OECD DEVELOPMENT CENTRE

Working Paper No. 67
(Formerly Technical Paper No. 67)

AN ASSESSMENT OF THE BRADY PLAN AGREEMENTS

by

Jean-Claude Berthélemy and Robert Lensink

Research programme on:
Financial Policies for the Global Dissemination of Economic Growth

OECD OCDE

May 1992
OCDE/GD(92)101

Technical Paper No. 67,
"An Assessment of the Brady Plan Agreements",

by Jean-Claude Berthélemy and Robert Lensink, produced as part of the research programme on Financial Policies for the Global Dissemination of Economic Growth,
May 1992.

TABLE OF CONTENTS

RÉSUMÉ

Ce document présente une évaluation des plans Brady du point de vue des cinq pays débiteurs qui ont jusqu'à présent mis en oeuvre de tels accord (Costa Rica, Mexique, Philippines, Uruguay, Venezuela). Dans un premier temps, on montre que le relatif succès du plan Brady mexicain n'est pas nécessairement généralisable, tant la diversité des accords signés est grande. Une évaluation au cas par cas est par conséquent nécessaire. Dans un second temps, on tente de mesurer les effets des plans Brady en termes de répartition des gains et pertes de richesse entre les parties prenantes. Cette tentative présente l'originalité de tenir compte explicitement du rôle des créanciers multilatéraux dans le partage du fardeau. En première analyse, les plans Brady sont ici interprétés comme un "cadeau" des créanciers officiels, partagé à une exception près à parts sensiblement égales entre les banques et les débiteurs. Si l'on complète l'analyse pour tenir compte de gains d'efficacité spécifiquement provoqués par les plans Brady, l'évaluation peut être modifiée au cas par cas, mais sans conduire à des conclusions systématiquement optimistes sur les accords Brady. Le document s'achève sur la présentation de simulations macro-économiques qui permettent de mesurer et de comparer les effets des plans Brady sur la croissance à court terme, lesquels effets sont de faible ampleur.

SUMMARY

This paper presents an assessment of the results of Brady plans for debtor countries which have implemented such agreements (Costa Rica, Mexico, the Philippines, Uruguay and Venezuela). First, we show that the relatively successful Mexican case cannot be generalized, due to the great diversity of the agreements signed. Hence a case-by-case analysis is essential. Second, we attempt to measure the distribution of wealth gains and losses among Brady plan participants. An original feature of this attempt is that we explicitly take account of the role of multilateral creditors in the burden sharing. In a simplified framework, Brady plans are interpreted as a "gift" from official creditors, which is, with one exception, fairly equally shared between banks and debtors. On completion of this analysis, the assessment is modified on a case-by-case basis in order to take account of efficiency gains specifically linked to the Brady deals. This does not lead to very optimistic conclusions about the effects of Brady deals. Finally, macroeconomic simulations are presented, providing an assessment of the short-term growth effects of the Brady plans. These effects appear to be very limited.

PREFACE

This Technical Paper, part of the research programme on "financial policies for the dissemination of economic growth", draws some lessons from the new strategy of commercial debt relief resulting from the so-called Brady Initiative.

Mexico has been the first beneficiary of this new strategy towards the resolution of the debt crisis, and probably for this reason most of the assessments of the Brady Initiative have been drawn on this sole experiment. On the other hand, a number of other developing countries have now reached similar agreements (namely the Philippines, Costa Rica, Venezuela and Uruguay, and very recently Argentina). It is therefore time to verify to what extent positive conclusions infered from the Mexican example have a wider relevance.

One interesting conclusion of this paper is to draw attention on the width of Brady plan experiences, in particular in terms of debt relief achievements. For most indicators, Mexico lies in the upper end of the sample, together with Costa Rica.

Another original feature of this paper is that it draws also attention to the way Brady agreements have dealt with official vs private burden-sharing issues. As long as Brady plans are financed by new official loans, there is a risk that part of the effort made by official creditors leaks to commercial banks, rather than to the debtors. Accordingly, these arrangements may be viewed, in a second-best world, as optimal subsidies intended to encourage changes of attitudes of commercial banks vis-a-vis the debtors and eventually induce efficiency gains. But adhering to such a view supposes that the subsidy is not too high as compared with the overall gains. This paper shows that this problem has not been resolved evenly among the various experiences. Obviously, the assessment depends on quite a number of assumptions, and unequivocal conclusions are difficult to obtain, even on a case by case basis. In particular, a major hypothesis concerns the effective seniority of official creditors, which directly determines the size of the implicit subsidy that they provide when they give new money. But it is remarkable that, even in the most optimistic assumption, according to which official creditors would be treated as truly senior lenders, the only debtor country which obtains a large share of the total gains is Mexico.

Therefore, a refreshing virtue of this paper is to suggest that the common wisdom, according to which the Brady plans would be a panacea for solving the commercial debt crisis, should be seriously reconsidered by policy-makers.

Louis Emmerij
President of the Development Centre
May, 1992

1. INTRODUCTION

The announcement of the commercial debt plan by US Secretary of the Treasury, Nicholas Brady, in 1989, marked the beginning of a new era in debt crisis management. The Brady Initiative differed from most previous official plans by explicitly considering debt reduction as a useful contribution to solving the debt crisis; debt relief was legitimized, on the basis that it could provide efficiency gains, shared between the debtors and the banks. Moreover, in the Brady Plan, the IMF and the World Bank have an increased role. These institutions provide financial means for guaranteeing a substantial portion of the bonds issued in exchange for old debt and for repurchasing part of it at a discount. Some creditor governments (in particular Japan) provide additional financial resources in this context.

Many authors have focused their analysis on the Mexican accord, which, being the first Brady deal, has been regarded a test case[1]. Now that we have four more cases (Costa Rica, the Philippines, Uruguay and Venezuela), it may be useful to compare the various Brady experiences. A number of other countries are also candidates for the Brady scheme (e.g., Argentina — which reached an agreement in principle in April 1992 — Brazil and Morocco), and it may be the case that this fairly strong demand for Brady deals is due to the fact that countries tend to base their assessment of such deals on the comparatively successful Mexican experience. Our contention is that an assessment based solely on the Mexican case may be biased and therefore somewhat irrelevant for policy evaluation.

A special feature of the Brady Plan is that there is no hard and fast blueprint for tackling the problem. Each country receiving different treatment since the terms of all agreements differ. The commercial banks can normally choose between several options determined by the debtor country and its Bank Advisory Committee. The only precondition is that most — if not all — banks participate in the accord, so that the traditional free-rider problem is avoided. It is therefore necessary to define common indicators to compare the deals implemented by the various debtors. In this respect, the calculations we present in this paper show that the first five Brady countries did not always negotiate with creditors in this way.

Another feature of our paper is that we have tried to take into account the role of official financing of Brady deals in analysing the distribution of costs and benefits. In most previous papers (e.g., van Wijnbergen [1991]), it is considered that the official loans provided to the debtor to finance the deals are senior loans, so that official lenders are not involved in the distribution of costs and benefits. As a result, the only distributive question is that of how the efficiency gains are shared between the debtors and the banks. This particular question is already quite complex, and has been solved only partially (e.g. Bulow and Rogoff [1991]). But this is not the only question. We consider that the assumption that official creditors are, in economic terms (rather than in legal terms), treated (or behave) as if they had a senior status is one that needs to be empirically tested. In this respect, it is worth mentioning that several papers, including an empirical evaluation by J.C. Berthélemy and A. Vourc'h (1991), have suggested that official creditors, and in particular IFIs, may have been treated in recent years as junior, rather than as senior lenders, since the counterpart of their "preferred

creditor status" is that they have had to refinance implicitly, through new loans, the whole debt service obtained from their debtors. If official loans which are provided to finance the Brady deals are actually not treated as senior loans, then the game to be considered has three players: it involves not only the debtor and the banks, but also IFIs (and some bilaterals), which finance the deal, and then bear some of the financial cost. Our paper, unlike earlier ones, seeks to address this issue.

Other important aspects of the existing literature on Brady deals may need deeper investigation, concerning in particular the common assumption of an efficient secondary market for LDC debts, on which the calculation of financial costs and benefits is primarily based. Also, it is worth mentioning that benefits from the Brady deals can go beyond purely financial gains. These aspects are not treated in the present paper.

Section 2 starts with a presentation of the basic characteristics of the debt reduction packages and estimates the debt reduction obtained using several different approaches. Our calculations show that, with the exception of Costa Rica and Mexico, the Brady Plan did not bring any substantial debt reduction.

Next, Section 3 assesses the financial costs and benefits of the Brady deals for the banks and the debtors. This Section is based on the assumption that secondary market price evolutions may be interpreted as the result of a rational assessment by the market, and thus provide information on the effect of Brady deals on lenders' wealth. One possible interpretation of the secondary market price increases observed after the implementation of Brady deals is that international financial institutions (IFIs), and other participating official agencies, are considered by the market as junior creditors. The resulting transfer of wealth from the official creditors is almost equally shared by the banks and the debtors, with the exception of Uruguay which suffered from a low contribution by these institutions to the financing of the deal. If, however, it is assumed that IFIs are actually treated as senior lenders, it is necessary to introduce large efficiency gains into the analysis, otherwise the secondary market price evolutions remain unexplainable on rational grounds. The framework then becomes more complicated because it is now a positive-sum game, rather than a zero-sum game. However, official lenders disappear to a large extent from the framework, so that we are back to the well known standard two-player game (between the debtor and its banks).

In order to complement this evaluation of net wealth effects by a more standard macroeconomic assessment, we provide in Section 4 an estimate of the direct short-term effects of the Brady accords on domestic economies. To some extent, significant short-run growth effects would be necessary to demonstrate the existence of efficiency gains: such efficiency gains, which are usually associated with a restoration of internal and external confidence, will certainly not show up if short-run natural trends are not inspiring increased confidence. According to our calculations, the short-run effects of Brady deals on growth appear to be somewhat limited, which reduces the likelihood of there being any large efficiency gains.

2. CHARACTERISTICS OF BRADY AGREEMENTS AND THEIR IMPACT ON DEBT REDUCTION

a- Basic Characteristics

Since the US Secretary of the Treasury's 1989 Speech, debt reduction deals have been concluded with Mexico, the Philippines, Costa Rica, Venezuela, and Uruguay. A detailed description of the Brady accords for different countries can be found in Appendix 1. Table 2.1 provides a summary of these different Brady accords, and shows the amounts of debt treated by the different options. The figures refer to the options chosen by the commercial banks.

Table 2.1 clearly shows that the debt reduction packages differ substantially between countries. For Mexico, Venezuela and Uruguay the Brady Plans contain a menu of different options for the creditors, whereas the greater part of the Philippines deal, and to a lesser extent that of Costa Rica, consists of buy-back only. For Mexico, contrary to the other countries, there is no buy-back option.

Table 2.1: Brady Accords of the Different Countries
(US$ million)

	Buy-back	Par Bond	Discount Bond retired	Discount Bond issued	Money
Costa Rica	991 (84)	465	-	-	-
Mexico	-	22846	19693	12800	1600
Philippines	1337 (50)	-	-	-	715
Uruguay	628 (44)	535	-	-	89
Venezuela	1411 (55)	7400 2919	1795	1257	1200

Notes: Buy-back refers to debt retired as a result of a buy-back. Figures in parentheses refer to the discount percentage of the buy-back. Par bond refers to debt exchanged at par with reduced interest rates. For Venezuela the figure of US$2919 million refers to the "step-down, step-up" bonds. The figure for Costa Rica refers to the total swapped interest payments and principal. Discount Bond retired refers to debt retired for exchange at discount. Discount Bond issued refers to new debt issued with respect to the discount bond. Money refers to new money coming available. For Mexico it equals 25 per cent of US$6397 million, for Uruguay 20 per cent of US$447 million, and for Venezuela 20 per cent of US$6000 million. For Costa Rica the Brady plan includes treatment of the interest arrears: the buy-back includes US$223 past due interest; in addition to the debt reduction shown in the Table, there has been a down-payment of 20 per cent of past due interest non tendered to the buy-back (US$29 million); finally, an amount of US$114 million of past due interest is converted into 15 year bonds.

