OECD DEVELOPMENT CENTRE

Working Paper No. 46
(Formerly Technical Paper No. 46)

THE EXTERNAL FINANCING OF BRAZILIAN IMPORTS
(SPECIAL SERIES ON MIXED CREDITS, IN COLLABORATION WITH ICEPS)

by

Enrico Colombatto, with Elisa Luciano, Luca Gargiulo,
Pietro Garibaldi and Giuseppe Russo

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

OECD OCDE

October 1991
OCDE/GD(91)180

TABLE OF CONTENTS

PREFACE

The OECD Development Centre and the Institute for International Economic Cooperation and Development (ICEPS), with financial support from the Italian Government, have carried out a series of country studies on "mixed credits", following a methodology developed and tested by Professor André Raynauld.

Some Member countries of the Development Assistance Committee (DAC), and Italy in particular, were of the opinion that it was only through detailed analytical work that some of the misgivings about the use of mixed credits in development assistance could be clarified.

Following the completion of the pilot study on Tunisia (published by the Development Centre in 1988) a methodological seminar was organized by ICEPS in Rome in November 1988, where it was decided to undertake four additional country studies on Turkey, Indonesia, Thailand and Brazil. Each of these studies was carried out in close collaboration between the three partners: ICEPS, a national research institute in the country concerned, and the OECD Development Centre.

In the Brazilian case, this paper shows that the impact of export-credit operations on the economy as a whole has been slight, representing less than three per cent of total imports over the years 1985 to 1989. Attention is therefore given to analysis of the methodology used to measure the extent of the subsidy implied by supportive financing given to Brazilian imports by the exporting countries. Of particular importance is the weight given to the application of repayment grace periods in the calculation of real costs or benefits accruing to Brazil as a beneficiary of import subsidies. Such considerations, naturally, are also relevant to analysis of such subsidies in other countries. In this sense, this study differs from its companions in the Mixed Credits series (on Tunisia, Turkey, Indonesia and Thailand) and widens the discussion to the methodological issues central to the series as a whole. It is therefore a complement to the other papers and helps to place the series as a whole in its scientific context.

After directing this series of country studies, Professor André Raynauld has undertaken a comparative analysis of the results in a synthesis study with a view to drawing more general conclusions and offering policy recommendations for the future.

Jean Bonvin
Director of Co-ordination
OECD Development Centre

Giuseppe Bonanno di Linguaglossa
Secretary-General
ICEPS

RÉSUMÉ

D’une manière générale les opérations de crédits à l’exportation (OCE) ont eu un rôle modeste dans l’économie brésilienne. Au cours de la période 1985-1989 ils ne concernaient que 2.57 pour cent du total des importations du Brésil, importations largement concentrées dans "l’équipement" (incluant les services de l’administration publique mais non les transports), "les céréales" et "le charbon" en provenance des Etats-Unis, du Canada et de la France (ces trois secteurs représentant environ 88.5 pour cent du total des importations).

En principe, la subvention équivaut à la valeur de la différence entre les remboursements aux conditions du marché et aux conditions libérales, c’est-à-dire la différence entre les paiements d’intérêts avec et sans conditions libérales. Cependant les problèmes apparaissent car, i) les prêts assortis de conditions libérales ne sont pas toujours disponibles dès la signature de l’accord, ii) de tels prêts bénéficient généralement d’un différé d’amortissement, iii) le taux d’intérêt sur le prêt et le facteur d’actualisation peuvent évoluer dans le temps et surtout, iv) les évaluations de bénéfices *ex-ante* sont difficiles à définir si l’on se réfère aux données *ex-post*.

Finalement l’importance de la subvention varie selon la durée prise en considération par le bénéficiaire. Trois cas, au moins, sont envisageables : le receveur peut décider de procéder à un ajustement économique, i) si l’accord sur le prêt assorti de conditions libérales a été ratifié, ii) si le versement est intervenu, iii) progressivement, avec le remboursement du prêt, la subvention apparaît comme un gain annuel concrétisé au moment du paiement des intérêts.

Les implications des questions sus-mentionnées ont été examinées en détail et comparées à la méthodologie classique qui est en fait un cas particulier du critère plus général proposé dans ce document.

Les 581 OCE décrites dans notre base de données ont été analysées en conséquence. Si l’on utilise la méthodologie classique, les résultats montrent qu’au Brésil le taux des subventions accordées dans le cadre des OCE a toujours été positif (la moyenne étant de 5.3 pour cent) mais très irrégulier (frôlant le zéro en 1989).

