. When there are no such costs, that is when the creditors can only impose financial autarky as a threat, they can recapture nothing (*again:* when the credit ceiling binds). To see the generality of the result, consider a continuous time model and take any interval $[a,b]$ on which the credit ceiling binds. One then has:

$$\forall t \in [a,b] \int_t^\infty e^{-\delta(s-t)}u(C_s)ds = \int_t^\infty e^{-\delta(s-t)}u(Q_s)ds.$$

If one assumes (importantly) that Q_s is continuous one can differentiate both sides and find $u(C_t) = u(Q_t)$, that is, $Q_t = C_t$ and get the no net transfers result. This no transfer result should *not* be taken to imply that no credit is feasible when only financial autarky is available as a threat. Take for instance the case when $u(.)$ satisfies the Inada condition, and assume that Q_t goes—repeatedly—through zero values for some positive amount of time. (I borrow this idea from the very useful survey by Eaton, 1991.) Then, surely, the country will never want to default and be relegated to financial autarky. But, in this case, the repayment of the debt will be *voluntary:* it will not take place during an episode when the credit ceiling binds.

2.2 THE SECONDARY MARKET AND THE PRICE OF THE DEBT

Debt repurchases played an important role in the solution of the debt crisis of the 1930s. Secondary markets (or at least secondary market

pricing) have now become, once again, the core of many proposals to end the debt crisis (and, indeed, they are already a key part of the Brady plan). We now review briefly the potential role of secondary market pricing as discussed in the recent literature and highlight the criticism of this role by Bulow and Rogoff (1991) and Dooley (1988). We then present empirical evidence which opens the route to an analysis (in Section 3) of the negotiated settlements under way with the Brady plan.

2.2.1 A Theoretical Background: Marginal and Average Prices   To set up the ideas in an explicit model, consider a simple two-period model of a country that owes a debt at time $t = 2$. Assume that the country always has the option of repudiating its debt, and also assume that the banks can (credibly) impose—in retaliation—a sanction that amounts to a fraction λQ of the country's income. Finally, assume that the banks can always get the country to pay that fraction λQ that the country would forego by defaulting. Call $dF(Q)$ the density of the (random) distribution of the country's income. Let us take the banks to be risk-neutral and (for simplicity of notation) take the riskless rate to be nil. One can write the market value of a debt whose contractual value is D as:

$$V(D) = \left[\int_0^{D/\lambda} \lambda Q dF(Q) + \int_{D/\lambda}^{\infty} D dF(Q) \right].$$

The first term in brackets represents how much the banks can get when the income of the country is so low that the country would rather default than service the debt fully ($\lambda Q \le D$). The second term measures the expected payments that accrue to the banks when the country honors the contractual value of the debt (an event that has a probability $1 - F(D/\lambda)$). (This model and its extensions are discussed at greater length in Cohen 1991a; see also Eaton, Gersovitz, and Stiglitz, 1986.)

The market price of the debt (such as observed on the secondary market) can simply be written as:

$$q(D) = \left[\int_0^{D/\lambda} \frac{\lambda Q}{D} dF(Q) + 1 - F(D/\lambda) \right].$$

If a country were, say, to repurchase \$1 of its debt on the secondary market, this is the price that it would have to pay. If instead the country wants to repurchase an amount B and is *known* to be willing to do so, then—as Dooley (1988) first pointed out—the price at which the transaction will be undertaken can only be the *ex post* equilibrium price.

(Otherwise, no lenders will actually sell their claim). One then gets that the price for the transaction has to be:

$$q(D - B) = \left[\int_0^{(D-B)/\lambda} \frac{\lambda Q}{D - B} dF(Q) + 1 - F[(D - B)/\lambda] \right].$$

Obviously, if a debtor country is known to be willing to repurchase *all* of its debt ($B = D$) then the only price at which the transaction will be undertaken is $q = 1$.

This crucial remark makes it very undesirable to set up, say, an institution—endowed with a given amount of money—that would operate openly to repurchase LDC debt. Such an institution would immediately raise the price and defeat its own purpose.

The point that is made by Bulow and Rogoff radicalizes this critique. Assume that the country (or an institution acting on its behalf) repurchases a small fraction of the debt. For the country, what matters is the (marginal) reduction of the market value of the debt, that is

$$\rho(D) = V'(D) = 1 - F(D/\lambda),$$

which is strictly (perhaps much) lower than $q(D)$. So even if the country was repurchasing a fraction B of its debt $1 after the other, repeatedly taking the creditors by "surprise" (i.e., they never expect that the next dollar will be repurchased, but they always know—at each point in time—what is the exact stock of debt), it would still be over paying its debt because it would pay:

$$\int_{D-B}^{D} q(\tilde{D})d\tilde{D},$$

which is strictly more expensive than:

$$\Delta V = V(D) - V(D - B) = \int_{D-B}^{D} \rho(\tilde{D})d\tilde{D}.$$

Bulow and Rogoff (1991) concluded that this wedge between the cost of a debt buy-back and its real effect on the market value of the debt makes it unlikely to turn buy-backs into a profitable investment. Does this reasoning apply to the debt crisis of the 1930s and lead us to interpret the large buy-backs that were then performed as an unworthy investment? Not necessarily. As was pointed out in Cohen and Verdier (1990), a buy-back can be good if it is done *secretly*. If—say—Morgan

repurchases Brazil's debt—held by Citicorp—on Brazil's behalf without revealing for whom the purchase is made, there are no limits to the extent of the repurchases that can be made by Morgan at the given price. (It is only when Brazil's actions are discovered that the price rises because only in that case the reduction of its outstanding external debt raises the price.) Obviously, in the 1930s, the Latin American buy-backs were only revealed *after* they were completed.

Yet, as far as open buy-backs, such as those that the Brady deal encourages, it is obviously crucial to make sure that the price at which the buy-back is undertaken is set appropriately. This involves a comprehensive *ex ante* agreement with the creditors, so that none of them can free-ride on the others. This is exactly what the Brady deal has done. In a process called *novation*, it was agreed that all the previous debt had to be exchanged against one of the three options that were available.

In order to evaluate empirically how the Brady deal has worked, I will first analyze how the average and marginal prices can be reconstructed empirically.

2.2.2 Econometric Estimates Previous econometric studies of secondary market pricing include Sachs and Huizinga (1987), Fernandez and Ozler (1991), Ozler and Huizinga (1992) and Cohen and Portes (1990). I will rely here on the price of 20 middle-income countries for which the transactions are relatively frequent. (Cf. *Financial Flows to Developing Countries*, Dec. 91).

To the extent that we are interested in distinguishing between the average and the marginal price of the debt, we want to estimate a price equation in which such a distinction is explicit. Following my earlier work (Cohen, 1991a, ch. 4) I will use a logistic function of the prices to account for this discrepancy. Specifically, I obtain (for 1989 data):

$$\text{Log}\frac{q}{1-q} = -2.71 - 1.47 \, \text{Log} \, D/Q + 5.48 \, \text{HUN}; \qquad R^2 = 0.72 \qquad (7)$$
$$\phantom{\text{Log}\frac{q}{1-q} = -2.71} (-3.44) \qquad\qquad (5.31)$$

in which D is the stock of the debt, Q is per capita income [such as measured by Summers and Heston (1988), in percent of 1980 U.S. per capita income]. HUN is a proxy for Hungary (Hungary is controlled for because it is the only country in the sample that did not reschedule its debt).

By differentiating both sides, holding output constant, we get:

$$\frac{dq}{q} = -1.47(1-q)\frac{dD}{D}.$$

There is consequently a threshold price for which the elasticity of price with respect to debt is (in absolute value) smaller than one. The price, here, is

$q^* = 0.32$ cents.

In part coincidently, this price is not significantly different from the average price ($= 0.35$) of the representative middle-income debtor at the end of 1989.

Call $V = qD$ the market value of debt, one gets

$$\frac{dV}{V} = [1 - 1.47\,(1 - q)]\frac{dD}{D} \tag{8}$$

One can also rewrite Equation (8) as:

$$\frac{dV}{V} = 1.47\,[q - q^*]\frac{dD}{D},$$

or equivalently, we can write that the marginal price is:

$$\rho = 1.47\,(q - q^*)q.$$

Below the price q^* there is a "debt Laffer curve," as Krugman (1988) puts it. Reducing the face value of the debt may *raise* its market value. As I emphasized in my earlier work, however, there are only very few countries for which—with 95% confidence—this mechanism is relevant. Around that threshold point, however, we can take the marginal price of the debt to be nil. Lenders, as a whole, are essentially indifferent between one more or less dollar on their books. For countries that would repurchase their debt to the left of the price q^*, the deal would offer the bankers a "boondoggle," as Bulow and Rogoff have put it for the Bolivian buy-back that occurred in 1987.

Another illustration of Equation (7) comes as follows. Consider a debt that is originally priced at 32 cents. Assume that the debt is unilaterally written down by 50%. What is the real cost for the bankers of such a write-down? Using Equation (7), one gets that the 50% write-off would bring the price to 0.57 so that the market value would go from 0.32 to 0.285. This only represents an 11% write-off in real terms. In nominal terms, the result is more spectacular: a 50% write-off only cost 3.5% of the original value of the debt! With a debt-to-GDP of 100% (which is the average middle-income debtor level), this represents 3.5% of GDP.