An important feature of the Brady accords is the financial contribution of the IFIs and other foreign official creditors to the financing of the deals. Table 2.2 presents the domestic and foreign financial contribution to the Brady Plans. It is worth noting that the foreign contribution to the financing of the deal is much lower for Uruguay than for any other Brady country. In Section 3 we show that this relatively low commitment of official foreign money substantially influences the distribution of the costs and benefits of the Brady accords.

Table 2.2: The Financing of the Brady Agreements
(US$ millions)

	Total	IMF	IBRD	Other	Own	Ratio
Costa Rica	216	51	35	102	28	0.87
Mexico	7000	1697	2010	2050	1243	0.82
Philippines	670	170	150	107	243	0.64
Uruguay	463	34	65	38	326	0.30
Venezuela	2380	880	500	600	400	0.83

Notes: Ratio refers to the foreign contribution to the financing of the Brady deal. Total refers to total financing requirements of the package. For Uruguay a part of the deal is financed with new money (US$89 million), which is included in Own. The figures for Venezuela are taken from World Bank (1991c). The figure for the total cost of the Mexico deal is taken from IMF (1991, p.77). The figures for Uruguay are taken from World Bank (1991a). The other figures are from World Bank (1990a).

b- Impact on Debt Reduction

There are several ways of measuring the impact of the Brady deals on debt relief. Table 2.3 presents some possible indicators. A simple measure is the commercial debt reduction, defined as the reduction of the face value of debt owed to commercial banks (including the effect of new money provided by the banks)[2]. The total decline in commercial debt appears to be about US$9 billion. In terms of the 1989 commercial debt the total decline amounts to 11 per cent. For Venezuela the percentage reduction in commercial debt appears to be modest, whereas it is substantial for Costa Rica, which reduced its commercial debt by some 62 per cent.

One should, however, take into account the fact that foreign borrowing to support the operation increases the face value of debt. The reduction of face value of debt owed to banks and official creditors (total gross debt reduction) appears to be much smaller than the commercial debt reduction. For Mexico and Venezuela, total gross debt even increased, whereas commercial debt decreased by some US$5.5 billion and US$0.8 billion respectively. The total decline in gross debt of the 5 Brady countries appears to be very small, some US$0.5 billion only[3].

Another indicator of the effect of Brady is the change in net debt, defined as total debt reduction plus the value of the collateral minus own resources used to finance the deal. This takes into account the fact that a purchase of foreign assets to be used for collateralizing newly issued bonds increases the real net wealth of a country. Using own resources to finance the operation, on the other hand, reduces net wealth. As compared with 1989 total gross debt the decline in net debt ranges from 0 per cent for Venezuela to 22 per cent for Costa Rica.

A drawback of the above mentioned methods is that they consider the impact of the decrease in face value of debt only. They do not take into account the benefits resulting from lower interest rates. A present value approach might gauge debt relief in terms of the combined effect of changes in the face value of debt and lower interest rates. Table 2.3 therefore also presents a measure of the net debt stock relief, which equals net debt stock reduction calculated with the financial value (face value net of

grant element) of debt[4]. The table shows that total net debt stock relief amounts to US$18 billion.

A final yardstick that can be used is the net transfer relief, defined as the yearly reduction in contractual flows of interest and principal repayments owed to all creditors, net of consumed own reserves and of associated foregone interest income, plus new money[5]. On average for the 1990-93 period, it appears that total net transfer relief is about US$6.8 billion, that is 30 per cent of contractual total debt service. However, without the Brady plan, these countries would have received some transfer relief anyway, through standard rescheduling agreements. Therefore, our net transfer figures do not indicate the specific effect of the implementation of the Brady plan on transfer relief. For instance, if we assume that all principal repayments, but none of contractual interests, would have been rescheduled anyway, the remaining transfer relief of the Brady plans is much smaller, about 5 per cent of contractual debt service. Then, the main component of the net transfer relief appearing in Table 2.3 comes from principal rescheduling associated with the grace period (from 7 to 29 years) of new bonds issued in exchange for old debt.

To conclude, it appears that the impact of the Brady deals on debt reduction, debt relief and transfer relief, as a percentage of 1989 debt or debt service, was greatest for Costa Rica according to all the indicators used. For all other countries the effects of Brady deals on debt stocks appear to be much smaller, with the exception of Mexico which has received a significant net debt stock relief. With respect to debt service, two countries, namely the Philippines and Uruguay, have received very little relief, while Mexico and Venezuela obtained more significant transfer relief, corresponding to the rescheduling of principal repayments.

Table 2.3: Effects of the Brady Plan on debt stocks and flow volumes (US$ billion) and ratios (in brackets)

Country	Commercial debt reduction (a)	Total gross debt reduction (b)	Total net debt reduction (b)	Net debt stock relief (b)	Net transfer relief (c)
Costa Rica	0.99 (62)	0.80 (22)	0.81 (22)	0.94 (26)	0.28 (51)
Mexico	5.55 (11)	-0.21 (-0)	5.55 (7)	13.54 (17)	4.10 (32)
Philippines	1.13 (12)	0.70 (3)	0.46 (2)	0.46 (2)	0.11 (4)
Uruguay	0.54 (33)	0.40 (10)	0.28 (7)	0.32 (8)	0.06 (12)
Venezuela	0.81 (4)	-1.17 (-5)	-0.06 (-0)	2.70 (11)	2.20 (39)
Total	9.02 (11)	0.53 (0)	7.03 (5)	17.96 (13)	6.76 (30)

Notes: The ratios are calculated (a) as a percentage of commercial debt; (b) as a percentage of total gross debt; (c) as a percentage of pipeline total debt service 1990-1993. Commercial debt, total gross debt and pipeline debt service are obtained from World Bank 1990e.

Source: Authors' calculations.

3. ASSESSING THE FINANCIAL COSTS AND BENEFITS OF THE BRADY DEALS

In order to compare the net gains from the various deals for the banks and the debtors, it is important to define a common yardstick for their costs. A straightforward method is to determine the implicit buy-back price to which a deal is equivalent. This indicator is a ratio which measures how much wealth the banks receive in exchange for their assets, per dollar of face value of old debt. A pure buy-back at a price equal to this ratio would be considered as equivalent to the deal by the banks. Our first step is to calculate this ratio. Such an implicit buy-back price may be compared to a status-quo (pre-deal) secondary market price, and this comparison provides a first insight into the gains obtained by the banks in the Brady deals. However, we have to go beyond these simple calculations in order to obtain an accurate comparison of debtor achievements and of bank versus debtor gains. There are three main reasons for this. First, the game has three players, rather than two: banks, the debtor and the IFIs. The implicit buy-back price cannot provide enough information to assess the distribution of costs and benefits among these three actors. Second, the distribution of costs and benefits cannot be measured by means of prices only, as these are average value indicators. As we shall show, we also have to estimate and take account of the marginal value of the debt. Third, we also have to take account of efficiency gains in the calculation of costs and benefits.

a- The implicit buy-back price

Calculating an implicit buy-back price means assuming that all options of a specific arrangement are equivalent, because of efficient arbitrage by the banks between the various options: under this assumption, it is possible to define a simple — actual or hypothetical — buy-back price which characterizes each deal. This does not mean that we believe that all options of a deal are actually equivalent. Our assumption simply means that we only consider an *ex ante* evaluation of the deals. *Ex ante*, there is no way to avoid this equivalence assumption: if two options of the menu were considered as non-equivalent *ex ante*, one of them would be preferred by all participating banks, unless these banks fail to achieve efficient arbitrage.

For the Philippines, Uruguay and Venezuela, a buy-back price is directly observable, since their Brady plans include a straight buy-back option. The Costa Rican deal also involves a buy-back, but this one is not a pure buy-back, since it is associated with the collateralization of remaining debt, so that the implicit buy-back price of the deal is actually higher that the price announced in the agreement. For Mexico, there is no buy-back at all, but exchanging the old debt for collateralized bonds is equivalent to a partial buy-back.

Our first step consists therefore in assessing the implicit buy-back prices for Mexico and Costa Rica.

For Mexico, the simplest way to find the implicit buy-back price is to consider the discount bond option. Under this option, $1 of old debt is exchanged against:

– $ q × (1 - c) of new (pure risk) debt (where q is the rate of exchange of old debt against new debt and c is the unit value of the collateral);

– $ q × c of collateral;

– $ q × rc corresponding to the value of the recapture clause.

This option therefore involves an exchange of (pure risk) debt for (pure risk) debt and guaranteed future cash payments. This is equivalent to an exchange of debt against cash payment, that is to a buy-back. In order to calculate the implicit buy-back price of this debt, we have to take account of the mechanical increase of the price of old (pure risk) debt, which is linked to the reduction of the debt stock, so that $1 of new (pure risk) debt is equivalent to $ p_1/p_0 of old debt, where p_1 is the *ex-post* pure Mexican risk price and p_0 is the implicit buy-back price (which is also equal to the price of pure Mexican risk at the time of the deal). The implicit buy-back price is therefore:

(1) $$p_0 = q \times c + q \times rc + q \times (1 - c) \times p_1$$

The arbitrage condition between the discount bond option and the new money option determines the rate of exchange of the pure Mexican risk price: the capital gains due to price increase, equal to $p_1 - p_0$ per dollar of old debt, must be equal to the capital loss incurred on new credit, equal to $n \times (1 - p_1)$, where n is the ratio of new money which creditors provide under this option.

(2) $$p_1 - p_0 = n \times (1 - p_1)$$

As a consequence, we obtain directly p_0:

(3) $$p_0 = \frac{q \times (c + n) + q \times rc \times (1 + n)}{1 + n - q \times (1 - c)}$$

Applied to the Mexican case, this formula gives an implicit buy-back price equal to 0.41[6]. This number is quite comparable to the secondary market price observed after the announcement of the deal in July 1989.

For Costa Rica, the implicit buy-back price depends on the post-deal price of pure risk debt: as for Mexico, one may expect an automatic improvement in the debt price, which increases the value of bonds received by banks. Since there is no new money option in the Costa Rican deal, the calculation of the post-deal price is less straightforward than for Mexico — equation (2) is not applicable. However, comparing option A and option B provides us a with reasonable estimate of this post-deal price p_1. Under option A, $1 of old (pure risk) debt is exchanged for four items: cash payment of the buy-back, new pure risk debt, a collateral attached to this debt, and a down-payment of 20 per cent of the remaining interest arrears. Under option B, it is exchanged for cash payment (from a smaller buy-back), new pure risk debt and down-payment of 20 per cent of remaining interest arrears. Part of the new bonds bear a reduced interest rate; this means that these new bonds obtained by the banks contain an implicit grant element, for which we calculate an average for each of the

two groups of banks (i.e. banks choosing option A or B). These parameters are called respectively g_A and g_B.