Des écarts avec les résultats obtenus par la méthode classique se produisent, i) si le différé d’amortissement est pris en compte, ce qui provoque une hausse du taux moyen de subvention (jusqu’à 6.9 pour cent) ; ii) lorsque l’on procède à une évaluation plus serrée du taux d’intérêt semi-annuel, ce qui augmente ensuite le taux de subvention (jusqu’à 7.4 pour cent) ; iii) lorsque l’on établit une distinction entre le différé d’amortissement nominal et réel, ce qui réduit le taux de subvention de 5.3 à 4.7 pour cent ; iv) si l’on rejette l’hypothèse d’un taux d’intérêt constant qui fait monter le taux de subvention à 7.4 pour cent (avec différé d’amortissement) et, v) avec une distinction entre le taux d’intérêt du marché et le taux d’actualisation qui peut fort bien entraîner une nouvelle hausse du taux estimé de subvention (les dernières estimations étant dépendantes du choix du nouveau taux d’actualisation). Finalement la méthode des ratios

de valeur actualisée a été utilisée afin de calculer au prorata la subvention pendant toute la durée du prêt.

Considérée dans son ensemble, l'analyse donne lieu à deux observations d'ordre général. D'une part, malgré la dimension modeste de l'OCE dans les importations brésiliennes au cours de la seconde moitié des années 80, le rôle de la subvention a été significatif, parfois très important (comme en 1988) dans certains secteurs industriels comme l'équipement, mais aussi très irrégulier dans le temps et selon les industries. Ceci peut signifier que ces transactions n'ont pas suivi les "règles du jeu" mais ont nécessité une approche au cas par cas. D'autre part, les questions de méthodologie qui doivent être envisagées au moment de l'évaluation du taux de subvention sont très importantes. Comme le montre ce document, les estimations de taux peuvent varier considérablement entre les différents critères allant (dans le cas du Brésil) de moins de 5 pour cent à plus de 10 pour cent. Ceci explique que pendant la période 1985-1989, la subvention totale accordée au Brésil aurait aussi bien pu être inférieure à 100 millions de dollars que supérieure à 250 millions de dollars.

SUMMARY

On average, the role of export-credit operations (ECOs) in the Brazilian economy has been modest: during the 1985-89 period they involved only 2.57 per cent of total Brazilian imports, highly concentrated in "equipment" (excluding transport, but including government services), "cereals" and "coal", with the United States, Canada and France being the most important partners (covering on average 88.5 per cent of the total).

The subsidy, in principle, corresponds to the value of the difference between repayments according to market and "soft" conditions, that is, the difference between interest payments without and with soft terms.

However, problems arise because (i) soft loans are not always made available as soon as they are agreed upon, (ii) such loans usually benefit from a grace period, (iii) the interest rate on the loan and the discount factor can change over time, and, last but not least, (iv) *ex-ante* evaluations of the benefit are hard to capture by looking at *ex-post* data.

Finally, the importance of the subsidy varies with the time it is taken into account by the beneficiary. At least three cases are possible: the recipient may decide to adjust his economic behaviour (i) when the soft loan has been agreed upon, (ii) when it has been disbursed, (iii) gradually, as the loan is paid back, that is, the subsidy is perceived as a yearly benefit which materializes as interest is paid back.

The implications of the issues mentioned above have been explored in detail and compared with the standard methodology which is actually a particular case of the more general criteria proposed in the paper.

The 581 ECOs described in our data base have been analysed accordingly. The results show that with the standard methodology the rate of subsidy implied in Brazilian ECOs has always been positive (the simple average being 5.3 per cent) but highly variable (and very close to zero in 1989).

Departures from the standard estimate occur (i) when the grace period is taken into account, which leads to an increase of the average rate of subsidy to 6.9 per cent; (ii) with a more precise calculation of the semi-annual interest rate, which further raises the rate of subsidy to 7.4 per cent; (iii) when there is a distinction between nominal and actual grace periods, which reduces the subsidy from 5.3 per cent to 4.7 per cent; (iv) with the removal of the constant-interest-rate hypothesis, which raises the subsidy to 7.4 per cent (with a grace period) and 9.5 per cent (without a grace period); and (v) with a distinction between the market interest rate and the discount rate, which may well provoke a further rise in the estimated rate of subsidy (the new estimates depending on the choice of the new discount rates). Finally the present-value-shares method has been applied in order to prorate the subsidy throughout the duration of the loan.