These calculations show the formidable consolidation that could be

brought by a debt settlement—if only it could be appropriately priced. (Similar conclusions are reached in the simulation studies of Bartollini and Dixit, forthcoming and Cohen, forthcoming). We shall compare these numbers to the negative effects of debt on growth later.

2.3 A VIEW OF THE BRADY DEAL

2.3.1 Test of the Seniority Hypothesis A simple test of the seniority hypothesis amounts to analyzing the significance of the composition (among private and public creditors) of the total debt in the price equation for commercial debt. Let us call D_1 the debt of the IFI. The results are given here:

$$\text{Log}\frac{q}{1-q} = -2.72 - 1.46\,\text{Log}\frac{D}{Q} - 0.02\,\text{Log}\frac{D_1}{D} + 5.46\,\text{HUN};$$
$$\qquad\qquad (-3.07) \qquad\quad (-0.05) \qquad (4.83)$$

$R^2 = 0.7$

(t statistic in parenthesis)

We find that the composition of the debt is not significant at the 95% level of confidence. More IFI debt does not depress (when holding the aggregate level constant) the price of the commercial debt, counter to the seniority hypothesis. Indeed, if the IFIs' debt were senior, then— *ceteris paribus*—more of it (holding the aggregate debt constant) would reduce the share of the pie that the commercial banks are expecting to get and should depress the commercial debt's price. (Now it may also be the case that two conflicting effects are at work. More IFI money may depress the price of the commercial banks on the one hand, but it can also raise the prospect of growth of the country so that, at the end, the banks would get a smaller slice of a larger pie).

2.3.2 The Redistribution of Wealth After the Mexican Deal A simple way to analyze a Brady deal is to recognize that it amounts to having the IFIs increase their nominal exposure in the country by ϵ dollars against a write-off of η dollars from the commercial banks. The IFIs bring ϵ_1 dollars in cash, ϵ_2 of which is handed to the commercial banks, ϵ_0 of which is handed to the country. Note that we do not impose $\epsilon = \epsilon_1$; for example, $\epsilon > \epsilon_1$ if there is a risk premium. Along the lines of the model presented earlier, let us analyze the distributional implications (for the country, the IFIs and the commercial banks) of such a combination in two cases, when the IFIs are senior or/and when the IFIs have equal status. Let us call $V_i(D_1,D_2)$, $i = 1,2$, the value of the debt D_i held

by the IFIs ($i = 1$) or the commercial bank ($i = 2$) and D the aggregate debt.

a. *When the IFIs are senior creditors,* V_1 (.) only depends on D_1 and is worth:

$$V_1(D_1) = \int_0^{D_1/\lambda} \lambda Q dF(Q) + [1 - F(D_1/\lambda)]D_1$$

while

$$V_2(D_1, D_2) = \int_{D_1/\lambda}^{(D_1 + D_2)/\lambda} [\lambda Q - D_1] dF(Q) + D_2[1 - F(D/\lambda)]$$

Let us now investigate, in such a case, the implications of a Brady settlement.

i. The IFIs nominally raise their exposure by ϵ dollars against ϵ_1 dollars in cash. In terms of the model developed earlier, one can write that the IFIs consequently gain:

$$\Delta G_1 = \epsilon[1 - F(D_1/\lambda)] - \epsilon_1$$

in which the first term in brackets is their probability of being repaid.

ii. The commercial banks get the ϵ_2 in cash and reduce their exposure by η, but they also lose because the senior creditors have raised their exposure by ϵ. One can calculate that the banks get:

$$\Delta G_2 = \epsilon_2 - \eta \frac{\partial V_2}{\partial D_2} + \epsilon \frac{\partial V_2}{\partial D_1}, \text{ i.e.:}$$

$$\Delta G_2 = \epsilon_2 - \eta[1 - F(D/\lambda)] - \epsilon[F(D) - F(D_1/\lambda)]$$

iii. Finally, the country reduced its debt by $\eta - \epsilon$, and gets ϵ_0 in cash, so that it gains:

$$\Delta G_0 = [\eta - \epsilon][1 - F(D/\lambda)] + \epsilon_0$$

One can check that the game is a zero-sum game. (Indeed, in this exercise, we do not take account of the potential efficiency gains.) So, for sure, if the banks do not lose, the game is a nega-

tive sum game between the IFIs and the country. Consider instead the simple case (which is the most favorable to the IFIs) when $F(D_1/\lambda) = 0$: the IFIs (which are senior creditors) expect to be paid fully, and also assume that $\epsilon_1 = \epsilon_2 = \epsilon$. In that case, the banks' gain turns out to be:

$$\Delta G_2 = [\epsilon - \eta][1 - F(D/\lambda)]$$

and the game is simply now a zero-sum game between the commercial banks and the country. If the *nominal* write-off from the commercial banks exceeds the cash injection of the IFIs, they lose, no matter what. The reason behind this perhaps paradoxical result is that they lose on two accounts: they cut their exposure by η, and they let the senior creditors raise their exposure by ϵ.

b. *When the IFIs have an equal status*, then one can write:

$$\forall i = 1,2 \qquad V(D_i) = \frac{D_i}{D} \int_0^{D/\lambda} \lambda Q dF(Q) + [1 - F(D/\lambda)]D_i.$$

The balance then comes as follows. Call (as before) q the average price and ρ the marginal price of the aggregate debt. One can use the cross derivative to calculate that the IFIs gain:

$$\Delta G_1 = -\epsilon_1 + \epsilon\rho + (q - \rho)\left[\epsilon\frac{D_2}{D} + \eta\frac{D_1}{D}\right]$$

while the commercial banks gain:

$$\Delta G_2 = +\epsilon_2 - \eta\rho - (q - \rho)\left[\epsilon\frac{D_2}{D} + \eta\frac{D_1}{D}\right]$$

and the country gains:

$$\Delta G_0 = (\eta - \epsilon)\rho + \epsilon_0.$$

c. *Empirical evaluation of the Mexican deal*

As the studies which have analyzed in detail the Mexican deal have shown (see especially Claessens and Van Wijnbergen, 1990; Diwan and Kletzer, 1990; Van Wijnbergen, 1990), the banks have written

off their claim by about \$12 billion, while the IFIs' exposure has been raised by $\epsilon = 7 billion, which was used to guarantee the new bonds. Let us interpret these guarantees as a cash payment to the banks whose value is $\epsilon_2 = \$7(1 - \rho)bl$ (because they will not be used with a probability ρ). With this interpretation, we must consequently take that the banks have written down their debt by $12 + \epsilon_2$.

To the extent that the deal may have been anticipated, it is hard to say what the "predeal" price of the debt actually was. Using a simulation study, Van Wijnbergen takes it to be 0.39; using an econometric equation, Diwan and Kletzer also conclude that it is around 0.40. They also estimate that the postdeal price is about 0.50. We follow their calculations and take the average "average" price (around which we calculate the marginal values) to be about 0.45. We consequently get the following numbers:

$q = 0.45, \rho = 0.086, \epsilon = \epsilon_1 = 7.0, \epsilon_2 = 6.4, \epsilon_0 = 0.6, \eta = 18.4,$

$$\frac{D_1}{D} = 1/3, \frac{D_2}{D} = 2/3.$$

One then gets:

$$\begin{cases} \Delta G_1 = -2.5 \\ \Delta G_2 = +0.9 \\ \Delta G_0 = +1.6 \end{cases}$$

So the deal now appears to amount to a transfer from the IFIs to the country, with the banks gaining only marginally. (Diwan and Kletzer finds that the banks gained, while Van Wijnbergen also finds that they stayed at par.)

2.3.3 Is the Brady Deal the Appropriate Vehicle for Settling the Debt Crisis? While the deal appears to not have been detrimental to the country, it did not accomplish what it was supposed to. What one would want is to allow the country to repurchase (out of its own resources) a *large* amount of its debt (say 50%) at a price that reflects the correct (marginal) value of the deal rather than a *small* amount using the IFIs' money.

Taking the numbers reported earlier, one wants to offer the country the opportunity to use, say, an extra \$5 billion to repurchase in one block \$50 billion.

The difficulty with such a deal is that if the country does accumulate

$5 billion it will then become the prey of the banks that will want to seize the $5 billion (without giving up their claims). So what we would really need is a *commitment* from the banks that they will sell (say over 3 or 5 years) their claims at a price arranged *ex ante*. In that case, one gives the country the opportunity to accumulate reserves so as to benefit from the deal. Such a deal would make it profitable for the country to embark on an adjustment program. It would not create later conflicts with the IFIs.

3. Debt and Growth

In this section we now want to address the correlation between debt and growth. We shall first investigate the extent to which the debt buildup of the early 1980s can be identified as an important cause of the slowdown of growth during the past decade. This will open the way to an empirical analysis of the potential efficiency gains that a debt write-off could deliver. We shall then attempt to draw more broadly the lessons of the debt crisis to assess the extent to which one should expect future foreign finance to speed up growth in the poor countries.