We then consider two typical banks, belonging respectively to group A and group B, and assume that these banks have tendered to the buy-back operation a proportion of their paper exactly equal to the proportion of paper sold on average by their group, which we call respectively s_A and s_B. Assuming that, on average, banks choosing option A and option B have enjoyed a similar treatment in the deal, we can equalize the implicit buy-back prices obtained by the two typical banks. This gives us an equation defining p_1:

$$p_0 = 0.16 \times s_A + dp_A + c_A \times (1 - s_A - dp_A) + (g_A - c_A) \times (1 - s_A - dp_A) \times p_1 \quad (4)$$
$$= 0.16 \times s_B + dp_B + g_B \times (1 - s_B - dp_B) \times p_1$$

In this equation, dp_A and dp_B are the proportions of down-payment of past due interest over total debt initially owned by the typical banks A and B. These parameters depend on the share of past due interest in total debt owned by banks of group A and group B (called respectively pdi_A and pdi_B), and on the share of total debt which is not tendered to the buy-back:

$$dp_a = 0.20 \times pdi_a \times (1 - s_a) \qquad (a = A, B) \quad (5)$$

Application of this formula to the numerical parameters of the Costa Rican deal gives a post-deal pure risk price equal to 0.22[7]. The corresponding implicit buy-back price is equal to 0.20. It may be noted that this implicit buy-back price is within the range of observed secondary market prices after signature of the agreement in principle with the banks in October 1989, which jumped from a low of 14 cents per dollar to between 17 and 21 cents per dollar.

In order to appraise the Brady deals, our first step is to compare the *ex-ante* secondary market price with the implicit buy-back price. To do this, we take average secondary market prices observed during the two quarters preceding the signature of the agreements in principle[8]. These prices are more relevant as indicators of the status-quo price for the banks than prices observed upon signature of the final agreements, which were usually reached much later: the market naturally took account of the gains of the deals as soon as they were announced, creating sharp price jumps for Uruguay and Costa Rica in particular. The figures appear in the first two columns of Table 3.1.

Table 3.1 shows that the banks obtained buy-back prices significantly higher than *ex-ante* secondary market prices. This means that they probably gained something in the deals, but this does not necessary mean that the debtors suffered, as we shall demonstrate below. The only point at this stage is that debtors could have gained more if they had succeeded in obtaining an implicit buy-back price closer to the *ex-ante* secondary market price. It can also be observed that implicit buy-back prices are lower than *ex-post* prices, which proves that debtors in any event obtained better

deals than if they had repurchased the same amount of debt through an open market buy-back.

Table 3.1: Comparison of prices in Brady deals

Country	*Ex-ante* price	Buy-back price	*Ex-post* price	Marginal value	Sept. 91 price(a)
Costa Rica	0.14	0.20	0.22	0.10	0.58
Mexico	0.38	0.41	0.51	0.14	0.56
Philippines	0.49	0.50	0.51	0.27	0.52
Uruguay	0.47	0.56	0.63	0.17	0.70
Venezuela	0.44	0.45	0.54	0.09	0.72

(a) Present prices are pure risk prices. They are calculated from the observed new bond prices, after stripping the value of the collaterals and taking account of the implicit grant elements where necessary.
Source: Authors' calculations.

b- Distribution of costs and benefits without efficiency effects

We start here with a discussion of the distribution of gains and benefits in the absence of efficiency effects. Two main theoretical contributions are relevant for this discussion. The first is a paper by Bulow and Rogoff (1988), which proves that a self-financed marginal buy-back at a price equal to or above the (ex-ante) secondary market price is costly for the debtor. The second one is provided by Dooley (1988), who introduces the idea that a non-marginal buy-back will necessarily be at a price depending on the *ex-post* secondary market price, which is higher than the *ex-ante* price. From these results, it is clear that pure market buy-back solutions provide a net gain to the banks and imply a loss for the debtors. Two particular features of the Brady deals may however counteract the costs born by debtors in the buy-back operation: the introduction of a supposedly senior debt to finance the buy-back, so that the deal would look like a successful exit bond (known to be more favourable than a buy-back, as proved by Froot (1989)), and the new money options, which create a wedge between the implicit buy-back price and the *ex-post* secondary market price.

For Bulow and Rogoff (1988), the gain of a (marginal) buy-back for the debtor depends on the marginal value of its debt, when its cost is equal to the secondary market price, which is the average value of debt. One may consider the usual simple model where there are only two states of nature. In the bad state of nature, the debtor cannot pay its full debt service, but it pays nevertheless some amount, which we interpret as a transfer capacity, considered independent of the debt stock. In the good state of nature, the debtor is able to pay exactly what it owes. We can translate these assumptions into the following simple formula for the secondary market price:

$$p = \pi + (1 - \pi) \times \frac{T}{D} \qquad (6)$$

where π is the probability of the good state of nature, D is the debt stock and T is the transfer amount which can be extracted from the debtor in bad states of nature.

In this equation, the marginal value of the debt is π, which is lower than the average value p. If the debtor buys back \$1 of debt (at a cost of \$ p), he saves only \$ π, so that its wealth is reduced by p-π. Since we are here in a zero sum game, this loss is a gain for banks.

The only solution for the debtor would therefore be to negotiate a deal in which it would buy back its debt at its marginal value, rather than at its average value. As proved by Froot (1989), this can be done through an exit bond. An exit bond is a buy-back which is financed by new senior bonds, rather than by the debtor's own resources. Since the new bonds are considered as senior, banks may be forced to accept a buy-back price below the secondary market price. Even for non-marginal deals, a credible exit bond may be negotiated at a price converging towards the marginal value of debt. This result can also be linked to a paper by Detragiache (1991), who shows that the creation of a structure of seniority among lenders may help the debtor achieve buy-backs at a "fair" price, that is at a price close to the marginal value of debt.

To some extent, the Brady deals are *in principle* nothing but exit bond deals, since old debt is bought back with the help of new money provided by IFIs, which are supposed to enjoy seniority status. But, apparently, the status-quo price for banks is higher than or equal to the *ex-ante* secondary market price, which suggests that the buy-back has not been financed through credible senior loans, which would have excluded banks from debt service payments in bad states of nature. As we shall demonstrate later, one possible explanation of is that the IFIs are actually not senior lenders.

With non-marginal buy-backs however, the story is complicated by the possible existence of free-riding banks, which could take advantage of the secondary market price improvement created by the Brady deal, while staying out of the arrangement. The Brady deals generate an automatic increase in secondary market prices, through a reduction of debt stocks. This effect is linked to the difference existing between marginal and average values of debt, as it appears in equation 6: the average value of debt increases when the debt stock decreases. As shown by Dooley (1988), the only way to avoid such free riding in a pure non-marginal buy-back is to propose a buy-back price equal to the *ex-post* secondary market price, rather than a price comparable to the *ex-ante* price. In the Brady deals, this problem is solved differently, through the creation of a wedge between the buy-back price and the *ex-post* price. In several Brady deals (Mexico, Uruguay and Venezuela), there is an explicit new money option, reducing the potential gains of banks not participating in the buy-back (or in an equivalent exchange against collateralized bonds), so that the buy-back price may be lower than the *ex-post* secondary market price, as shown in equation 2 and in Table 3.1. The two other Brady plans for the Philippines and Costa Rica include arrangements which create similar effects.

For the Philippines, there is a kind of new money obligation for debt holders who have not tendered their paper for the buy-back, since a rescheduling/refinancing agreement of the remaining debt was negotiated together with the buy-back. In this context, \$715 million of interest payments were refinanced, creating an effect similar to a new money option. However, part of this refinancing would have taken place

anyway, even outside the Brady deal, since the Philippines consistently refinanced about half of their interest bills in preceding years: Claessens and Diwan (1990) consider that about $500 million of interest payments would have been refinanced in an alternative scenario without the Brady plan, so that the cost of this part of the interest refinancing may be considered as already incorporated in the secondary market price. As a consequence, we consider that the banks' new lending obligation was equivalent to only 3 per cent of their non-tendered debt[9]. The fact is, that if we considered the $715 million of new credits provided by the banks to be entirely new money obligations arising from the Brady plan, this would imply a secondary market price increase from 0.49 to 0.54, which would be much higher than the actually observed price increase, and far too high as compared with the relative debt stock decrease.

In the deal negotiated by Costa Rica, there is no new money obligation of any kind, but the option A - option B arbitrage similarly creates a wedge between the implicit buy-back price and the *ex-post* price, as shown above (equation 4).

In order to take account of these analytical developments in our assessment of the deals, we have firstly to make some assumption about the seniority status of the IFIs, which determines the influence of the marginal value of the debt on the distribution of costs and benefits. Secondly, we have to estimate the marginal value of debt compatible with the deals.

The assumption of relative seniority of IFIs and banks has definite implications on the way we can use the valuation formula for private debt (equation 6). Since we know the variation of commercial debt stock implied by the deals, we can calculate, for each specific assumption about the seniority of IFIs, the predicted secondary market price increase which is compatible with these deals[10]. Arguing along the same lines as Dooley, we assume that the banks take precise account of such a predictable improvement, so that the post-deal price p_1 must be exactly equal to the predicted secondary market price. This will prove useful in assessing the plausibility of our assumptions regarding the IFIs' seniority status, as well as in estimating π.

Three scenarios are considered:

[a] loans made by IFIs and bilateral lenders to finance the deals are senior, so that their face value S must be subtracted from the extractable transfer T in the debt valuation formula:

(7a) $$p_1 - p_{-1} = (p_{-1} - \pi) \times \frac{\Delta(D)}{D - \Delta(D)} - (1 - \pi) \times \frac{S}{D - \Delta(D)}$$

where Δ(D) is the amount of commercial debt reduction provided by the deal.

[b] all loans are of equal status, so that the cost borne by the banks because of the new IFI loans comes only from a dilution effect: rights on the debtor's transfer capacity owned by banks (applicable in case of a bad state of nature) are, in case of perfectly equal status, proportional to their share of total debt

owed by the debtor, which decreases due to the substitution of official debt for private debt.

(7b) $$p_1 - p_{-1} = (p_{-1} - \pi) \times \frac{\Delta(D) - S}{D + B - \Delta(D) + S}$$

where D+B measures the total (commercial and official) debt stock and Δ(D)-S is its net reduction.

[c] IFIs and OECF loans are considered by the market as junior. This view is backed by the observation of uneven burden sharing among creditors of defaulting debtors, in favour of commercial banks, as shown by Berthélemy and Vourc'h (1991). The observation of only a small number of countries falling into arrears vis-à-vis the IFIs is misleading; this often appears to be the case simply because these institutions may implicitly refinance their old loans through new money provided to the same debtor. It is clear that a creditor who tends to provide positive net transfers will be treated better by its debtors than others who do not, but this does not by any means imply that this creditor is actually senior, even though it may be considered senior from a legal point of view. Consequently, in economic rather than in legal terms, the "preferred creditor status" of IFIs is at best an assumption, which has to be tested empirically, and not an unquestionable truth. If IFIs are *de facto* junior, the preceding equation becomes:

(7c) $$p_1 - p_{-1} = (p_{-1} - \pi) \times \frac{\Delta(D)}{D - \Delta(D)}$$

For each of these scenarios, the above equations, applied to actual figures for D, ΔD, etc., give us an estimate of π compatible with the reduction of the commercial debt stock and with the implicit (or explicit) buy-back price negotiated in the Brady deals (detailed calculations appear in Appendix 3).

The results are striking and indicate definitely which scenarios are plausible and which not: for scenario [a] as well as for scenario [b], the computed marginal value of debt is negative. This means that, for any likely value of the parameters, the assumption of senior or equal status for official lenders financing the Brady plans would not be consistent with the sharp secondary market price increase implied by the level of implicit buy-back prices observed in the Brady deals. The only scenario consistent with the empirical evidence provided by the Brady deals is the third one, in which the IFIs are considered as junior lenders.

Therefore, we consider the third scenario [c] as the most plausible one, and base our subsequent analysis on it. Equation (7c) may then be used to calculate the marginal value of debt as presented in Table 3.1. It is interesting to note that our estimates of π for four of the five countries lie in a rather narrow range. They are also quite consistent with available econometric estimates of secondary market price curves[11].