As a whole, the analysis suggests two rather general comments. On the one hand, in spite of the modest weight of ECOs in the Brazilian import bill, the element of subsidy they have implied in the second half of the 1980s has been significant, very high in certain years (1988) and industries (equipment), but also highly variable over time and between industries. This could mean that these transactions did not follow standardized "rules of the game" and require a case-by-case approach. On the other hand, the methodological issues to be considered when evaluating the rate of subsidy are indeed crucial. As has been demonstrated in this paper, estimates of the rates can vary greatly between the different criteria, ranging (in the Brazilian example) from less than 5 per cent to above 10 per cent. This means that during the 1985-89 period Brazil's total subsidy could have been less than $100 million or as much as $250 million.

FOREWORD

The original aim of this work was twofold. First, we wanted to understand the role of export-credit operations (ECOs) in the Brazilian case: the value of these transactions, the measurement of the subsidy they imply, and the distribution of the benefits over time and among industries. The second objective was to determine the impact of ECOs on the economy, both from a sectoral and a general point of view, with their microeconomic and macroeconomic implications.

However, in spite of early hopes and repeated efforts, the data set provided by the Brazilian authorities was not adequate for our purposes. In particular, they covered only five years (1985-89) and a limited number of (very large) industries — not enough to carry out any serious econometric work. Furthermore, during that period financial flows to the Brazilian economy at market conditions were virtually nil, so that ECOs were no longer a financial opportunity for the authorities, but indeed one of the very few possibilities available.

As such, the benefit Brazil derived from these operations was linked not only to their amounts and conditions, but also to the very fact that they were offered. As a matter of fact, the value of ECOs during these years was too low to have any significant impact on the economy as a whole.

Given these crucial shortcomings, the focus of the study has been shifted from analysing the economic impact of ECOs in the Brazilian case to examining the methodological issues raised by the measurement of the subsidy implied by ECOs. Each measure — and the choice among them is not as obvious as it may seem — has led to different estimates; and these differences have then been illustrated by means of the Brazilian data.

This work — a more complete version of which is available upon request — has been carried out thanks to the efforts of many people. The OECD Development Centre (Paris) and ICEPS (Rome) have financed the study and provided all sorts of help throughout the project. Mr. Motta Veiga of FUNCEX has made it possible for us to have the official data necessary for the empirical work. As for my co-authors, Dr. E. Luciano (University of Torino) has helped me through Section 3 (which is the core of the paper) and parts of Section 4, Mr. P. Garibaldi (URCC Piemonte) through Section 1 and parts of Section 4, Mr. Giuseppe Russo (Centro Einaudi, Torino) through Section 5 and many efforts (not reported here for the reason mentioned above) to estimate the micro- and macro-effects of the operations examined, and Mr. L. Gargiulo (URCC Piemonte) analysed the raw data in Section 2 and wrote computer programs.

Enrico Colombatto
University of Turin and ICER
July 1991

I. INTRODUCTION

Since the late 1960s Brazil's gross foreign debt has increased from less than $4 billion (1968) to some $114 billion (1988), rising sharply as a proportion of both exports and GDP.

Several causes are at the origin of this rise. By and large, prior to the first oil shock gross debt increased mainly because of the desire to accumulate reserves. In the mid-1970s, however, net growth of debt gained momentum as a consequence of the first oil shock — which led to a fall in the terms of trade as well as in foreign demand for Brazilian exports — and because of the reluctance to cut imports and GDP growth. The situation deteriorated sharply in the 1980s, due to the second oil shock[1] and the rise in world interest rates[2]; as a consequence, the country's indebtedness rapidly became unsustainable[3].

In recent years, debt strategies have been replaced by policies aimed at restoring the external balance and reducing inflation regardless of the effects on GDP growth. As a matter of fact, the debt issue now plays a secondary role, for there is not much that can be done about it: the trade surplus is not enough to service the outstanding debt, so that a moratorium on debt servicing cannot be avoided. At the same time, however, the financial problem remains: new resources are still badly needed in order to obtain the fixed capital to be invested in the most competitive industries, but new funds are very difficult to attract, given the country's poor standing as a debtor.

Within this framework the role of export-credit operations (ECOs)[4] may change in various respects. On the one hand, ECOs are one of the very few channels which enable the country to maintain its imports when no cash is available to pay for them. On the other hand, low credibility may affect the propensity of the exporter to engage in ECOs and, in turn, both the volume and the conditions which characterise such transactions.

For reasons which will be clearer shortly, this study is not concerned with how ECOs have evolved in the Brazilian case. It focuses on their main features during the second half of the 1980s: in particular, after a short comment on the data available (Section 2), Section 3 explains how the subsidy element included in ECOs can be measured, which is then computed in Section 4. The main conclusions and comments are then the subject of Section 5.