3.1 GROWTH FROM THE 1960s TO THE 1980s

3.1.1 A "Quasi Accounting" Framework We shall set up, here, a "quasi-accounting" framework that builds on the "augmented" Solow model analyzed in Mankiw, Romer, and Weil (1992) (henceforth MRW). Assume that production can be written as:

$$Q_t = K_t^\alpha H_t^\beta (A_t L_t)^{1-\alpha-\beta}, \tag{9}$$

K_t is physical capital, H_t is "human" capital, L_t is raw labor (which grows exogenously at rate n) and A_t is an exogenous productivity term (which grows at rate μ). Accumulation of physical and human capital obeys:

$$\begin{cases} \dot{K}_t = -dK_t + I_t & \text{(10a)} \\ \dot{H}_t = -dH_t + Z_t & \text{(10b)} \end{cases}$$

Define $Y_t = (Q_t/L_t)$ output per capita, $a_t = \text{Log } A_t$, $y_t = \text{Log } Y_t$. One can log-linearize Equations (9) and (10) as:

$$\frac{d}{dt} y_t = \mu + (1 - \alpha - \beta)(d + n + \mu)[\hat{y}_t - y_t] \tag{11}$$

in which, $\hat{y}_t$ is:

$$\hat{y}_t = a_t + \frac{\alpha}{1 - \alpha - \beta} \operatorname{Log} \frac{I_t}{Q_t} + \frac{\beta}{1 - \alpha - \beta} \operatorname{Log} \frac{Z_t}{Q_t}$$

$$- \frac{\alpha + \beta}{1 - \alpha - \beta} \operatorname{Log}(d + n + \mu)$$

(12)

In MRW, $\hat{y}_t$ is taken as a proxy of the (Log of the) income per capita steady-state toward which the economy is converging. There is no reason to make such an hypothesis because $\frac{I_t}{Q_t}$ and $\frac{Z_t}{Q_t}$ can very well vary with the level of income. Equation (11) is simply obtained by differentiating (9) (around its initial value) while taking account of (10a,b) to measure the increase of capital. In particular, an equation such as (11) is plainly consistent with a model of endogenous growth (in which the growth of human capital can be unbounded). It nevertheless remains the case that one can interpret Equations (11) and (12) as a "quasi-accounting" framework. It is on such an interpretation that we shall draw in order to decompose the origin of the growth slowdown in the 1980s.

3.1.2 A Benchmark Equation   In this section, we first estimate Equation (11). Because we want to pay specific attention to shifts in the pattern of growth over the sample period, we shall pool the time averages over the following four subsamples: 1960–1966, 1967–1973, 1974–1980, and 1981–1987. We use the Summers–Heston data (1991) and supplement them with World Bank data. Z_t/Q_t is proxied by secondary school enrollment. (In Cohen, 1991b, I show that MRW's procedure essentially amounts to that.) The results are shown in Appendix 1, column 1. These results are consistent with the estimation of Equation (9) when $\alpha = 0.55$ and $\beta = 0.24$. The sum $\alpha + \beta = 0.79$ is in line with the results in Barro and Sala-i-Martin (1990) and MRW (who respectively defended $\alpha + \beta = 0.8$ and $\alpha + \beta = 0.66$). The share of capital is larger than in MRW (which defended the view that $\alpha = \beta = 1/3$).

The main feature that appears from this regression is the very significant slowdown of growth in the 1980s. Growth in the 1980s was 2.5% below the level that was reached in the 1960s ("all things equal"). It is crucial to note that this reduction is obtained even though the "conditional dynamics" that we estimate take account of the investment decision. It is therefore *not* a shift in investment that explains the slowdown of growth that we are identifying but a loss of "productivity" (which

obviously must take account of the fact that the recession of the early 1980s has pushed the economies within their production possibility frontiers).

3.1.3 The Debtor Nations and the Terms of Trade   We now investigate the specific pattern of growth of the debtor countries and take account of the terms of trade (a prime suspect for the developing countries troubles). We shall distinguish two subgroups. One group is the group of "moderately and severely indebted countries," such as defined by the World Bank (henceforth the SM group). The other group is composed of those countries that got into "refinancing difficulties," which we define as countries that rescheduled their debt more than once in the 1980s.

We then add a last explanatory variable: the "trend" of the terms of trade in the 1970s and in the 1980s. The "trend" is taken by regressing the rate of growth of the terms of trade (within each period) on a time trend. (For lack of comprehensive data, we do not include the terms of trade in the 1960s. For the subgroup of countries for which we did get this variable, we did not find the terms of trade to be significant in the period prior to the seventies.)

We consequently ran the following regressions

$$g = \hat{a} + \hat{b}D_i + \hat{c}D_{80} + \hat{d}D_i * D_{80} + \hat{e}\,\mathrm{linv} + \hat{f}\,\mathrm{tot} + Z_i \qquad (13)$$

in which D_i is a dummy for (respectively) the group of large-debtors or the group of rescheduling countries. D_{80} is the dummy for the 1980s; $D_i * D_{80}$ is the product of the two; inv and tot are investment and the terms of trade; Z_i are the other time dummies.

The results are in columns 2 and 3, Appendix 1. We now find that the nondebtor countries experienced a significant "productivity" slowdown in the 1980s of about 2.3%. Beyond this general slowdown, the group of severely indebted countries experienced an additional fall of about 0.9% (which is only significant at the 10% degree of confidence), while the group of rescheduling countries experienced an additional slowdown of 1.4% (which is significant at the 5% degree of confidence). In addition, the debtors experienced a lower "trend" in the rate of growth of their aggregate productivity: It is worth about 0.6% in both groups (and is only significant at the 10% degree of confidence).

This slowdown of aggregate "productivity growth" is obtained when controlling for the (adverse) effects of the investment slowdown and of the terms of trade shocks. In order to get a measure of these two additional terms, we have estimated an investment equation and measured

similarly the investment slowdown that was experienced: (1) in the eighties (for all countries), (2) for the debtors groups (prior to the debt crisis), and (3) for both debtor groups in the 1980s. Using the measured elasticity of growth with respect to investment such as obtained in columns (2) and (3) (in Appendix 1), we then calculated the specific effect of the investment slowdown on growth. We similarly decomposed the specific effect of the terms of trade (prior to and during the debt crisis) on the growth of each of the two subgroups of debtors. The results are summarized in Table 5.

Table 5 must be read as follows. In the 1980s, growth in the large debtor group was 4.9% below the previous average of the nondebtor countries. Of this (extraordinary) reduction, about half (2.5%) was a worldwide phenomenon. Another half a percentage point is part of a trend that prevailed in these countries. Finally the specific slowdown of growth in the large debtor group is 1.9%, 0.2 of which is due to another round of lower investment and 0.8 to a bad terms of trade shock. So, at the end, out of a fall of 4.9%, we are left with a remaining ("unexplained") productivity slowdown of 0.9%. This is the amount (apart from the investment effect to which we shall return later) that is, perhaps, to be explained by the debt crisis.

Table 5   SLOW GROWTH IN THE 1980s

	"Productivity" slowdown	Slower growth because of investment	Slower growth because of term of trade	Total fall
All countries (1)	−2.3	−0.2	—	−2.5
Additional fall in the large debtors				
(2) Trend	−0.6	−0.1	+0.2	−0.5
(3) 80's	−0.9	−0.2	−0.8	−1.9
Total for the large debtors (4):				
(1) + (2) + (3)	−3.8	−0.5	−0.6	−4.9
Additional fall in the rescheduling countries:				
(5) Trend	−0.6	−0.4	+0.1	−0.9
(6) 1980s	−1.4	−0.1	−0.5	−2.0
Total for the rescheduling countries (7):				
(1) + (5) + (6)	−4.3	−0.7	−0.4	−5.4

Another measure of the "total" fall in the debtors' growth due to the debt crisis can be (roughly) obtained by estimating a growth equation *without* controlling for the investment and the terms of trade effect. This is shown in columns (4) and (5) in Appendix 1. We estimate a general fall of the growth rate in the 1980s of 2.5%, specific lower growth of the SM group of 1% (prior to the debt crisis) and a specific fall in the eighties of 1.6% so that, at the end, we get a lower growth of the SM group of 5.1% (which is of the same magnitude as the aggregate reduction of 4.9% that we estimate in Table 5). Similarly, for the rescheduling countries, we get an overall fall (with respect to the previous average of the nondebtors) that amounts to 5.5% (compared to 5.4% in Table 5).

3.1.4 The "Unexplained" Residual   Let us now turn to analyze the extent to which we can trace back to the debt factor the origin of the "productivity" slowdown (such as measured left by the residual analyzed earlier). There are (at least) six terms that we can think of as correlated with the debt crisis and that can explain the specific reduction of growth in the debtor countries: (1) the stock of debt, (2) the net resources that were *actually* transferred by the debtors to their creditors, (3) the variation of the share of imports in GDP, (4) the variation of the tax burden imposed on the country by the government, (5) the variation in the share of government expenditure, and (6) the rise of inflation.

When including these six factors together, we found that *none* are statistically significant, that the debt factor is wrongly signed, and that the unexplained residual is *raised* (in absolute value) to 1.1%!

After a few iterations, the only robust factor to emerge is the reduction in the share of imports in GDP, which is only significant at the 10% degree of confidence. One gets—by taking account of this item only— that the unexplained residual for the group of large debtors falls to 0.5% and again is only significant at the 10% degree of confidence.

The same paradox emerges with the group of rescheduling countries. When taking account of "everything," the unexplained residual is not reduced. When taking account of the variation in the share of imports only, it is—again—reduced by 0.5%. In this case, the unexplained residual is still statistically significant and worth 0.9%.