Knowing the marginal value of debt, we can easily calculate the gains and losses of the participants in the deal for this scenario [c]:

– The IFIs (and bilaterals) bear a cost equal to $ 1 - π per dollar of loan provided to the debtor. If these loans are junior, they are worth only the marginal value of debt in the simple theoretical framework corresponding to equation 6: either the country is able to pay back all its contractual debt service (with a probability π), or it is not, in which case the banks are paid a net transfer T and the IFIs are paid nothing. Here we see the effect of the wedge between p and π; but, contrary to the Bulow-Rogoff framework, this wedge creates a cost for the IFIs rather than for the debtor when the deal is financed by junior IFI loans.

– The banks' benefit is equal to the net change in the total market value of their portfolio (where we evaluate the initial and final pure risk component of their assets at pre-deal (p_{-1}) and post-deal (p_1) prices appearing in Table 3.1), plus the cash received in the buy-back transactions or as down-payment of arrears or collaterals, and net of the cash disbursed in application of the new money options.

– The debtor gain is equal to the IFI loss, net of banks' gains, since we are in a zero sum game.

Table 3.2 reports the results of such calculations, based on price figures appearing in Table 3.1 (detailed calculations appear in Appendix 4).

Table 3.2: Gains and losses without efficiency effects

Country	IFI loss	Bank gain	Debtor gain	
	$ bil.	$ bil.	$ bil.	% of IFI loss
Costa Rica	0.17	0.09	0.07	44
Mexico	4.95	2.79	2.16	44
Philippines	0.31	0.15	0.16	52
Uruguay	0.11	0.24	-0.13	-111
Venezuela	1.79	0.76	1.03	58
Total	7.33	4.04	3.30	45

Source: Authors' calculations.

The results are striking: on average, the banks captured 55 per cent of the net transfer of wealth incurred by the IFIs. Among debtors, Costa Rica, Mexico, the Philippines and Venezuela received roughly comparable treatment, sharing almost equally the IFIs' "gift" with the banks. There are some differences among these four countries, but, given the simplifying assumptions we had to adopt in order to make this evaluation, such differences are not of a significant magnitude. By contrast, Uruguay lost a lot in its Brady plan.

The bad result suffered by Uruguay is due to two factors: the relatively high level of its buy-back price, and a low commitment of IFI money.

When we look the behaviour of the secondary market price, it is perfectly obvious that the Government of Uruguay mistakenly set the buy-back price at a level much higher than expected by the banks, thus giving them an unexpected gift. When the agreement in principle was signed in October 1990, the secondary market price jumped from 47 cents to 53 cents, providing a clear indication of the banks' expectations. In the negotiations with the Government, the banks then asked for a buy-back price as high as 60 cents, and the Government finally decided on an intermediate buy-back price level of 56 cents. If the secondary market reflected accurately banks' expectations, it is likely that banks would have finally accepted a price lower than 56 cents, so that the buy-back price level set by the Government was actually far too high.

However, even if Uruguay had set its buy-back price at 53 cents, this country would have still suffered a loss. This may be explained by the modest financing allocated to if by the IFIs: Uruguay self-financed some 70 per cent of its Brady plan, whereas the official money obtained by other debtors to finance their deals accounted on average for about 80 per cent of the financial package (Table 2.2). As a consequence, this last Brady plan was much closer to a self-financed buy-back than the other accords. This obviously explains some part of the observed negative result for Uruguay.

c. Introduction of efficiency gains

A limitation of the previous calculations may therefore be that they do not take account of possible efficiency gain effects of the Brady deals, which could be linked to the debt overhang hypothesis: a reduction of the debt stock may increase the efficiency of the debtor economy, because it removes some of the disincentive effects generated by debt overhang, such as those associated with the lack of confidence in the Government policy. For instance, Bacha (1991) considers that Brady deals may have pushed secondary market prices up through a "confidence boosting" effect. Ignoring these potential positive effects may lead to overly pessimistic conclusions. Therefore, in order to assess the soundness of our previous conclusions, we try in the present section to estimate to what extent these conclusions would be changed if we adopted optimistic assumptions about efficiency gains.

We may doubt that efficiency gains were taken into account by market operators at the time of Brady negotiations. Firstly, nobody has ever uncovered any undisputable empirical proof of the accuracy of the debt overhang hypothesis, so that such positive indirect outcomes of a debt reduction are very uncertain *ex-ante*[12]. Therefore, assuming that the banks would have taken efficiency gains into account in their negotiations on the implicit buy-back price would be a rather extreme assumption. Second, it may be observed (last column of Table 3.1) that secondary market prices definitely increased *after* the completion of the Brady deals as well as upon their completion. To a large extent, this subsequent improvement of secondary market prices may be linked to subsequent efficiency gains. This observation suggests that efficiency gains were perhaps taken into account by the market, but *after* the

implementation of the deals, rather than during their negotiation. If banks had immediately expected an efficiency improvement, secondary market prices would have been affected by such an improvement immediately rather than later on; the available evidence shows on the contrary that actual price improvements were in fact spread over time following the Brady accords.

The appearance of *unexpected efficiency gains* would not alter our conclusion on the *de facto* juniority of IFIs, and therefore our interpretation of Brady deals as an immediate "gift" from IFIs to banks and the debtors. However, the corresponding cost supported by IFIs may have been eventually reduced by subsequent efficiency gains. The effects of efficiency gains may be introduced into our framework either through an increase of the marginal value of debt (π) or through an increase of the transfer capacity (T). The cost incurred by *de facto* junior IFIs will be reduced only in the first of these two instances, where efficiency gains improve the marginal value of debt: in such a case, costs incurred on new money may be compensated by gains on the previous debt stock, the average value of which is π. In order to verify whether our conclusions are sound under optimistic assumptions about the effect of efficiency gains, we will assume below that they affect only π, rather than T. This assumption may be illustrated through linking the subsequent secondary market price evolution (as indicated by the September 1991 price in Table 3.1) with a $\Delta(\pi)$ increase. This leads to an equation similar to (7c), where p_1 has been replaced with p_2 (September 1991 pure risk price), and in which a $\Delta(\pi)$ term appears:

(8) $$p_2 - p_{-1} = (p_{-1} - \pi) \times \frac{\Delta(D)}{D - \Delta(D)} + (1 - p_2) \times \frac{\Delta(\pi)}{1 - (\pi + \Delta(\pi))}$$

If efficiency gains indicated implicitly by the secondary market price evolution up to September 1991 had compensated the cost incurred initially by the IFIs, then a lower bound of these efficiency gains would be given by:

(9) $$\frac{\Delta(\pi)}{1 - (\pi + \Delta(\pi))} \geq \frac{S}{B}$$

As a consequence, a lower bound of π compatible with the previous assumptions would be obtained by replacing the last term in equation (8) with S/B. This implies:

$$\pi \geq \frac{(1 - p_2)\times\frac{S}{B} + p_{-1}\times\frac{\Delta(D)}{D - \Delta(D)} - (p_2 - p_{-1})}{\frac{\Delta(D)}{D - \Delta(D)}} \quad (10)$$

A numerical application of the above formula leads to impossible results for Mexico, the Philippines and Venezuela. For these countries, the resulting lower bound for π is much too high: ranging from 0.34 for Mexico to 0.71 for Venezuela. Therefore, in such cases, the observed secondary market evolution cannot support the idea that subsequent (unforeseen) efficiency gains could have cancelled out the costs incurred initially by IFIs. For Uruguay and Costa Rica, the calculated lower bound of π is respectively 0.14 and -0.02. In the first instance, the cost born initially by IFIs was small, because of low involvement of these institutions in the financing of the Brady deal, so that their initial loss may indeed have been compensated by the effects of subsequent efficiency gains, but the cost incurred by the debtor probably remained. According to these results then, the Costa Rican Brady deal, which was followed by a sharp secondary market price increase (from 0.14 *ex-ante* to 0.58 in September 1991), is the only one in which unexpected efficiency gains, revealed later by market prices, probably eliminated the financial costs incurred by those who financed the Brady deal.

For the sake of completeness, it may finally be useful to consider how much our conclusions would be modified if we assumed the existence of *expected efficiency gains*. Two kinds of corrections must be contemplated under this assumption. On the one hand, it may be considered that costs incurred by *de facto* junior IFIs were reduced by the presence of efficiency gains. On the other hand, our conclusion about the *de facto* juniority versus seniority of IFIs may also be contested.

Concerning the first question, the same analysis as above may be applied: in order to know whether IFIs' costs may have been outweighed by the effect of efficiency gains, we have simply to replace in condition (10) the present price p_2 with the post-deal price (p_1), which is now assumed to take account of expected efficiency gains. Not surprisingly, a numerical application of the corresponding formula leads to impossible results for all countries. The calculated lower bounds of π are higher than the *ex-ante* secondary market prices for all countries but Uruguay. For Uruguay, we obtain a lower bound of π as high as 0.28, which is also impossible when compared with available econometric evidence[13]. Even assuming that IFIs' costs would be halved through efficiency gains still leads to impossible values of π for all countries but Uruguay (0.14 for Costa Rica, 0.23 for Uruguay, and over 0.30 for other countries). Therefore, if one maintains the assumption of IFI juniority, introducing expected efficiency gains cannot change significantly our conclusion that Brady plans have been costly for IFIs.

If we turn now to the second question, it may be shown firstly that reverting to a postulate of IFI seniority would imply very strong assumptions about the expected positive efficiency gains. Again, such efficiency gains may be introduced either through π increases or through T augmentations. If, as before, we assume optimistically that marginal value increases prevailed, equation (7a) becomes:

$$(11)\qquad p_1 - p_{-1} = (p_{-1} - \pi)\times\frac{\Delta(D)}{D - \Delta(D)} - (1 - \pi)\times\frac{S}{D - \Delta(D)} + (1 - p_1)\times\frac{\Delta(\pi)}{1 - (\pi + \Delta(\pi))}$$

This equation may be used to verify whether the assumption of expected efficiency gains combined with IFI seniority is plausible. To this end, we start with a conjecture on the initial marginal value of debt (π) and we calculate its resulting *ex-post* level $\pi + \Delta(\pi)$. On average, an initial level of π equal to 0.05 (resp. 0.10) leads to a final level $\pi + \Delta(\pi)$ equal to 0.19 (resp. 0.25). Then, in order to defend the story of IFI seniority, we need to presume very large expected efficiency gains, equivalent to a 150 to 300 per cent increase of π.

Those who believe strongly in the IFI seniority story may think however that such large efficiency gains are believable. Even if it is not our preferred assumption, it may be instructive to assess the Brady Plans under this assumption.

Again, the discussion will be carried out in terms of gains and benefits distribution between banks, debtors and the IFIs. For banks, nothing changes: the assessment of their gains is in any case based on the market valuation of their portfolio. In other words, their gains are certain, while the costs and benefits of the debtors and the IFIs are uncertain. However, the IFIs and debtors' net gains may change radically. The third agent, the IFIs, is no longer involved in the game considered: senior IFIs simply provide new money to help the implementation of the deal, but it is assumed that they will be reimbursed each dollar of the contractual debt service on these loans in the future. As a consequence, they experience no financial gain, and no financial cost in the Brady deals. The Brady deals can therefore be considered in the well known standard two-player framework.

In this framework, Bulow and Rogoff (1991) have provided recently an analytical way of dealing with efficiency gains, through providing a simple way of measuring an upper bound of the debtor gains in a negotiated buy-back deal. Since Brady plans, as we have explained above, are equivalent to negotiated buy-backs (at a previously determined price p_0), we may simply use here the Bulow and Rogoff criteria.