NOTES

1. Brazil's terms of trade fell by 40 per cent between 1978 and 1982.

2. It is worth recalling that at the time the share of variable interest rate debt was well over 60 per cent, mainly denominated in US dollars; it is hardly surprising that the rise in LIBOR (from 10.3 per cent in 1978 to 18.9 per cent in 1981) hit Brazil particularly hard.

3. At the beginning of the 1980s debt servicing was already absorbing over 60 per cent of export earnings.

4. ECOs refer to non-cash transactions in which exports to Brazil (mainly from the OECD countries) are associated with particularly favourable financial conditions (with respect to the current market terms).

Brazilian Foreign Debt, 1965-1991
(million $)

Year	Gross debt[1]	International reserves	Net debt
1965	3 644	483	3 161
1966	3 666	421	3 245
1967	3 281	786	2 495
1968	3 780	257	3 523
1969	4 403	656	3 747
1970	5 128	1 190	3 938
1971	6 628	1 754	4 874
1972	10 165	4 219	5 946
1973	12 939	6 509	6 430
1974	19 416	5 463	13 953
1975	23 737	4 167	19 570
1976	29 031	6 667	22 364
1977	41 397	7 442	33 955
1978	53 614	12 190	41 424
1979	60 419	9 839	50 580
1980	70 957	6 875	64 082
1981	79 946	7 507	72 439
1982	92 812	3 997	88 815
1983	98 095	4 562	93 533
1984	105 015	11 961	93 054
1985	105 526	11 618	93 908
1986	113 043	6 754	106 289
1987	123 560	7 864	115 696
1988	115 646	1 118	114 258
1989	111 290		
1990	115 342[2]		
1991	114 796[2]		

1. Medium- and long-term debt outstanding at the end of the year (including private non-guaranteed external debt).

2. Estimates.

Source: World Bank, *World Debt Tables*, various years.

Total Debt Stock
(million $)

	1970	1975	1980	1985	1990
Long-term debt	5 128	23 737	57 431	91 638	94 882
Public[1]	3 421	14 144	40 826	74 461	86 304
Private	1 706	9 593	16 605	17 177	8 578

1. Plus publicly guaranteed.

Source: World Bank, *World Debt Tables*, various years.

Main variables and debt indicators

	1980	1985	1987	1988	1989
Gross debt/Exports (%)	305	360	430	317	302
Gross debt/GNP (%)	31	49	42	34	36
Interest/Exports (%)	34	31	26	36	15
Debt Service/Exports (%)	63	39	42	49	31
Interest rate (%)	12.5	9.1	7.8	9.4	8.5
Maturity (years)	10.3	11.8	13.1	11.4	12.8
Grace period (years)	3.9	3.2	3.1	3.9	3.2

Source: World Bank, *World Debt Tables*, various years.

II EXPORT CREDITS: THE DATA

As in many debt-troubled countries, ECOs may have some interesting features in the Brazilian situation. In particular, such transactions may be the only way for Brazil to import high-priority commodities without immediate disbursement of hard currency.

Of course these transactions are not immune from drawbacks. On the one hand, the soft-credit element which characterises them may be offset by higher prices of the commodities involved. On the other hand, these subsidies may induce the importer to buy goods which would not have been purchased under market conditions. That does not mean that such imports are useless, but it is likely that they generate inefficiencies, especially from the microeconomic standpoint.

The data set which has been made available to us by the Central Bank of Brazil through the "Fundaçao de Estudios do Commercio Exterior" is not rich enough to allow an in-depth analysis of these possibilities. However, it is satisfactory for estimating the subsidy element included in ECOs concerning Brazil and making some observations about their possible impact.

Such data include ECOs for 14 industries in the 1985-1989 period[5]; and according to our source, they include all operations which have taken place in that time span. As can be seen in the tables, the limited total of ECOs has been concentrated in cereals, machinery and coal[6], without corresponding to their relative weights in total imports. As a consequence, if the data actually covered the totality, the conclusions would be straightforward: ECOs are almost irrelevant in the Brazilian context. On the other hand, if the data are just a sample, one should concentrate on its quality, relative to the totality — a task which goes beyond the aim of this work[7].

The main ECO sources for Brazil have been the USA, Canada and France (on average they represent 88.5 per cent of ECOs with Brazil).

NOTES

5. Those classified as "Federal Government Services" have been included in "Other Equipment and Machinery", the underlying hypothesis being that such operations concern fixed-capital imports for infrastructure.