3.1.5 Conclusion   The fact that the group of large debtors—and especially the group of reschedulers—experienced a specific slowdown of their growth rate (even after taking account of the fall of investment and the variations of their terms of trade) is confirmed by the econometric analysis. Yet it is puzzling to find that this slowdown does not appear

to be a function of the parameters that are (one would guess) highly correlated with the debt crisis (the stock of debt or the flows of net payments). One simple interpretation is that a country with a good prospect of growth can perhaps easily reimburse its debt while—at the other extreme—a country that is vulnerable to sanctions may have to reimburse its debt at the cost of a lower growth so that no obvious correlation between growth and payment is likely to be obtained.

As far as the rescheduling countries are concerned, it may also be that once a country gets into financial difficulties (whatever their magnitude may be), it suffers a loss of confidence because of capital flight, external liquidity problems, and so forth, which leads to a "productivity slowdown" captured by the rescheduling dummy, with little explanatory power left for the other debt factors.

Albeit one can always point to other factors, let us take here as a benchmark measure of the pure *waste* caused by the debt crisis the unexplained performance of the reschedulers, that is, 0.9% of GDP over the 6 years 1983–1988, or about 5.5% of GDP. As we have shown earlier, it may cost 3.5% of GDP to write down half of the debt of the rescheduling countries. With half its face value, we have also shown that the debt would have been sustainable (and below the 1980 level), so that one can assert that having written down half the debt, we may have avoided the crisis. This would have implied a return of about 60%! We obviously can not take these numbers at face value, but given the low cost of writing off a large fraction of the nominal debt, it does not take much of a net benefit to yield the result that repurchasing (at the right price) the debt is a profitable investment. At a more intuitive level, it is not shocking to argue that a country would have willingly wanted (with the benefit of hindsight) to pay—say over 2 or 3 years—an extra cost amounting to 3.5% of its GDP to get its debt reduced by half and avoid the rescheduling limbo.

3.2 BEYOND THE DEBT CRISIS: CAN FOREIGN FINANCE SPEED UP GROWTH?

3.2.1 Introduction Let us now look ahead and try to understand the lessons of the debt crisis. What should we think of the failure of the large debtors to grasp the opportunities that were offered by access to the world financial market? Should we think that the failure was only "bad luck" (the Reagan–Volcker shock), or more deeply should we conclude that the world financial markets are not likely to help poor countries very much?

These questions have already arisen once more with respect to the (former) East European countries. Should the West lend them the

money they need to build up their capital stock? Is it the case that free access to the world financial markets could help these countries catch up to their Western counterparts more rapidly? We have, before our eyes, the case of East Germany, which is a reduced version of what the total release of specific sovereign risk can produce. Large amounts of resources are flowing from the West to the East (more than $50 billion a year, for only 16 million people; scaled for Russia (only) this would correspond to more than $500 billion a year). Even in this narrow case, voices have expressed doubts concerning the ability of East Germany to catch up "rapidly" with West Germany. Barro and Sala-i-Martin (1991), in particular, have extrapolated the results that they found for *regions* across Europe and across the United States and for *nations* around the world to the German case. The speed at which poor regions (within a nation) appear to catch up to the rich ones appears to be approximately 2% per year, a number that is remarkably about the same as the speed at which—they found—the poor nations are catching up to the rich ones. According to their calculations, it would then take (no matter what) about 25 years to close *half* the gap between the western and the eastern parts of Germany, a number certainly bound to disappoint Chancellor Kohl and likely to be even more despairing for the countries that count on foreign finance to raise their growth rates.

In a different framework, Krugman (1991) makes the same claim that one should not expect capital mobility to do much to reduce the gap between the rich and the poor nations. Past historical episodes (before the debt buildup of the 1970s), for one thing, never really show the north financing the south. The cases in which one can point toward some success in this matter are the regions of "recent settlements" such as Australia, Canada, New Zealand, and the United States (and also Argentina) in which capital flows substantially helped to finance capital accumulation. In the case of Canada, for instance, up to 40% of domestic capital accumulation has been financed from abroad. In contrast, India (which was many times more densely populated) only absorbed a marginal part of British surplus. In conclusion, Krugman argues that the idea that foreign finance might speed up growth in the poor countries has been "oversold."

3.2.2 Theoretical Background   Krugman characterizes the problem as follows: Either we trust the Solow model (in which, say $Q = AK^{1/3}L^{2/3}$) and then capital accumulation only plays a minor role in explaining growth (indeed, asymptotically, no role at all). Or we trust the Lucas–Romer model, but then there is no reason for capital to flow from the rich to the poor countries (if there are no decreasing returns, capital is *not* more

profitable in the south, where it is scarce). Let us follow here the middle ground of MRW and assume that:

$$Q_t = K_t^\alpha H_t^\beta (A_t L_t)^\gamma, \quad \text{with } \alpha + \beta + \gamma = 1 \tag{14}$$

The (simple) point that I would now want to make is the following: whether a poor country can count on foreign finance to speed up growth critically depends on its physical–human capital ratio. When it is low (as, perhaps, is currently the case in Eastern Europe) then there is room for foreign finance to speed up growth in a poor country.

In Appendix 2, I sketch a simple model in which I attempt to replicate theoretically the results that have been found empirically by Barro and Sala-i-Martin. If one takes "nations" to be closed economies (which must count on domestic savings to accumulate capital), then the domestic stock of capital is running after a moving target that corresponds (at any point in time) to the level K_t^c for which domestic saving would stabilize the capital output ratio, that is, a level K_t^c such that:

$$s(K_t^c)^\alpha H_t^\beta (A_t L_t)^\gamma = (d + n + \mu) K_t^c,$$

in which s is the domestic saving rate, d is the depreciation rate, n is the rate of growth of labor, and μ is the rate of growth of productivity. Equivalently, in log terms, one can write:

$$k_t^c = \frac{\beta}{1 - \alpha} h_t + \theta_c,$$

in which

$$k_t^c = \text{Log} \frac{K_t^c}{A_t L_t}, \quad h_t = \log \frac{K_t}{A_t L_t}, \text{ and } \theta_c = \frac{1}{1 - \alpha} \text{Log} \frac{s}{d + n + \mu}.$$

Now, if we take "regions" to be open economies for which the marginal product of capital is equalized to a given interest rate r, one finds that the open economy target K_t^0 is defined through:

$$\alpha (K_t^0)^{\alpha - 1} H_t^\beta (A_t L_t)^\gamma = r + d$$

so that

$$k_t^0 = \frac{\beta}{1 - \alpha} h_t + \theta_0$$

in which

$$k_t^0 = \text{Log} \frac{K_t^0}{A_t L_t}, \, \theta_0 = \frac{1}{1 - \alpha} \text{Log} \frac{\alpha}{\gamma + d}.$$

As one sees the closed and the open economy targets have the same functional form. (This is due to the fact that the closed economy's saving rates determines the average productivity of capital, while the open economy determines the marginal productivity; in the Cobb–Douglas case, they are proportional to each other.) This explains why the pattern of growth of open and of closed economies may appear to be qualitatively similar. (See Appendix 2 for more details.) Within such a framework, regions and nations will appear to converge at the same speed toward their steady states (the speed depending essentially on the law of motion of human capital), as found in Barro and Sala-i-Martin.

Yet, this framework helps to indicate why Barro and Sala-i-Martin's conclusion about the effect of turning a nation (East Germany) into a region (Eastern Germany) is misleading. It may very well be that both regions and nations appear to converge towards their (own) steady state at about the same speed, and yet when a nation *becomes* a region (by being integrated to a larger nation), its capital stock may well be shifted to a new point, from which it will return to converging (at perhaps "2% a year") toward its new steady state. If one takes the case of a closed nation in which the saving rate is low, turning this "nation" into a "region" that faces a lower interest rate would then (rapidly) lift up the capital stock.

In terms of the figure below, a nation would go from an initial point
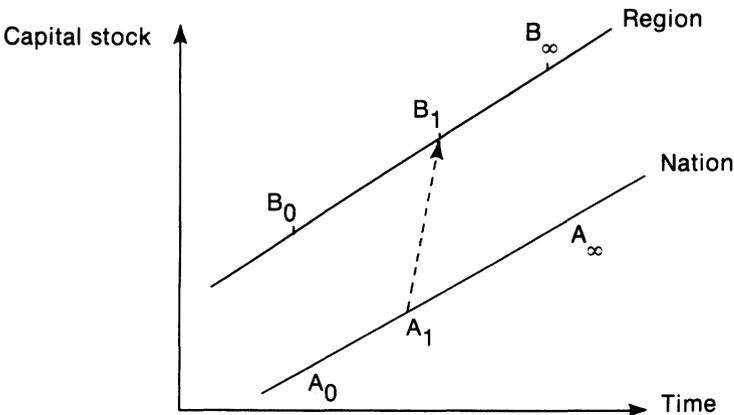
A_0 to a terminal point A_∞ at 2%. East Germany instead goes from A_0 toward B_∞; it converges at 2% a year toward its steady state only after it has been lifted up to B_1.