The basic idea of Bulow and Rogoff (1991) is that, even if there are efficiency gains, a buy-back at the secondary market price cannot bring any net wealth gain to the debtors: the banks are aware of the efficiency gains, and then these efficiency gains are taken into account by the market, through a further increase in the secondary market price. A similar viewpoint appears in Claessens, Diwan, Froot and Krugman (1990). As a consequence, Bulow and Rogoff show that an open market buy-back is necessarily costly for the debtor. In a concerted deal, however, the debtor can gain something, if the price at which it repurchases its debt is lower than the post-buy-back price ($p_0 < p_1$ with our notations).

According to the Bulow and Rogoff (1991) analysis, the gross benefit that debtors obtain from a debt reduction deal, due to efficiency gains, is then bounded by

the cost of reducing debt by the same amount through a buy-back on the secondary market: those costs are necessarily higher than the gross benefit that a debtor obtains from efficiency gains, since, as stated above, an open market buy-back is costly for this debtor. Therefore, an upper bound for the net gains that a debtor can obtain through a concerted implicit buy-back is:

$$p_1 \times \Delta D - C$$

where C is the total amount paid to banks in the negotiated implicit buy-back (cash payment plus the value of collaterals). Application of this rule to the five Brady deals is provided in the following Table 3.3[14]. Implicit in the construction of this table is the optimistic assumption that debtor gains are close to their upper bound.

Table 3.3: Gains and losses with efficiency effects and IFI seniority

Country	banks gain	upper bound of debtor gain	total gain	debtor share of total gain
	$ bil.	$ bil.	$ bil.	%
Costa Rica	0.09	0.04	0.13	29
Mexico	2.79	3.46	6.25	55
Philippines	0.15	-0.09	0.06	-141
Uruguay	0.24	0.03	0.27	11
Venezuela	0.76	0.36	1.12	32
Total	4.04	3.80	7.84	48

Note: IFI loss is here equal to zero by assumption. The "total gain" in the third column is actually an upper bound, since it is the sum of the first two columns; the same qualification applies to the last column.
Source: Authors' calculations.

A number of interesting conclusions can be drawn from this table. If the efficiency gain assumption has any relevance, the various Brady plans have had quite different effects on the net wealth of debtors. Under the previous assumptions, only Mexico would have obtained a significantly favourable deal, giving this country a net gain greater than the banks' gain, and equivalent to 2 per cent of its GDP. Costa Rica and Venezuela would have still obtained some gain, but this gain would have been much smaller, equivalent to half the bank's gain (and 0.8 to 0.9 per cent of their GDP). The Philippines and Uruguay would have gained nothing from their Brady deals, and in fact the Philippines would have suffered a loss.

4. THE IMPACT ON SHORT-TERM GROWTH

In order to have a rough estimate of the impact of the Brady debt packages on economic growth, we calculate in this section the direct, short-term, transfer effects on the domestic economies of the different countries. We only treat the direct liquidity effects of the different accords, which implies that the debt overhang effect is not

considered in the calculations. According to e.g. Krugman (1988), and Sachs (1989) a large debt overhang reduces the incentive to make necessary macroeconomic adjustments. A debt reduction, therefore, may stimulate macroeconomic reform. Moreover, a debt reduction may stimulate the repatriation of flight capital. The impact of the different deals, especially in the long run, might therefore be much stronger than shown in this section. Our decision not to include the debt overhang effect is based on the fact that empirically this argument is rarely confirmed, as we have indicated previously.

The calculations are made with a simple two-gap model (see Appendix 5).[15] The macroeconomic impact of the Brady deals for the different countries is shown by the difference between a so-called base case (Base) and a case in which the debt reduction package of the deal, as described in Section 2, is considered (Brady).

In the Brady deals the "par" bonds, "discount" bonds and new money options all have grace periods of over 7 years and maturities of over 15 years. Principal repayments on these debt issues are therefore shifted to a year outside the projection period. We assume that principal repayments on money from official creditors, used for the financing of the Brady deals, are also shifted outside the projection period, which is reasonable if one considers the usual borrowing terms on debt owed to these creditors. Hence principal repayments on "new" debt to private and official creditors are not taken into account.

To make a comparison between both scenarios an assumption with respect to debt service payments for the Base and Brady cases had to be made. We first make the rather extreme assumption that contractual obligations are paid in full (scenario (a) in Table 4.1).

In addition, we investigate the impact of the Brady deals for the more realistic case where debt service obligations are not paid in full (scenario (b) in Table 4.1). In line with the analysis of Section 3 we then use the *ex-ante* and *ex-post* secondary market price (p_{-1} and p_1, see Table 3.1) as an approximation of the probability of default on debt service payments to private creditors for the Base and Brady case respectively. Hence, private creditors are paid p_{-1}, p_1 per dollar of debt service owed in the Base and Brady cases respectively. Official creditors, on the other hand, are paid the marginal value (see again Table 3.1) per dollar of debt owed, for both the Base and Brady cases. The latter is consistent with the findings of Section 3 which indicate that IFIs are probably considered by the market as junior creditors.

For the Base cases contractual principal repayments for official and private creditors are exogenously taken from World Bank (1990e)[16]. For the Brady scenarios an estimate of the decrease in principal repayments to private creditors has to be made. We approximate the remaining principal repayments to private creditors by multiplying the annual contractual principal repayments to private creditors for the Base case to the ratio between the post-deal commercial debt and the pre-deal commercial debt. The post Brady deal commercial debt, used for the calculation of the ratio, only refers to "old" commercial debt. It does not contain the value of the converted debt instruments, such as new money, "par" bonds and "discount" bonds, since principal repayments on "new" debt are transferred outside the simulation period.

For scenario (b) where debt service payments are not made in full, annual principal repayments on "old" debt to private and official creditors are simply calculated as the total contractual principal repayments multiplied by the relevant secondary market price or the marginal value of debt.

Contractual interest payments are endogenously determined by multiplying debt to official and private creditors by the relevant interest rate (for both the Brady and Base case). For scenario (b), where debt service payments are not made in full, actual interest payments are calculated by multiplying the total required interest payments by the relevant secondary market price of debt or the marginal value of debt[17].

For some countries "new" debt is enhanced by a collateral. The guarantees with respect to interest payments are taken into account in the scenarios where the debtors default by assuming that interest payments are made in full for the period the interest payments are guaranteed. For the rest of the simulation period interest payments are calculated as described above. The collaterals with respect to principal repayments are not considered since all amortization on "new" debt has been shifted to a year outside the simulation period.

New money is assumed to become available in four years. Interest foregone on own resources is also taken into account in the calculation of resources available in the balance of payments in the Brady cases. Finally, the impact of the "value recovery provisions" is not taken into account.

Table 4.1 presents the simulation results. For the scenario where debt service payments are made in full (scenario (a)) the impact of the Brady Plan on economic growth appears to range between an increase of the average annual growth rate between 1990 and 1995 of 0.2 for the Philippines and 1.4 for Costa Rica. The increase in this growth rate appears to be modest for Mexico (0.5 per cent) and somewhat higher for Uruguay and Venezuela (0.8 and 1.1 per cent respectively). The results of this scenario (a) correspond with the findings of Section 2 where it was shown that the impact of the Brady Plan on net transfer relief was greatest for Costa Rica and least for the Philippines.

With respect to the more realistic scenario (b), where debt service payments are not paid in full, it appears that the direct liquidity effects of the Brady operations on domestic growth are very small. For most countries there was even no effect at all. The increase in net transfers to the different countries, taking into account the rise in the secondary market price due to the debt reductions, are too small to have any significant effect on macroeconomic growth.

Table 4.1: The Impact of the Brady Accords on Economic Growth (1989 US$ million; (percentage))

	Y95 (a)	TR95 (a)	Y95 (b)	TR95 (b)
Costa Rica				
Base	5650 (1.3)	-168	6603 (4.0)	176
Brady	6098 (2.6)	-130	6622 (4.0)	177
Mexico				
Base	221677 (1.7)	-5247	241551 (3.1)	1148
Brady	228129 (2.2)	-4847	242180 (3.2)	746
Philippines				
Base	42158 (-0.8)	-3148	46369 (0.9)	-613
Brady	42636 (-0.7)	-3075	46716 (0.9)	-721
Uruguay				
Base	7711 (-1.5)	-365	8725 (0.6)	-56
Brady	8077 (-0.7)	-303	8780 (0.7)	-65
Venezuela				
Base	44642 (0.3)	-3917	50325 (2.3)	-1374
Brady	47482 (1.3)	-3268	50475 (2.4)	-1344

Notes: Scenario a = debt service payments are made in full; Scenario b = debt service payments are not made in full; Y95 = the level of real GDP in 1995; TR95 = transfers in 1995, defined as net capital inflows (gross capital inflows minus principal repayments) minus interest payments; figures in parentheses refer to average annual growth rates between 1989 and 1995. See Appendix 5 for more information with respect to the assumptions made in the model calculations.

Source: Authors' calculations.

The calculations made above are subject to many assumptions. They can therefore be seen only as a very rough estimate of the effects on economic growth. Nevertheless, there appears to be reason to doubt whether the direct liquidity effects of the Brady accords are at all substantial. It should be noted however that the results of the scenarios may be too pessimistic since we assume that the different countries are not able to raise additional funds from multilateral institutions or private creditors during the simulation period[18]. It is likely that in the long run most of the countries under consideration will be able to raise additional funds. The modelling of future capital flows for the Brady countries is therefore highly important, but this lies outside the scope of our paper.

5. SUMMARY AND CONCLUSIONS

This paper has shown that the Brady accords lead to substantial debt reductions for Costa Rica and Mexico only. Debt reduction for the other countries considered is very modest.

In terms of costs and benefits distribution, the only participants which certainly gained something from the Brady deals are the banks. A majority of debtors (Mexico, Costa Rica and Venezuela) certainly also gained something in the Brady deals, although the interpretation of this gain is less clear than assumed in previous papers. One possible explanation of banks' and creditors' gains may be that new loans provided by official creditors were not considered as truly senior by the market. In that case, our conclusion is that possible IFI losses outweighed gains by debtors. Moreover, these direct IFI losses were so substantial that they could not be offset by expected or unexpected efficiency gains effects.

On the other hand, if one believes that IFIs are truly senior, benefits obtained by the banks and the debtors must be interpreted as a result of *expected* efficiency gains only. It is shown that this would indeed require strong assumptions regarding the size of such efficiency gains. If one nevertheless accept the IFI seniority story, it may be concluded that Brady deals have probably been quite successful for Mexico, marginally successful for Costa Rica and Venezuela, and neutral or costly for the Philippines and Uruguay.

If one considers that efficiency gains were expected by the market but that the scenarios of IFI juniority and seniority are both equally probable, it may be tempting to compute an average of the two corresponding results. Then it appears that the only undeniably successful case is the Mexican one: this is the only country where average possible gains for the debtor clearly outweigh average possible losses for the IFIs. Therefore, our findings show at least that Brady deals have not been universally as effective as they were for Mexico. Moreover, two of these accords (namely for Uruguay and the Philippines) may have been particularly ineffective, since in these cases the average possible gains for the debtor are rather small if not actually negative.

Finally, the short-term effects of the Brady accords on economic growth are very small, unless they bring about significant additional effects due to "confidence boosting", like the repatriation of flight capital, or (future) access to the international capital markets. One may suspect that the combination of small automatic short-term effects on growth and of uncertain wealth gains for the debtor may not be conducive to any great improvement in confidence. Future research should, however, consider these additional effects.