In other words, a *new* access to the world financial market may speed up growth (even though open regions are not observed to grow more rapidly than closed nations) if the capital stock of the nation is initially low. In order to analyze when this will be the case, and when *sovereign risk* constraints are likely to be binding, one needs to be more specific about the reasons why a "poor" country may want to raise its stock of capital. In terms of the model sketched earlier:

a. It may want to speed up its transitional dynamics toward its ("instantaneous") closed economy steady state k^c.
b. It may want to raise "permanently" its capital stock to the level, k^0, which is consistent with the equalization of the (social) rate of return to the rich countries' returns.

In the first case, the sovereign risk constraint need not be binding: Financial markets simply help the countries move faster to a point that is consistent with their domestic ability to save. The second motive is likely to be impossible for nations: large transfers of sovereignty (on the ownership of capital) would indeed be *permanently* needed (assuming savings are too low in the debtor country).

This typology is also useful in addressing Krugman's point according to which only regions of recent settlement seem to have enjoyed the benefit of foreign finance (before World War I). This may be due to the fact that they were essentially places that hardly started their transitional dynamics (being characterized by low initial physical capital and large initial human capital) so that foreign lending was indeed the right vehicle to speed up growth.

3.2.3 The "Poverty of Nations": A Typology Let us now investigate empirically which of the causes outlined previously is likely to explain the poverty of the "poor" nations (characterized by a "low" per capita income) and consequently assess the extent to which the access to the world financial markets may help them.

More specifically, we want to decide if these countries are poor because of a "low" initial stock of physical capital or, simply because of a low initial productivity. "Low" capital stock has two potential meanings: (1) vis-à-vis the steady state to prevail in the closed economy, and (2) vis-à-vis the benchmark case in which the free mobility of capital would equalize the rates of returns across nations.

Let us consequently define two measures of "poverty": one that measures how far a country's initial capital stock (k_o) stands with respect to the level to prevail under a free access to the world financial markets (k^o) and one that measures how far an economy stands with respect to its closed economy benchmark (k^c). These two benchmarks are calculated at the *current* level of human capital. They are consequently aimed at assessing whether a country is poor or rich in physical capital *relative* to its stock of human capital. We define the open economy criterion as:

$$\omega^o = k^o - k_0,$$

while the closed economy benchmark is defined as:

$$\omega^c = k^c - k_0.$$

Taking account of the fact that $y = \alpha k + \beta h$, one can write, up to a multiplicative constant $\left(\dfrac{1}{1 - \alpha}\right)$ and to an additive constant (θ_o):

$$\omega^o = [y_0 - k_0]$$

and

$$\omega^c = \omega^o + \log s_1.$$

We consequently only need to know the physical stock of capital in order to calculate ω^o and ω^c (see Cohen, 1991b, on the data). (s_1 is the average investment rate in 1970–1988.)

The results are shown in Table 6. We report the values obtained for the 20 countries that we examined earlier and for the average OECD countries in 1970 and in 1988. It is first extraordinary to note the wide differences of capital–output ratios across the world. (This point is also emphasized in MRW.) When interpreted in terms of rate of returns, these amount to differences that range from 15.5% in the case of France and Germany to about 45.5% in the case of Thailand and Philippines.

While most LDCs are off the open economy benchmark, only a few (9) of them were (two OECD standard deviations) off the closed economy benchmark in 1988. The latter are: Malawi, Tanzania, Zimbabwe, Hong Kong, Pakistan, Brazil, Philippines, and Thailand (plus Australia, which is the only OECD country to be "capital poor" with respect to the open economy target). When testing this hypothesis formally, one finds that—in 1988—the large debtors are significantly off the OECD average

as far as the open economy criterion is concerned but not significantly (at the 95% degree of confidence) off the OECD average as far as the closed economy benchmark is concerned. On the other hand, in 1970, one finds that they were off *both* benchmarks. So, to some extent, the large debtors did follow their transitional dynamics over the past two decades. Were they helped by the access to the world financial markets?

3.2.4 Capital Accumulation in the Group of Large Debtors Prior to the Debt Crisis In order to find out if this is the case, we analyze the speed of capital accumulation in the group of large debtors and compare it to capital accumulation in the other nondebtor developing economies in the 1970s (prior to the debt crisis). Specifically, we regress the growth rate of physical capital (*dk*) on the initial value of (the log of) per capita income (y_0) and of physical capital per head (k_0).

We first analyze capital accumulation for a sample of 48 developing

Table 6   DISTANCE "OFF" OPEN ECONOMY (OMEO) AND CLOSED
ECONOMY (OMEC) BENCHMARKS

	1970		1988	
	OMEO	OMEOC	OMEO	OMEOC
Algeria	0.16	3.50	−0.79	2.55
Egypt	1.78	3.58	0.82	2.63
Ivory Coast	0.98	3.27	0.39	2.68
Morocco	1.29	3.54	0.41	2.66
Nigeria	1.09	3.59	0.09	2.58
Sudan	3.52	4.04	2.10	2.62
Zaire	1.83	4.17	0.10	2.45
Mexico	−0.41	2.58	−0.33	2.67
Argentina	−0.54	1.91	−0.17	2.28
Brazil	−0.52	2.46	−0.04	2.94
Chile	−0.72	3.20	−0.04	2.44
Colombia	−0.33	2.47	−0.19	2.62
Ecuador	−0.48	2.75	−0.48	2.75
Peru	0.13	2.85	−0.16	2.57
Venezuela	0.19	3.02	−0.06	2.76
Pakistan	−0.46	2.07	0.58	3.11
Philippines			0.31	3.28
Turkey	−0.28	2.82	−0.36	2.74
Large Debtors	0.70	3.17	0.16	2.67
OECD	−0.82	2.40	−0.65	2.57
(OECD standard deviation)	(0.79)	(0.76)	(0.24)	(0.15)

countries, while controlling for the group of large debtors (dummy DSM). We get:

$$dk = -0.10 - 0.026 \, \text{DSM} + 0.0823 \, y_0 - 0.0610 \, k_0; \qquad R^2 = 0.66$$
$$(-2.25) \qquad\qquad (6.71) \qquad (-9.1)$$

(t statistic in parentheses). Period of estimation: 1970–1980.

This regression is interesting in its own right. Capital accumulation appears to be positively correlated with initial income and negatively correlated with the initial stock of physical capital. When one takes the view that $y_0 = \dfrac{1}{3} (h_0 + k_0)$, this also implies a positive correlation with initial human capital and a negative correlation with initial physical capital. The key result of interest to us, however, is that the capital in the severely indebted countries grew *less* rapidly than capital in the other developing countries.

A key feature of the large debtor countries' capital accumulation is revealed when one tests for the stability of the partial correlation of capital accumulation with respect to y_0 and k_0. When one restricts the sample to the subgroup of debtors only, one gets:

$$dk = -0.15 + 0.083 \, y_0 - 0.059 \, k_0;$$
$$(5.7) \qquad (-7.3)$$

$R^2 = 0.64$ (t statistics in parentheses)

Period of estimation: 1970–1980.

As one sees, the coefficients obtained for the subsample of large debtors appear to be essentially identical to the coefficients for the developing countries at large. (A Chow test formally rejects the hypothesis that the coefficients are different.)

One conclusion that one draws from these results is that the 1970s failed to change the qualitative pattern of capital accumulation in the group of large debtors. In those countries, capital accumulation was less rapid, but for exogenous rather than for endogenous reasons. One consequently gets the intuition that the group of large debtors behaved more like a closed economy with a low saving rate rather than as an open economy.

3.2.5 Domestic Saving and Investment Off and at Financial Autarky   In order to get a more specific estimate of the distance of investment from a

closed economy benchmark, let me—briefly—build on previous work to calculate a "financial autarky" investment rate and see how far off that benchmark the group of large debtors stood over the past three decades.

In order to calculate the rate of investment that would have prevailed under financial autarky, let us assume that investment is a function of an exogenous (predetermined) set of variables (x_i) and of a shadow cost of capital, ρ. One then writes:

$$\frac{I}{Q} = \sum_i a_i x_i - \alpha \rho + \epsilon$$

Similarly, assume that saving can be written as:

$$\frac{S}{Q} = \sum_i b_i x_i + \beta \rho + \eta$$

Given the national account identity, one knows that:

$$S = I + TB$$

with TB the resource balance. Substituting for the value of ρ, which is consistent with the availability of funds, one gets:

$$\frac{I}{Q} = \frac{1}{\alpha + \beta} \left[\sum_i (\beta a_i + \alpha b_i) x_i + \beta \epsilon + \alpha \eta \right] - \frac{\alpha}{\alpha + \beta} \frac{TB}{Q} \qquad (15)$$

The first term in the brackets is nothing else but the "financial autarky" investment rate, that is, the rate to prevail when ρ is (domestically) set so as to impose $I = S$. The second coefficient is a crowding in or out coefficient. Perhaps more intuitively one can characterize $\dfrac{\beta}{\alpha + \beta}$ as the "leakage" of foreign finance out of investment into aggregate consumption.

While the relation (15) is *always* true, whether $\dfrac{TB}{Q}$ is determined endogenously or exogenously set out of a rationed access to the world financial market, it can only be econometrically tested in the latter case.

In another work (Cohen, forthcoming), I have tested this correlation over the 1960s and during the 1980s for the group of rescheduling countries, on the ground that both these subsamples were characterized by

a restricted access to the world financial market. I found that over both subperiods, the coefficients $\dfrac{\alpha}{\alpha + \beta}$ were not statistically different and around 0.30. This shows that the "leakage" of foreign finance out of investment (the coefficient $\beta/\alpha + \beta$) is very large because it amounted to 2/3 of the foreign impulse (whether its sign was positive as in the 1960s, or negative as in the 1980s).