APPENDIX 1: DETAILED DESCRIPTION OF THE BRADY AGREEMENTS[19]

MEXICO

The first test case of the Brady Plan was the February 1990 deal with Mexico, in which an amount of US$48.9 billion of debt was restructured (World Bank, 1990a, p.58). The agreement consisted of three options for the creditor banks. Banks could choose among a swap of bank loans at face value for new bonds (the so-called "par" bonds), denominated in ten different Western currencies (van Wijnbergen, 1990, p.13 and 14), paying 6.25 per cent interest; a swap of old loans for newly issued bonds, denominated in the same ten currencies, paying a market based interest rate (LIBOR + 13/16 per cent) but at a 35 per cent discount on face value (the so-called "discount" bond); or exchange old debt for new debt at par and market rates conditional upon new lending (in four years an amount equal to 25 per cent of their current and long-term exposure) at an interest rate of LIBOR plus 13/16. Banks choosing the new money option could choose between lending in the New Money Credit Agreement to the United Mexican States, new money bonds (up to 50 per cent of its new money commitment, with a maximum of US$500 million), onlending to public sector borrowers or lending to a medium-term trade credit facility (both up to 20 per cent of the new money commitment).

The "par" and "discount" bonds are issued by Mexico and have 30-year "bullet" maturities; payment of the full principal amount will be after 30 years. Payment of the principal of the new bonds is backed by US 30-year zero-coupon bonds placed in escrow at the Federal Reserve Bank (FED) in New York. Moreover, 18 months' worth of interest payments on the new bonds are guaranteed by an escrow account[20] at the FED as well. The principal and interest payments with respect to the new money are not backed.

The costs of the collateral amounted to some US$7 billion. The World Bank, the IMF, and Japan financed part of the escrow by providing US$2.01 billion, US$1.697 billion, and US$2.05 billion respectively in the form of new loans (World Bank, 1990a, p.58). The rest was financed by Mexico, either using its reserves, or through diverting moans already granted for other purposes to the escrow.

The Mexican deal is extended by a "novation" clause, which implies that creditors exchanging debt into new instruments or providing new money are no longer subject to the sharing clauses. In fact the non-exiting creditors are made junior. This clause substantially discouraged free-riding. Moreover, banks taking part in the Brady Plan for Mexico may participate in a debt/equity programme of, in total, US$1 billion a year (Van Wijnbergen, 1990, p.16)

An additional feature of the Mexican deal is the existence of a recapture clause based on oil prices. From July 1996 onwards bond holders involved in the debt reduction operation will receive 30 per cent of additional oil revenues due to prices higher than US$14 per barrel in real (1989) terms. The maximum amount of money a creditor can receive from this clause is limited to 3 per cent of the amount of old debt exchanged in the debt reduction operation.

It appeared that most banks chose one of the debt or debt service reduction options. The new money option was chosen by creditors holding only 13 per cent of the eligible debt[21]. The "par" bonds and the "discount" bonds were chosen by creditors holding 47 per cent and 40 per cent of the face value of affected claims respectively (World Bank, 1990a, p.33).

THE PHILIPPINES

The Brady Plan for the Philippines does not contain a menu of different options for the creditors. The deal consists of different agreements which are signed independently of each other. The most important part of the debt reduction operation, signed between January and February 1990, is a cash buy-back operation at 50 per cent discount. The Philippines repurchased some US$1.3 billion at a discount of 50 per cent (US$1.8 billion was offered). This agreement also entitled the Philippines to use US$850 million of external resources to buy back an additional amount of debt before the end of 1991. After 1991, and already before 1991 in the case where the US$850 million is spent, a complementary amount of US$300 may be used for buy-backs.

In another agreement with the Philippines an amount of US$781 million is rescheduled. Half of the amount rescheduled is backed and exempted from future new money calls. Finally, on February 28, 1990, the Philippines succeeded in borrowing an additional US$715 million (US$300 million less than was hoped), which will be provided over two years. This money was borrowed through new money bonds with a maturity of 15 years, a grace period of 8 years, and an interest rate of LIBOR plus 13/16 per cent. The Philippines promised that these new money bonds would be ineligible for restructuring. Moreover, the holders of these bonds will be exempted from future new money calls (World Bank, 1990a, p.59, and p.60).

The IMF, the World Bank, and Japan provided US$170 million, US$150, and US$107 respectively to finance the buy-back. The Philippines contributed US$243 million from its own reserves.

Besides the Brady Plan agreements the Philippines are trying to reduce their debt and to obtain new money in different ways. First, they have a debt-equity programme in which US$300 million of central bank debt has to be converted into local currency during 1991 (LDC Debt Report, March 1991, p.6). Second, the Philippines are seeking an arrangement with the Paris Club to have part of its official debt forgiven. Finally, they have a "debt-for-defense" proposal in which the Philippines are seeking US support for a defense burden-sharing bond, collateralized by the US treasury and to be sold to Asian countries which benefit from the security provided by the US bases.

COSTA RICA

Like the deal with the Philippines the May 1990 Brady Plan for Costa Rica did not contain a menu of different options for the creditors. The accord consisted of a cash buy-back (of US$991 million, at a discount of 84 per cent), enhanced by the possibility of swapping the remaining debt into "par" bonds. The buy-back included US$223 million of interest arrears. The agreement gave commercial banks, who sold more than 60 per cent of their debt, the right to exchange the rest of their debt for new bonds with a maturity of 20 years, a grace period of 10 years, and an interest rate of 6.25 per cent. In addition, the non-repurchased interest arrears could be swapped into 15-year bonds, paying interest of LIBOR plus 13/16 per cent. These new bonds are collateralized to an amount equal to 18 months (for the swapped principal), or 36 months (for the swapped arrears) interest payments. This operation lead to a swap of principal and past due interest of US$237 million, and US$53 million, respectively. Banks providing less than 60 per cent of their debt were eligible to change the remainder of their debt into 25-year bonds with a grace period of 15 years, and an interest rate of 6.25 per cent. Conversion amounting to US$228 million took place. Interest arrears could be swapped into bonds with a maturity time of 15 years, paying interest of LIBOR plus 13/16 per cent. This possibility lead to the exchange of US$61 million of interest arrears. None of these last mentioned bonds received any guarantee.

The deal with Costa Rica also contains a recapture clause conditional upon GDP; bond holders will receive priority treatment with respect to payments on past due interest bonds and higher interest payments on the other bonds when GDP exceeds 120 per cent of 1989 level in real terms.

Mexico and Venezuela contributed bridging loans to finance the agreement, since in May 1990 Costa Rica had not yet been able reach agreement with the IMF, this being necessary to obtain money form the World Bank (US$35 million) and Japan's Overseas Economic Cooperation fund (US$35 million). In October 1990 Costa Rica succeeded in reaching the required agreement with the IMF on a standby arrangement, concerning US$51 million (LDC Debt Report, October 1990, p. 1).

VENEZUELA

At the end of 1990 Venezuela reached a Brady Plan agreement. The deal, covering US$20 billion of commercial bank debt (World Bank, 1990c, p.14), like the Mexican one, consisted of a menu of different options for the commercial banks. Banks could choose between a buy-back against 45 per cent of face value (chosen by creditors holding 7 per cent of the eligible debt); a swap of old bonds against "par" bonds, paying 6.75 per cent interest (38 per cent); a new money option in which old debt will be collateralized (debt conversion bonds) conditional upon new lending of an amount equal to 20 per cent of their exposure (31 per cent); a conversion of old debt into new debt with a 6 year rising

interest rate ("step-down, step-up" bonds; 15 per cent); and a swap of old loans into "discount" bonds, paying a market based interest rate (LIBOR plus 13/16 per cent) but at a 30 per cent discount on face value (9 per cent: The Economist, 1991, p. 62).

The principal of the "par" and "discount" bonds is, unlike the principal of the "step-down, step-up" bonds, fully collateralized by US government 30 year-zero coupon bonds. Moreover, 14 months' (for the "par" and "discount" bonds), or 12 months' (for the "step-down, step-up" bonds) worth of interest payments are guaranteed. The new money option is in the form of new money bonds extended with rights for future debt-equity swaps[22]. Finally, from 1996, a recapture clause becomes available if the oil price rises above US$26 a barrel.

URUGUAY

The last deal to be concluded so far is that with Uruguay (signed on January 31, 1991). The operation concerned Uruguay's entire eligible commercial debt of US$1.6 billion. There was a menu of three options: a swap of old loans at face value against 30-year new debt, with an interest rate of 6.75 per cent; a cash buy-back with a discount of 44 per cent; and a new money option, in which creditors convert old debt for new debt and provide new money equivalent to 20 per cent of their exposure. The "par" bond is subject to a recapture clause in which the interest rate will be raised in steps to 7.5 per cent depending on whether a partial commodity terms of trade index increases. In addition, the "par" bond is collateralized with a US government zero-coupon bond, paying 8.5 per cent interest. Interest payments with respect to the "par" bond are guaranteed for an amount worth 18 months. The conversion notes used in the money option have a maturity of 16 years, a grace period of 7 years, and bear an interest rate of LIBOR plus 7/8 per cent. The new money was in the form of 15-year money notes, with a grace period of 7 years and paying an interest rate of LIBOR plus 1 per cent.

The "par" bond, the cash buy-back, and the new money option was chosen by banks covering US$535 million, US$628, million and US$447 million of the eligible debt respectively. Hence, US$89 million of new money became available. The World Bank (IBRD), the IMF, and also the Inter-American Development Bank (IDB) proposed to contribute to the financing of the operation (in total some US$130 million). A part of the deal will be financed through Uruguay's reserves (US$237 million: World Bank, 1991a, pp.18-19).

The debt conversion deal contains the possibility of changing the new bonds into Uruguayan Treasury Bonds, of which the yield may be used for investments in Uruguay.

APPENDIX 2: CALCULATION OF s_A and s_B

We have the following accounting structure of the assets affected by the deal (in $ million):

Principal:

buy-back = 768
initial stock = 768 + 237 (par bonds of A banks) + 228 (par bonds of B banks)
= 1233
=> 62.3 per cent is bought back

Past due interest:

buy-back = 223
initial stock = 223 + 53 (par bonds of A banks) + 61 (par bons of B banks)
+ 14 (down payment to A banks + 15 (down payment to B banks)
= 366
=> 60.9 per cent is bought back

(memo item) Free riders: 13

We define $\alpha=1/(1-s_A)$ and $\beta=1/(1-s_B)$. The average share of principal bought back is equal to

$$\frac{237(\alpha-1) + 228(\beta-1)}{237\alpha + 228\beta} = 0.623$$

Similarly, the average share of PDI bought back is equal to

$$\frac{(53 + 14)(\alpha-1) + (61 + 15)(\beta-1)}{(53 + 14)\alpha + (61 + 15)\beta} = 0.609$$

This set of equations defines a linear system of two equations with two variables. After calculation, it gives:

$\alpha = 3.78$, hence $s_A = 0.735$
$\beta = 1.48$, hence $s_B = 0.325$

APPENDIX 3: CALCULATION OF π IN THE 3 ALTERNATIVE SCENARIOS

It is considered that the secondary market evaluates the total private debt, which is made up (principally) of commercial bank debt and (marginally) of other private assets not exchanged in the Brady deals. These two kind of private debt are assumed to have the same seniority status.

Definition of variables:

D banks = initial commercial debt (owed to banks), as measured in Brady plans

ΔD banks = reduction of D banks due to the Brady Plan. This is calculated in terms of equivalent of pure risk debt bearing a LIBOR + market rate (the calculation takes account of the collateral and of the grant element of par bonds). Disbursement of new money is discounted in order to take account of the distribution of disbursement over time. The Costa Rican down payment, which reduces the amount of private debt, is also taken into account.