Let me simply report here the results of a regression in which the impact of the trade balance onto investment is distinguished according to the time subperiods (1960s, 1970s, and 1980s) and—in the 1980s— according to the status of the developing country (rescheduling, nonrescheduling). One gets:

$$\frac{I}{Q} = 5.27 - 3.17\,\text{DLA} - 2.90\,\text{DAF} + 2.37\,\text{D7481} - 1.76\,\text{D8287}$$
$$\quad\ (2.28)\quad (-3.02)\qquad (-2.42)\qquad (2.09)\qquad\qquad (-1.76)$$

$$+\ 1.14\,\text{POPERT} - 0.29.10^{-1}\,\text{INFL} + 0.17\frac{X}{Q} + 0.21\,y_0$$
$$\quad (1.92)\qquad\qquad (-2.23)\qquad\qquad (4.31)\qquad (2.40)$$

$$+\ 0.10\,\text{ENROL1} - 0.33\,\text{KTB60} - 0.17\,\text{KTB70}$$
$$\quad (5.12)\qquad\qquad (-4.64)\qquad\ (-2.58)$$

$$-\ 0.31\,\text{KTB80R} - 0.20\,\text{KTB80NR}; \qquad R^2 = 0.56$$
$$\quad (-8.29)\qquad\quad (-6.38)$$

(t statistics in parentheses),

in which DLA and DAF are Latin American and African dummies; D7481, D8287 are time dummies for 74–81 and 82–87, POPERT is population growth; INFL is the inflation rate, X/Q is the export-to-GDP ratio, y_0 is beginning of period per capita income, ENROL is primary school enrollment. KTB60, KTB70, KTB80R, and KTB80NR are the trade balance in the 1960s, 1970s, and 1980s in the group of rescheduling and nonrescheduling countries, respectively.

All attempts to instrument the trade balance in the seventies reduced the crowding out coefficient. Furthermore, when one uses a regression based on the 1960s only to forecast the 1970s, one finds that the regression *over*predicts the share of investment in GDP by about 1% for all countries and 1.5% for the debtor countries (albeit the differences are not significant). Although the potential endogeneity of the trade balance

is not appropriately dealt with in the seventies and—for the nonre-schedulers—in the 1980s, we are led to a simple conclusion: The impact of foreign finance on investment never seems to have exceeded the level that it reached in the 1960s, of about 0.3. (See also Warner, 1991, for an analysis that rejects the hypothesis that the debt crisis caused the investment slowdown.) As I show in my earlier paper, this is consistent with the view that the intertemporal elasticity of substitution is about 1/3 (which is quite reasonable). In other words, the leakage of foreign finance into consumption is a feature that one should expect whenever a poor country starts borrowing. As the case study of Singapore by Young (1992) shows, however, there are cases when this feature can be avoided through (a quite authoritarian) government policy.

3.2.6 Conclusion   One sees that investment never appears to have gone very far off the closed economy benchmark in the group of large debt-ors. This explains why we found no *endogenous* difference in their rate of capital accumulation. With the numbers that we got, even a deficit of 6% of GDP would only raise domestic investment by 2%. To get an estimate of its impact on growth, one can take equation (11) to see that it would only generate an additional growth of 0.4%. The success story of East Asia teaches—from that perspective—a simple lesson. It saves 60% more than the rest of the developing countries, and this may gener-ate (from equation 11) an extra growth of per capita income of 3%. Taking account of the leakage coefficient that we estimated, this would require an external deficit of 30% of GDP! When one remembers that—at best—the large debtors seem capable of servicing no more than 3% of GDP, one sees why sovereign risk comes very quickly to be a binding constraint. (See Marcet and Marimon, 1991, for a similar conclusion.) This is why *regional* integration could make a difference. However big the number may look, 30% of their GDP may well actually be what Eastern Germany is currently receiving from the West.

Do these results foreclose the role of foreign finance as a vehicle to speed up growth? Not entirely. For one thing, direct investments are always welcome to the extent that they help transfer technologies. But even debt finance can play a role if it helps by speeding up (rather than by shifting up) the transitional dynamics of a poor country from an initially low level of physical capital to a higher level, provided that the higher level is consistent with domestic saving. In order to have foreign finance perform such a role, it must be (besides controlling its saving rate) that the "poor" country is relatively well endowed in human capi-tal and relatively poor in physical capital. Although this is a rare combi-nation, this may be a good description of Eastern Europe today.

Appendix 1: DEPENDENT VARIABLE—GROWTH RATE OF PER CAPITA INCOME 1960–1987

	(1)	(2)	(3)	(4)	(5)
c	$0.37.10^{-2}$	0.029	0.030	0.068	0.058
		(1.66)	(1.78)	(4.09)	(3.78)
D6773	$0.90.10^{-3}$	$0.16.10^{-2}$	$0.15.10^{-2}$	$0.27.10^{-2}$	$0.24.10^{-2}$
	(0.23)	(0.42)	(1.62)	(0.67)	(0.62)
D7480	$-0.98.10^{-2}$	$-0.62.10^{-2}$	$-0.63.10^{-2}$	$-0.89.10^{-2}$	$-0.95.10^{-2}$
	(−2.44)	(−1.57)	(−1.62)	(−2.13)	(−2.33)
D8187	−0.03	−0.023	−0.022	−0.025	−0.026
	(−7.39)	(−4.50)	(−4.75)	(−4.66)	(−5.35)
DSM		$-0.60.10^{-2}$		−0.010	
		(−1.62)		(−2.63)	
DSM81		$-0.89.10^{-2}$		−0.016	
		(−1.38)		(−2.50)	
DRES			$-0.57.10^{-2}$		$-0.99.10^{-2}$
			(−1.60)		(−2.87)
DRES81			−0.014		−0.019
			(−2.22)		(−2.96)
TT7481		0.18	0.18		
		(4.01)	(4.26)		
LINV	0.020	0.017	0.014		
	(2.84)	(4.60)	(3.66)		
LYI	$-0.74.10^{-2}$	$-0.91.10^{-2}$	$-0.88.10^{-2}$	$-0.92.10^{-2}$	$-0.81.10^{-2}$
	(−2.70)	(−3.31)	(−3.28)	(−3.24)	(−2.94)
LENR2	$0.85.10^{-2}$	$0.82.10^{-2}$	$0.93.10^{-2}$	0.12	0.012
	(2.84)	(2.73)	(3.21)	(3.88)	(4.14)

t statistic in parentheses. Explanatory variable: D6773, D7680, D8187: time dummy; DSM: dummy for severely and moderately indebted country; DRES: dummy for rescheduling countries; DSM81 = DSM * D8187; DRES81 = DRES * D8187; TT7481: terms of trade after 1974; LINV: log of share of investment in GDP; LYI: log of initial per capita income; LENR2: log of secondary school enrollment.

APPENDIX 2

Assume that output is:

$$Q_t = K_t^\alpha H_t^\beta L_t^\gamma \quad \text{where } \alpha + \beta + \gamma = 1 \tag{A1}$$

and write the law of motion of capital to be:

$$K_{t+1} = (1 - d)K_t + I_t \tag{A2}$$

in which I_t is the amount of investment undertaken at time t.

Assume that H_t ("human capital," or perhaps more appropriately "immaterial capital") can only be accumulated domestically and follows a law of motion that can be written as:

$$H_{t+1} = (1 - \delta)H_t + s_2 H_t^\lambda K_t^\nu L_t^{1-\lambda-\nu}. \tag{A3}$$

in which s_2 is the number of hours spent on education (and, say, collinear with school enrollment data) while $H_t^\lambda K_t^\nu K_t^{1-\lambda-\nu}$ is a measure of an "aggregate" stock of knowledge that education builds upon.

Let us now assess, within such a framework, the extent to which the access to the world financial market changes the pattern of growth of a nation.

1. Dynamics in the Closed Economy

So as to simplify the analysis of the dynamics, let me assume that $d = \delta = 1$, so that the time interval is, say, one generation, and assume that population growth is zero.

Assume that $I_t = s_1 Q_t$ in which s_1 is the propensity to save (say, of the young generations). In this case, one can write (in Log terms) the dynamics of the economy as:

$$k_{t+1} = \text{Log } s_1 + \alpha k_t + \beta h_t \tag{A4}$$

$$h_{t+1} = \text{Log } s_2 + \nu k_t + \lambda h_t \tag{A5}$$

The system is converging toward a steady state (which depends on s_1 and s_2) if and only if $(\alpha - 1)(\lambda - 1) - \beta\nu > 0$.

2. Dynamics in the Open Economy

Assume now that the country has a totally free access to the world financial markets so that capital can freely flow in up to the point where

$$\frac{\partial f}{\partial K}(K_{t+1}, H_{t+1}, N_{t+1}) = 1 + r$$

so that

$$k_t = \theta_0 + \frac{\beta}{1 - \alpha} h_t ; \quad \text{with } \theta_0 = \frac{1}{1 - \alpha} \text{Log} \frac{\alpha}{1 + r} . \tag{A4'}$$

Assume furthermore that the law of motion of human capital is not dependent upon the way physical capital is accumulated. One then finds that the system (A4') and (A5) is converging toward a steady state if and only if $\frac{\nu\beta}{1 - \alpha} + \lambda - 1 < 0$, which is the *same condition as in the closed economy case.*

3. Intuition

The result is intuitive because the open economy's capital stock is

$$k_t^o = \frac{\beta}{1 - \alpha} h_t + \theta_0$$

while the law of motion of capital in the closed economy can be written:

$$k_{t+1} - k_t = (1 - \alpha)[k_t^c - k_t]$$

in which

$$k_t^c = \frac{\beta}{1 - \alpha} h_t + \theta_c ; \quad \text{with } \theta_c = \frac{1}{1 - \alpha} \text{Log } s_1.$$

Up to a constant, the closed economy is running after a target that has the same dependency on human capital as the open economy capital stock. If one system is converging toward a steady state, so must be the other one. To go one step further in the analysis of the dynamics, first consider the simple case in which $\nu = 0$. In that case, the closed economy has two eigenvalues that are simply λ and α, while the open

economy has only one, λ. If $\alpha > \lambda$, then the closed and the open econo-
mies look different. The closed economy asymptotically converges to-
ward its steady state at a speed $1 - \alpha$, while the open economy
converges at a speed $1 - \lambda$. If instead $\lambda > \alpha$ (as it is intuitively the case,
and as appears to be the case when testing directly an equation such as
(A3)) then, asymptotically, human capital accumulation will be driving
the growth rate of the economy in both cases, and both of them will
asymptotically converge at the speed $(1 - \lambda)$. In the general case when
$\nu \neq 0$, this is still qualitatively true if $\dfrac{\beta \nu}{1 - \alpha}$ is small with respect to λ.

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Comment

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As usual, Daniel Cohen has written a wide-ranging paper that touches on a variety of interesting topics. In the interests of brevity, I will confine my remarks to just a few areas—Cohen's estimates of private creditor losses during the debt crisis, the importance and the measurement of official creditor seniority, and a critique of the Brady plan deals.

1. Losses of the commercial banks

Cohen argues that losses on Third World debt have been small, measuring returns in dollars and using data from the World Debt Tables. But as he acknowledges, currency differentials can greatly influence these results. For example, from 1985 to 1987 Brazil paid in $242 million to the World Bank. At the same time, its debt to the Bank grew from $4 billion to $9.4 billion, primarily because these loans were in currencies that rose dramatically against the dollar. All told, almost two thirds of the growth in World Bank claims against the Third World during this period, when outstanding loans rose from $36.6 billion to $89 billion, was due to the dollar's decline. This does not imply that the Bank, which assiduously hedges most of its currency risk, made extraordinary profits from these borrowers. Similarly, looking at results in dollars may understate the losses of the commercial lenders.

How can we appropriately measure the losses suffered by the commercial banks, given the currency issue? Ideally, any measure should indicate that if a bank lent at the riskless interest rate, forgave none of its debt, and could realize 100 cents on the dollar for outstanding loans,

then the bank would have broken even. Similarly, if a country paid no cash out since the initial period, then the loss of the creditors should be proportional to the discount at which the debt is selling. It turns out that there is a fairly simple formula that has these and other equally desirable properties.

To calculate the amount that private creditors have lost since the beginning of the debt crisis, I assume that (1) all debt repayments are made at the end of the year; (2) the World Bank's estimates of debt stock reduction apply to private debt, while "debt forgiveness" applies to official debt; and (3) on average, debtors were charged an interest rate that would have given the lenders a two-point profit were the loans repaid in full. (On average, countries paid roughly 2% more than LIBOR, but lender costs, including administrative expenses, were clearly above LIBOR.)

The private creditors' losses can then be calculated as:

$$L_0 = 1 - P_T \prod_{t=1}^{T} \frac{D_t}{D_t + NT_t - X_t} - \sum_{t=1}^{T} \frac{NT_t}{D_t} \prod_{s=1}^{t} \frac{D_s}{D_s + NT_s - X_s},$$

where
  $L_0 \equiv$ amount of loss in present value as a function of debt outstanding
      at $t = 0$;
  $P_T \equiv$ the price of debt at terminal time t;
  $D_t \equiv$ debt outstanding at the end of year t;
  $NT_t \equiv$ the net transfers made in year t;

and $X_t = .02D_t - F_t$, where F_t is the amount of debt reduction that occurs in year t. That is, X_t would represent the creditors' economic profits in year t, if they received a gross interest rate 2% above the riskless rate and then granted debt reduction of F_t, if its debt was worth par at both the beginning and end of the year.

Using this methodology, it is possible to estimate that, from the end of 1981 until the end of 1990, the commercial banks lost over 30% of their initial investment, even assuming an average debt price of 50 cents on the dollar at the end of 1990. (The data used is from recent hard copy editions of the World Debt Tables, Vol. 1, looking at the relevant variables in the tables for all developing countries. 1981 is defined as year 0 and 1990 as year $T = 9$.) There is no moral issue here—the fact that the banks have made very poor returns in some countries does not imply that the leaders of those countries should strive to do more for

the banks in the future—but for commercial banks that typically have equity stakes that are less than a tenth of total assets, losses of this magnitude are very serious.

2. *Seniority*

Whether official creditors are senior or junior to commercial creditors is one of the major underexplored areas of the debt crisis. It is obviously quite relevant to "burden sharing," the issue of whether official or private creditors bear the bulk of the cost of any debt restructuring plan. Furthermore, we can also learn something about the net effect of a restructuring on a country if we understand more about seniority. For example, a number of calculations indicate that private creditors may have gained a little, or perhaps broken even, from the Mexican Brady deal. If official creditors as a group are, in fact, certain to be repaid in full, then these creditors presumably did not lose anything from the Mexican restructuring either. The implication would be that the Mexican Brady deal did not reduce the expected present value of the country's future debt repayments, only the variance around those payments. Any gain to Mexico from the deal would have to stem from the new contract requiring repayments that were less state contingent.

While I applaud Cohen's efforts in this area, there is a problem in estimating the price of debt as a function of the share of official creditors.

That is because it is well known that official creditors have gone out of their way to lend to countries who did not have access to private lenders. It is therefore necessary to use an instrumental variables approach to remove the endogeneity of official share and debt price. Kenneth Rogoff and I do this in Bulow and Rogoff (1992) and, like Cohen, find no compelling evidence that official creditors are either senior or junior to private creditors.

There is also the issue of whether, even if all official creditors are not senior, the World Bank and IMF have some kind of priority. These institutions almost invariably get repaid in full. The IMF has even been able to extract $4 billion from sub-Saharan Africa over the last 6 years. But it is possible, if not likely, that these "preferred creditors" are repaid out of the pockets of other aid agencies so that, for example, the IMF repayments in sub-Sharan Africa may have been financed by aid from the International Development Agency and the bilateral aid agencies. What this implies is that, even if the IMF and World Bank always get repaid, there is nothing inconsistent with Cohen's result that official creditors as a group are not better than equal priority, and new IMF loans may create a burden that is primarily, if not totally, borne by

official creditors. The nature of World Bank and IMF seniority is still an unresolved research question.

3. The Brady Plan

I am somewhat more sanguine than Cohen is about the efficacy of the Brady plan. It is worthwhile to recall how the need for the Brady plan developed. Early in the debt crisis, restructuring typically involved no debt forgiveness. For example, assume that a country owed $50 billion, on which $5 billion in interest was owed. The country might agree to pay all of its interest obligations, if creditors would agree to lend an extra $2 billion, reducing the country's cash cost to $3 billion.

Typically, all lenders would be asked to participate proportionately in the new loan. Because the country's debt might only be worth 80 cents on the dollar, there would be a free rider problem. An individual bank would be about 8% worse off in the example if it agreed to relend 40% of its interest income, and the new loans were worth 20% less than face value, than if it refused to participate in the new money package. While many small banks did not participate in new money packages, the benefits of free riding were not that large, and the costs to the remaining banks of making up for the free riders were also manageable.

By the late 1980s, such deals were less feasible. By this time many countries' debts had increased, with no comparable increase in their capacity to repay. Now debts were selling at 30 cents on the dollar and sometimes less. The discount that a bank could save by free riding on a new money package would be 3.5 times as great at a debt price of 30 (discount of 70%) than when debt sold at 80 (discount of 20%). Furthermore, if the country were to pay a smaller fraction of the larger interest payment in cash, the free riding incentive would be further magnified. At this level, more banks were likely to refuse to participate in new money negotiations, and larger banks might have been better off with partial default, in which a country paid only part of its interest due and did not receive a new loan, than with a new money agreement in which they were required to put up most of the funds.

The Brady plan recognized the problem of negotiating new money deals when the price of debt is too low. Effectively the commercial banks, under pressure from governments, agreed to accept relatively small lump sums in return for substantial reductions in the amount of private debt. The best estimates are that the banks did not lose from these deals. For example, if a country had 80 in debt outstanding, worth 40 cents on the dollar, and was able to reduce the debt to 40 in return for a payment of 4, then creditors would break even if the price of the

remaining debt rose to 70 cents, leaving the creditors with a total package worth $32 billion both before and after the deal. This implies that any gains from the Brady deals did not come at the expense of creditors. But with the price of debt raised by the buy-back any needed future debt restructurings may be easier.