D other = other initial private debt (bonds, etc.), as measured in WDT (1989 figures)

D IFIs = initial multilateral debt, as measured in WDT (1989 figures)

D bilateral = initial bilateral debt, as measured in WDT (1989 figures)

ΔD IFIs = increase of debt owed to IFIs, as measured in Brady plans

D-ΔD priv. = terminal private debt (after completion of the Brady Plan)

D+ΔD off. = terminal official debt (after completion of the Brady Plan)

ΔD/(D-ΔD) banks = ΔD banks divided by D-ΔD priv., utilized in equations 7a and 7c

ΔD/(D-ΔD) total = (ΔD banks + ΔD IFIs) divided by (D-ΔD priv.+ D+ΔD off.), utilized in equation 7b

ΔD IFIs/(D-ΔD priv.) = ΔD IFIs divided by D-ΔD priv., utilized in equation 7a

Table A1: data for calculation of π

Country	D banks	ΔDbanks	D other	D IFIs	D bilateral	ΔD IFIs
Costa Rica	1.61	1.16	0.06	1.06	0.96	0.19
Mexico	48.90	20.50	9.50	15.84	6.03	5.76
Philippines	9.30	1.13	1.60	6.16	7.61	0.43
Uruguay	1.61	0.78	0.58	0.83	0.86	0.14
Venezuela	19.50	5.10	3.60	1.56	0.40	1.98
Total	80.92	28.66	15.34	25.45	15.87	8.49

Country	D-ΔD priv.	D+ΔD off.	ΔD/(D-ΔD) priv.	ΔD/(D-ΔD) total	ΔD IFIs / (D-ΔD priv.)
Costa Rica	0.51	2.21	2.27	0.36	0.37
Mexico	37.90	27.63	0.54	0.22	0.15
Philippines	9.77	14.20	0.12	0.03	0.04
Uruguay	1.41	1.83	0.55	0.20	0.10
Venezuela	18.00	3.94	0.26	0.14	0.11
Total	67.59	49.81	0.42	0.17	0.13

Country	P_{-1}	P_1	P_1-P_{-1}	π if IFIs senior equation 7a	π if IFIs equal equation 7b	π if IFIs junior equation 7c
Costa Rica	0.14	0.22	0.08	-0.07	-0.08	0.10
Mexico	0.38	0.51	0.14	-0.20	-0.20	0.14
Philippines	0.49	0.52	0.03	-0.17	-0.37	0.27
Uruguay	0.47	0.63	0.16	-0.00	-0.35	0.17
Venezuela	0.44	0.54	0.10	-0.48	-0.25	0.09
Total	0.40	0.52	-0.11	-0.23	-0.26	0.14

APPENDIX 4: CALCULATION OF GAINS AND LOSSES OF IFIs, BANKS AND THE DEBTORS

IFI losses = $(1-\pi) \times \Delta$D IFIs

Bank gains = value of collateral + buy-back cash (cash payment received by banks in the buy-back operation) + downpayment (of part of interest arrears owed by Costa Rica) + $P_1 \times$ (D-ΔD priv) -$P_{-1} \times$ (D banks + D others) - (discounted) cash disbursed by the banks when they provide new credit

NB: For the sake of consistency with previous calculations, it is assumed that "other" private debt holders have the same capital gain as banks (due to the difference P_1-P_{-1}). Actually, it would be more correct to call it "private creditors' gains".

Debtor's gain = 0 - IFI losses - bank gains

Table A2: Data for calculating the distribution of gains and losses

Country	IFI loss	Bank gain	Debtor gain	Value of collateral	Buy-back cash	Down-payment	New credit
Costa Rica	0.17	0.09	0.07	0.03	0.16	0.03	0.00
Mexico	4.99	2.79	2.20	7.00	0.00	0.00	1.34
Philippines	0.31	0.15	0.16	0.00	0.67	0.00	0.21
Uruguay	0.11	0.24	-0.13	0.11	0.35	0.00	0.09
Venezuela	1.79	0.76	1.03	1.75	0.63	0.00	1.14
Total	7.33	4.04	3.30	8.89	1.81	0.03	2.78

APPENDIX 5: THE SIMULATION MODEL

To clarify the model it is helpful to present two well known economic identities:

$$I - S = F - J \quad (1)$$
$$M - X = F - J \quad (2)$$

I = investment; S = domestic saving; F = net capital inflows;
J = net factor services to abroad; M = imports; X = exports.

Equation (1) is the savings gap; equation (2) is the foreign exchange gap. To keep things as simple as possible the model does not explicitly distinguish between different categories of import goods. Nevertheless, the model implicitly allows for the fact that imports consist of imported capital goods and consumer goods by assuming that total imports depend on investment and GDP (Y).

$$M = F_1(I, Y) \quad (3)$$

By inverting (3) we get

$$I = F_2(M, Y) \quad (4)$$

Total possible imports are given by the available amount of foreign exchange.

$$M = F - J + X \quad (5)$$

Savings are assumed to be a function of GDP.

$$S = F_3(Y) \quad (6)$$

Savings constrained investment (I_s), and foreign exchange constrained investment (I_f) can now be derived. Rewriting (1) and substituting (6) gives I_s:

$$I_s = F_3(Y) + F - J \quad (7)$$

Combining (4), and (5) gives I_f, or in other words the maximum investment when it is taken into account that investment goods should contain imported capital goods:

$$I_f = F_2(F - J + X, Y) \quad (8)$$

Exports are assumed to be related to the (exogenous) industrial countries' growth rate (y_i):

$$X = X_{-1}(1 + by_i) \quad (9)$$

b = export elasticity

Actual investment is the minimum of I_s, and I_f:

$$I = \min(I_s, I_f) \quad (10)$$

In the case where I_s is binding, we assume that imports will adjust to a level so as to equilibrate the savings and foreign exchange gap[23]. If I_f is binding, savings adjust.

Capital inflows are exogenous. We distinguish private bank lending (B), principal repayments (AP), foreign direct investment (FDI) and disbursements of unutilized balances (DB).

$$F = B + DB + FDI - AP \quad (11)$$

All capital flows are exogenous. Bank lending equals private creditors' "new" money in the Brady deals. Principal repayments and disbursements of unutilized balances are taken from World Bank (1990e). Foreign direct investment grows with an exogenously specified growth rate.

For the net factor services, we divide total debt into commercial bank debt (D_m), paying a market interest rate (r_m), commercial bank debt (D_r), paying a reduced interest rate (r_r), debt owed to official creditors (OD_m), paying a market interest rate, and debt owed to official creditors (OD_r), paying a reduced interest rate ($r_{o,}$r), which may differ from the reduced interest rate on commercial debt. All interest rates are exogenous.

$$J = r_m D_{m,-1} + r_r D_{r,-1} + r_m OD_{m,-1} + r_{o,r} ODr,-1 \qquad (12)$$

Finally, potential output (Y) is modelled using a conventional Harrod-Domar production function.

$$Y = vK \qquad (13)$$

v is the (constant) marginal productivity of capital (the inverse of the ICOR).

Writing (13) in first differences and some rewriting gives.

$$Y_t = Y_{t-1} (1 - c) + vI \qquad (13a)$$

c is the degree of depreciation.

The import function (3), and the saving function (6) are estimated using a simple least squares regression method. The results are shown below. The coefficient for the production function is obtained from other studies.

REGRESSION RESULTS

Costa Rica

m = 0.95 y + 0.46 i (3a)
(2.88) (4.53)
Sample: 1970-1989; DW = 1.66; F = 61.25; R^2 = 0.76

S = -295 + 0.29 Y_{-1} (6a)
(-3.44) (12.82)
Sample: 1970-1989; DW = 2.0; F = 164; R^2 = 0.90

Mexico

m = 1.13 y + 0.63 i (3b)
(1.76) (2.13)
Sample: 1970-1987; DW = 1.0; F = 27.64; R^2 = 0.67

S = -4260 + 0.28 Y_{-1} (6b)
(-1.82) (18.71)
Sample: 1970-1989; DW = 1.49; F = 350; R^2 = 0.95

The Philippines

m = 0.77 y_{-1} + 0.53 i (3c)
(1.51) (3.31)
Sample: 1971-1989; DW = 1.13; F = 15.73; R^2 = 0.45

$S = -3912 - 4590\ Dum + 0.39\ Y_{-1}$ (6c)
(-2.19) (-4.5) (6.38)
Sample: 1970-1989; DW = 1.16; F = 20.4; R^2 = 0.67

Uruguay

$m = 0.65\ y_{-1} + 0.32\ i$ (3d)
(1.13) (1.99)
Sample: 1971-1989; DW = 1.94; F = 12.15; R^2 = 0.38

$S = -1764 + 0.35\ Y_{-1}$ (6d)
(-3.73) (5.45)
Sample: 1970-1989; DW = 0.72; F = 29.7; R^2 = 0.60

Venezuela

$m = 1\ i + 0.05$ (3e)
(9.38) (1.72)
Sample: 1974-1989; DW = 1.87; F = 88.0; R^2 = 0.86

$S = -4685\ Dum + 0.35\ Y_{-1}$ (6e)
(-4.1) (17.41)
Sample: 1974-1989; DW = 0.77; F = 10.25; R^2 = 0.40

Notes to the regression results: y, i, and m refer to the growth rate of GDP, investment, and imports respectively; Dum is an intercept dummy for the years from 1982 (all equations are estimated with this dummy, only when the dummy was significant it is incorporated in the equation);[24] ( ) = t-statistic; DW = Durbin-Watson statistic; R^2 refers to the adjusted R^2. Data for the regressions are obtained from World Bank (1991b). Saving is calculated by subtracting private and government consumption from GDP. All data used are in constant 1987 prices and subsequently converted to constant 1989 US$ (the start year for our simulation model) prices with the overall GDP deflator and the 1989 conversion factor. For Venezuela some data are lacking, so that the sample period is shorter. Moreover, for Venezuela we could not find a significant coefficient for y in the import function. With respect to the import function for Mexico we did not consider data for 1988, 1989, and some years in the sample period since import behaviour for these years was extremely volatile (falling 50 per cent in a year) and different from the other years.

Note that for some regressions the Durbin-Watson statistic is rather low, which may point to the existence of serial correlation. In addition, for some regressions the explanatory power is low. However, for the purpose they are used for the results are satisfactory. It should be noted that we had no intention to build large-scale, perfectly forecasting econometric models for Costa Rica, Mexico, the Philippines, Uruguay, and Venezuela. The models used here only serve to give a rough estimate of the liquidity effects of the Brady deals.

The model uses constant 1989 prices. It only needs some coefficients and start values. Table A3 gives the start values.

Table A3: 1989 start values
(million 1989 dollars)

	Costa Rica	Mexico	Philippines	Uruguay	Venezuela
GDP	5221	200729	44342	8418	43836
Exports	1892	35900	12407	2193	15672
Imports	2023	31014	11946	1500	9116
Invest	1275	34816	8265	777	5615
Debt OCC	741	428	5253	68	94
Debt OCNC	1285	21449	8518	846	1863
Debt PC	1593	63470	11181	2360	28904
FDI	116	2241	482	47	213

Notes: Sources: GDP, Exports, Imports, and Investment (Invest) from World Bank (1991b). Imports refer to merchandise imports and imports of nonfactor services. Factor services are not included since they are endogenous in the model. With respect to exports factor services are included. Debt OCC = concessional debt to official creditors; Debt OCNC = non-concessional debt to official creditors, calculated as the sum of public and publicly guaranteed non-concessional debt to official creditors and use of IMF credit; Debt PC = debt to private creditors, calculated as the sum of public and publicly guaranteed debt to private creditors plus private non-guaranteed debt. All debt figures are taken from World Bank (1990e). FDI = (net) foreign direct investment, taken from World Bank 1990e, the figure for Uruguay refers to 1988.