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Comment

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Cohen (1991) following his "Theoretical Autopsy" has produced this equally valuable piece "A Post Mortem." His next piece on international debt might yet be called "The Night of the Living Dead," if indeed the 1990s does not turn out to be the decade of grand settlement of the debt problem.

This thought-provoking piece recapitulates a number of the major debates on developing country indebtedness over the last decade. Three important aspects of the debt issue are addressed. First is the question of whether the Brady deal is a good vehicle to achieve a grand settlement of the debt crisis. Cohen suggests the answer is no. The second question is whether productivity growth of highly indebted countries fell between the 1960s and the 1980s. Cohen presents evidence that productivity growth has slowed down for rescheduling countries during the 1980s. However, he is unable to link conclusively this slowdown to countries' indebtedness. Finally, based on estimation of investment equations, Cohen sugggests that access to foreign finance in the 1970s has not enhanced investment opportunities in the borrower countries.

Cohen's emphasis on the settlement of debts seems somewhat puzzling given his negative findings on the effects of indebtedness on growth and foreign finance on investment.

Why is settlement of nominal debts an issue? One reason is the debt overhang: the presence of a large amount of debt that creditors do not expect to be fully repaid. See Krugman (1987). Large secondary-market discounts indicate creditors' pessimism about the prospects for repayment. In much of the literature debt overhang is viewed as a tax on

investment. Increased output is held to increase the amount a country will repay, as it shares the returns of investment with foreign creditors. Hence, repayment acts as a tax on investment. A second consequence of debt overhang might be that productive investment opportunities are unexploited because of the illiquidity problems caused by large outstanding nominal debts. The illiquidity problem arises because in the absence of seniority clauses, new lenders do not have any incentive to make loans, because their claims would be diluted alongside with the old loans. Along the similar lines, it is often asserted that free-rider problems among existing creditors diminish the incentives of these creditors to make any new loans.

The evidence presented in the paper suggests that neither of the above two reasons is likely to be very important. While rescheduling countries appear to have suffered from a slowdown in productivity growth, indebtedness does not appear to explain the slowdown. Access to financial markets does not seem to have enhanced investment either. Consequently one might advise debtors to "leave the private debt hanging." See Bulow and Rogoff (1990).

Cohen posits a solution to the debt problem where the creditor banks commit to allowing the countries to repurchase their debt, after giving them the opportunity to accumulate reserves, at prices agreed upon *ex ante*. Yet this solution is extremely difficult to implement in practice. It supposes that the banks, on their own, will be able to resolve free-rider problems and make a credible commitment to let the countries purchase their debt at the right price.

The International Financial Institutions' (IFI) role in debt restructurings, such as in the Brady plans, are a response to such difficulties. Typical elements of such plans and the functions that they serve can be summarized as follows: See Diwan and Rodrik (1992). IFIs make new loans to countries, in part, to accommodate adjustment programs that countries commit to undertake, which have high initial costs. In addition, loans from IFIs allow countries to purchase part of the debt outstanding from their commercial creditors. In these arrangements, banks typically agree to sell a quantity of outstanding debt at a particular price, and make some new lending.

The parameters of these agreements, the amount of new loans made, the relative shares of banks and IFIs in the new loans, the amount of the debt retired, and the price at which it is retired determine the burden sharing among different classes of lenders and the borrower. The menu approach of recent agreements provides banks with an opportunity to select from a set of options according to their own valuation, hence combining market elements with concerted mechanisms.

The IFIs play a crucial role by monitoring the borrowers' adjustment efforts, for which they are better equipped than individual private banks. The IFIs' better capacity to undertake such monitoring is due to a number of factors, such as their experience with countries, their superior access to information, and the greater political acceptability of monitoring by IFIs as opposed to private commercial banks.

Whether the IFI loans are senior to loans from private lenders or not has important implications for debt settlement packages as well as for the potential role IFIs might play in the ongoing reforms of Eastern Europe and the republics of the former Soviet Union.[1] Cohen does not find evidence of seniority effects (for which I believe he has used 1989 data as I infer inspecting Table 1). To have a cursory look at the impact of official debt on discounts in the secondary market I have estimated the following regression.[2] (The numbers in parentheses are t values.)

$$\text{Log (discount)} = 3.99 + .003\,\text{dexp} + .009\,\text{rimp} - .54\,\text{rgnp} - .02\,\text{inf}$$
$$\quad\quad (5.23)\quad (3.21)\quad\quad (.79)\quad\quad (-2.17)\quad (-2.41)$$

$$.15\,\text{y87} + .51\,\text{y88} + .14\,\text{spr} - 3.54\,\text{offc}$$
$$(.60)\quad\quad (1.98)\quad\quad (3.26)\quad (-4.03)$$

R sqr $= 0.7$
Adj. Rsqr $= 0.6$

where discount $= 100 -$ bidprice, dexp $=$ debt /exports, rimp $=$ reserves/imports, rgnp $=$ real GNP per capita, inf $=$ rate of inflation, spr $=$ spread between bid and ask prices, offc $=$ share of official debt (total multilateral and bilateral) in total debt, y87 and y88 are dummy variables for 1987 and 1988, respectively.

The previous results suggest that official debt is senior to private debt. There are several reasons for the contrast between these results and Cohen's. First, Cohen considers 1989; the above regression is for 1986–1988. Second, Cohen looks at IFI debt, which must be the multilateral debt category, whereas I look at total official debt. Finally, the equations are somewhat differently specified.

The contrast between the previous regression and the analogous re-

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1. For a recent study of the role of IFIs in the East, see Bulow and Rogoff (1992). The authors provide a wealth of evidence that challenges the IFI seniority hypothesis.
2. The data are annual for the 1986–1988 period and include Argentina, Brazil, Mexico, Venezuela, Colombia, Chile, Ecuador, Morocco, Philippines, Turkey, Zaire, and the Ivory Coast. The annual values are obtained from the quarterly data used in Ozler and Huizinga (1991). The countries are the subset of countries Cohen uses, which are also in Ozler and Huizinga.

gression in Cohen's paper suggests a more careful consideration of the evidence on seniority is needed.

Cohen's study addresses a number of very important issues empirically, providing a "first pass" at them and pointing to the importance of further and more detailed investigations. Cohen's regression analysis does not provide evidence indicating that various measures of indebtedness affect growth. Yet it may be that indebtedness interacts with the political and institutional climate in the country. In more polarized and politically unstable countries, higher levels of external debt, and struggle over burden sharing may reduce growth. If so, this effect could be detected by regressing growth on indebtedness interacted with measures of these other variables.[3]

I question Cohen's claim that there are no substitutes for domestic savings, which he bases on regressions of domestic investment and availability of foreign finance. There are numerous historical examples that point to the benefits of international financial integration in development process, while the importance of the relative timing of integration and other macro and international policies is well known.

In sum, while I do not agree with all the views expressed in this paper, which require considerably more empirical support, the paper provides a stimulating and important overview of many major issues.

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3. See Ozler and Rodrik (1992) for a similar approach in estimating investment levels.

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Discussion

Stan Fischer argued that in determining the beneficiaries of the Brady Plan, the secondary market prices for debt are essentially useless. Market participants certainly anticipated that some kind of settlement was going to occur well before the Brady Plan was announced. Thus, the only information gained from examining movements in secondary market prices is whether the settlement was more or less generous to debtholders than was expected.

Alan Stockman suggested that additional theoretical work on the question of why did the debtor countries repay their debt would be useful. For example, understanding how reputation, the imposition of sanctions, and the possibilities of negotiation are interrelated is crucial for evaluating the genesis and the effects of the Brady Plan.

On this issue, Bill English noted that Cohen assumes a discount factor of only .85. This value seems low, suggesting that Cohen overstates the amount that countries are willing to pay to avoid the default penalty. In addition, English argued that, based on the Bulow and Rogoff *JPE* paper, the default penalty imposed by creditors is likely to be more substantial than Cohen assumes.

Olivier Blanchard questioned the use in debt settlements of the marginal price of debt as opposed to the average price. From the point of view of the debtor countries, the marginal price is clearly preferable. However, from the point of view of society, this may not be the correct price, because the discrepancy between the marginal price and the average price arises from behavior on the part of the debtor countries that we may not want to validate.

Herschel Grossman remarked that one must be careful when drawing inference from the countries that have defaulted on their debt without experiencing a systematic worsening in the terms at which they can borrow in the future. To the extent that these defaults are the result of crisis situations and are in some sense "excusable," their subsequent treatment cannot be interpreted as the penalty for outright repudiation. Stan Fischer noted that one of the significant lessons of the debt crisis is the importance attached by the debtor countries to being in good standing with the international agencies and the international capital markets.

Michael Gavin observed that looking only at the residuals of the growth equation in order to gauge the effect of the debt crisis on growth may be misleading. A substantial part of the effect may work through the other right-hand side variables, such as terms of trade. Citing the large drop in the ratio of investment to GDP for Mexico from 27% in 1981 to 16% in 1982, Gavin questioned the notion that the debt crisis had little effect on investment. Responding to the first point, Cohen argued that in principle this is correct, but in fact these effects are not that important for the debt crisis. Stan Fischer remarked that these growth regressions must be interpreted cautiously because there is tremendous endogeneity in the first place in terms of which countries got into the debt crisis.