Other Assumptions

The assumed export elasticity is based on Fishlow (1987, p.259) and set at 1.5 for all countries. GDP growth of the industrial countries is assumed to be 2 per cent for 1990 and 1991, and 3 per cent from 1992 (based on de Marulanda, 1991, p. 101). The (real) interest rate on non-concessional debt to official creditors and on debt to private creditors is assumed to be 8.6 per cent (LIBOR of 9.1 per cent minus 1989 US inflation of 0.5 per cent). The (real) interest rate on concessional debt to official creditors is set at 2 per cent. The marginal productivity of capital for the Latin-American countries is set at 0.4 (based on Dittus and O'Brien, 1991). The marginal productivity of capital for the Philippines is assumed to be 0.286 (based on Taylor, 1990). The rate of growth of foreign direct investment is set at 7.5 per cent (based on the continued policy reform scenario of de Marulanda, 1991, p.105). This growth rate is increased to 10 per cent in the Brady2 scenario.

Additional assumption with respect to the model calculations

All start values for the Base scenarios are given in Table A1.

In the Brady scenarios Debtpc equals the start value of Debtpc minus debt repurchased in the Brady deals plus the value of Discount Bond issued (see Table 2.1). Debt OCNC in the Brady scenarios equals the start value of Debt OCNC plus the IMF, IBRD and Other contributions in the financing of the Brady agreements (see Table 2.2). In the Brady scenarios debt to private creditors with reduced interest rates equals the value of the Par Bonds (Table 2.1).

For Costa Rica, the converted past due interest payments (amounting to US$114 million) are not considered. The 20 per cent downpayments on past due interest are considered by decreasing the calculated interest payments over the simulation period by an amount equal to the downpayment. For Venezuela an additional debt stock is introduced: the start value of the "step-down, step-up" bonds (US$2919 million). In the first 6 years these bonds pay real interest rates equal to the nominal interest rates as given by World Bank (1990a, p.60), minus 0.5 per cent. In the other years these bonds pay a real interest rate of 8.6 per cent. Foreign contributions of official creditors are assumed to be US$2000 million minus US$630 million.

REFERENCES

Bacha, E.L., "A Three-Gap Model of Foreign Transfers and the GDP Growth Rate in Developing Countries," *Journal of Development Economics*, 32 (1990), pp. 279-296.

Berthélemy, J.C., and A. Vourc'h, Burden-Sharing Among the Creditors of Defaulting Debtor Countries, OECD Development Centre, mimeo, October 1991.

Bulow, J, and K. Rogoff, *The Buy-back Boondoggle*, Brookings Papers on Economic Activity, 2, 1988.

Bulow, J. and K. Rogoff, Sovereign Debt Repurchases: No Cure for Overhang, *Quarterly Journal of Economics*, vol. CVI, n°4, November 1991, pp. 1219-1235.

Claessens, S., and I Diwan, *Methodological Issues in Evaluating Debt-Reducing Deals*, Policy, Research, and External Affairs Working Paper, WPS 408, The World Bank, Washington D.C., May 1990a.

Claessens, S., and I Diwan, The LDC Debt Crisis: Who Gains From Debt Reductions?, The World Bank, Forthcoming in: Japan and the World Economy, 1990b

Claessens, S, I. Diwan, K.A. Froot, and P.R. Krugman, *Market-Based Debt Reduction for Developing Countries: Principles and Prospects*, International Economics Department, Debt and International Finance Division, The World Bank, Washington D.C., September 1990.

Claessens, S., and S van Wijnbergen, *Pricing Average Price Options for the 1990 Mexican and Venezuelan Recapture Clauses*, Policy, Research, and External Affairs Working Paper, WPS 541, The World Bank, Washington D.C., November 1990.

Cohen, D., How to Cope with a Debt Overhang: Cut Flows rather than Stocks, *in* I. Husain and I. Diwan (ed.), *Dealing with the Debt Crisis*, The World Bank, Washington D.C., 1989, pp. 229-237.

Detragiache, E., *Sensible Debt Buy-backs for Highly Indebted Countries*, Policy, Research, and External Affairs Working Papers, WPS 621, The World Bank, Washington D.C., March 1991.

Dittus, P., and P.S. O'Brien, *A Macroeconomic model for debt analysis of the Latin American Region and Debt Accounting Models for the Highly Indebted Countries,* OECD Department of Economics and Statistics, Working Papers No. 93, Paris 1991.

Diwan, I, and K. Kletzer, *Voluntary Choices in Concerted Deals,* Policy, Research, and External Affairs Working Paper, WPS 527, The World Bank, Washington D.C., October 1990.

Dooley, M., "Buy-Backs and Market Valuation of External Debt", *IMF Staff Papers*, vol. 35, June, p. 215-229.

Fishlow, A., "Capital Requirements in Developing Countries in the Next Decade," *Journal of Development Planning*, 17 (1987), pp. 245-291.

Froot, K.A., "Buybacks, Exit Bonds, and the Optimality of Debt and Liquidity Relief", *International Economic Review*, vol.30, February, pp. 49-70.

Hofman, B., H. Reisen, *Debt Overhang, Liquidity Constraints and Adjustment Incentives*, Technical Papers, No. 32, OECD Development Centre, October 1990.

IMF, International Capital Markets, Development and Prospects, May 1991.

Krugman, P.R., *Market-Based Debt Reduction Schemes,* NBER Working Paper No. 2587, Cambridge, May 1988.

LDC Debt Report, various issues.

Marulanda, N. R. de, "External Financial Requirements For Latin America in the Nineties: Alternative Scenarios," In : Emmerij, L., and E. Iglesias (eds.), *Restoring Financial Flows to Latin America*, OECD, Paris, 1991, pp. 97-158.

Reisen, H. The Brady Plan and Adjustment Incentives, *Intereconomics*, vol. 26, No. 2, March-April 1991, p. 69-73.

Sachs, J.D., "Conditionality, Debt Relief, and the Developing Country Debt Crisis," in: J.D. Sachs (ed.), *Developing Country Debt and Economic Performance, Vol. 1., The International Financial System,* Chicago, 1989, pp. 255-299.

Taylor, L., *Foreign Resource Flows and Developing Country Growth*, World Institute for Development Economics Research of the United Nations University (WIDER), Helsinki, April 1990.

van Wijnbergen, S., *Mexico's External Debt Restructuring in 1989-90*, Policy, Research, and External Affairs Working Papers, WPS 424, The World Bank, Washington D.C., June 1990.

van Wijnbergen, S., Mexico and the Brady Plan, *Economic Policy*, No. 12, April 1991, p. 14-56.

World Bank, *World Debt Tables, 1990-91 Edition Volume 1*, Washington D.C., 1990a.

World Bank, *Quarterly Review*, Financial Flows to Developing Countries, Debt and International Finance Division, Washington D.C., March 1990b

World Bank, *Quarterly Review*, Financial Flows to Developing Countries, Debt and International Finance Division, Washington D.C., December 1990c.

World Bank, *World Debt Tables 1989-90 First Supplement,* Washington D.C., 1990d.

World Bank, *World Debt Tables 1990-91, Volume 2. Country Tables,* Washington D.C., 1990e.

World Bank, *Quarterly Review*, Financial Flows to Developing Countries, Debt and International Finance Division, Washington D.C., March 1991a.

World Bank, *World Tables 1991*, Washington D.C., 1991b.

World Bank, *World Debt Tables 1991-92, Volume 1. Country Tables,* Washington D.C., 1991c.

NOTES

1. See, e.g., Van Wijnbergen (1990,1991), Reisen (1991), Bulow and Rogoff (1991). A recent study covering all Brady plans implemented so far is Bacha (1991).

2. A discounted value of this new money is used in order to take account of its partly delayed disbursement. A discount rate of 9.1 per cent has been adopted. This rate is used throughout the paper.

3. For the Philippines we have assumed that about US$500 million would have been provided by the banks anyway through a standard refinancing of interest payments falling due (see Claessens and Diwan (1990) and Section 3 of this paper). In calculating the effects of the Brady plan, this amount is stripped from total new money obtained in the rescheduling/refinancing agreement.

4. Debt relief from the "par" bonds equals: (1 - new interest rate/old interest rate) × value of bonds exchanged. Debt relief from "discount" bonds and buy-backs equals debt retired minus new debt issued. The value of the "recapture clauses" is not considered.

5. It refers to the net transfer per year over the period 1990-93. An interest rate of 9.1 per cent is used for the calculation of interest foregone, interest payments on foreign contributions and interest payments on pre-Brady debt. The reduction of principal payments is the annual average contractual principal payments previously due on debt which has been repurchased or exchanged against new bonds benefiting from a grace period. The effect of new money is assumed to be spread over the four years 1990-93.

6. q = 0.65, c = 0.196 (total value of principal and interest guaranteed payments, discounted at a rate of 9.1 per cent), rc = 0.02 (calculated by S. Claessens and S. van Wijnbergen (1990)), n = 0.21 (discounted value of the 25 per cent of new money calls, which are split over 4 years).

7. The figures are: s_A= 0.735, s_B= 0.325, g_A= 0.81, g_B= 0.79, dp_A= 0.012, dp_B= 0.033. s_A and s_B are derived from figures appearing in the accounting structure of the deal, as provided in World Bank(1990a) and explained in Appendix 2; g_A and g_B are implicit grant elements of bonds A and B; c_A= 0.10.

8. *Source:* Salomon Brother bid prices, as appearing in World Bank (1991a).

9. Initially, the commercial debt was equal to $ 8790 million, of which $ 1337 million has been bought back. The ratio of new money obligation is then (715 - 500)/(8790 - 1337) = 0.03.

10. In this exercise, the "secondary market price" is the price of a pure risk debt bearing a market interest rate, and the commercial debt stock is similarly calculated as a pure risk debt stock bearing a market interest rate.

11. For all countries but Costa Rica, our estimate of π lies within a 95 per cent confidence interval calculated using econometric estimates appearing in Cohen (1989). For Costa Rica, econometric results lead to a negative value of π, and are therefore much lower than our own estimate.

12. See Hofman and Reisen (1990) for an empirical discussion.

13. It is above the upper bound of the 95 per cent confidence interval for π mentioned in note 11.

14. For Mexico our result is close to figures given by Bulow and Rogoff.

15. For an explanation of the two-gap models see, among others, Bacha (1990).

16. The World Bank provides projections of contractual principal repayments, excluding the effects of the Brady plan, under the heading "projections on existing pipeline of long-term debt".

17. Interest payments are calculated as the previous period debt stock times the interest rate. The debt stock used for this calculation equals the previous period debt stock plus new lending minus total principal payments due. We used total principal payments due instead of the actual principal payments since in this way the total present value of the actual debt service payments during the simulation period divided by the present value of total debt service obligations during the simulation period exactly equals the secondary market price. The same applies to the interest payments on remaining (old) debt to private creditors in the Brady scenario.

18. The model only considers disbursements of unutilized balances, foreign direct investment and new money as a result of the Brady accords (see Appendix 5).

19. A substantial part of this section is based on World Bank (1990a).

20. An escrow account is an account that comes available when specific conditions are fulfilled. Until that time it is held by a third party.

21. Claessens and Diwan (1990a), Van Wijnbergen (1990) and Claessens, Diwan, Froot, and Krugman (1990, p. 49) show that the value of the new money option was lower than that of the bond options, which explains why the new money option was not popular.

22. The new money bonds consist of series A and series B bonds. Series A bonds are issued by the Republic of Venezuela, series B bonds are issued by the central bank. Series A and B bonds were chosen by 40 and 60 per cent respectively of the creditors involved in the new money option (World Bank, 1990a, p.60).

23. A capacity constraint appears in the savings gap. Therefore another way of closing the model is by rationing exports. In the case where imports adjust, we assume that all available foreign exchange will be used. The increase in imports will lead to an increase in imported consumer goods and hence to a decrease in consumer demand for domestic goods.

24. In the simulations the significant dummies are taken into account.