6. Except in 1988.

7. In order to assess the peculiarity of the sample, some weighted estimates for the sectoral rates of subsidy have been put forward, the weights being 1985 imports:

$$\frac{\Sigma_j w_j \cdot \Sigma_i subs_i}{\Sigma_j w_j \cdot \Sigma_i loan_i}$$

with $i = 1, ..., I_j$
$j = 1, ..., J$

I_j : number of observations relative to the jth industry
J : number of industries examined
w_j : (imports of industry j)/(total imports)

ECOs and Imports - Brazil
(million $)

	1985	1986	1987	1988	1989	Average
ECOs (value)	820	308	226	438	207	
Imports (cif)	14 332	15 557	16 581	16 055	20 022	
ECOs/Imports	5.72%	1.98%	1.36%	2.73%	1.04%	2.57%

Subsidized Exports to Brazil, from 1985 to 1989

Industry	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**
Food	18	3.10	14.5	0.72	803	156
Textiles/clothing	64	11.02	79.3	3.97	1 239	324
Other consumer goods	17	2.93	27.6	1.38	1 622	183
Cereals	244	42.00	750.9	37.56	3 078	47
Chemicals	10	1.72	2.7	0.14	273	59
Paper/cellulose	5	0.86	7.5	0.37	1 492	92
Plastics/rubber	1	0.17	0.3	0.02	350	0
Iron/non-ferrous metals	33	5.68	38.3	1.92	1 161	139
Other raw materials	2	0.34	1.6	0.08	789	61
Coal	17	2.93	248.3	12.42	14 603	97
Oil	10	1.72	59.4	2.97	5 939	81
Transport equipment	15	2.58	10.2	0.51	678	152
Other equipment[1]	145	24.96	758.9	37.95	5 234	391

(a) Number of ECOs.
(b) Number, as percentage of total ECOs for Brazil.
(c) Value, in million dollars.
(d) Value, as percentage of total ECOs for Brazil.
(e) Average value of ECOs.
(f) Coefficient of variation for the ECO average value.

(1) Including "Federal Government Services", as pointed out in the text.

Source: Banco Central do Brazil, 1990.

Loans, by lender (1985-1989)

Country	(a)	(b)	(c)	(d)
Argentina	129	0.01	126	0.01
Belgium	29 146	1.46	27 419	1.43
Canada	302 219	15.12	292 696	15.29
China	1 000	0.05	981	0.05
Czechoslovakia	9 572	0.48	8 880	0.46
D.R. Germany	2 864	0.14	2 643	0.14
F. R. Germany	110 906	5.55	106 865	5.58
Finland	1 273	0.06	1 204	0.06
France	391 364	19.57	372 962	19.48
Netherlands	4 584	0.23	4 258	0.22
Hungary	1 136	0.06	1 067	0.06
Israel	467	0.02	459	0.02
Italy	23 211	1.16	20 969	1.10
Japan	5 000	0.25	4 340	0.23
Panama	4 360	0.22	3 967	0.21
Poland	351	0.02	349	0.02
Spain	8 854	0.44	7 940	0.41
Sweden	1 096	0.05	1 076	0.06
Switzerland	23 952	1.20	22 569	1.18
United Kingdom	620	0.03	574	0.03
United States	1 071 896	53.61	1 028 444	53.72
USSR	5 375	0.27	4 826	0.25
TOTAL	1 999 377	100.0	1 914 616	100.0

(a) Value, in thousand dollars.
(b) Column (a), as a percentage of the total.
(c) Value, in thousand dollars at constant 1985 prices.
(d) Column (c), as a percentage of the total.

Source: Banco Central do Brazil, 1990.

III METHODOLOGICAL ISSUES: THE GENERAL CASE

Within the framework of concessionary financing, the subsidy implied in a single operation is usually measured as the value of the difference between repayments according to market and soft[8] conditions. On aggregate, the subsidy for the borrowing country at a fixed date is then the sum of the subsidies for all the loans extended or outstanding at that date.

According to the above definition, given that principal repayments are assumed to be the same under subsidised and non-subsidised conditions, the subsidy can be measured as the difference between interest payments without and with soft conditions.

If it is assumed that no uncertainty exists and the loan is made available as soon as it is agreed upon, disbursement takes place at time 0 and interest payments are made at the end of each time period, from 1 on. Assume that (i) the loan under scrutiny lasts T periods, (ii) the market interest rate for period (t-1, t) is i_t , (iii) the soft rate — in the same currency[9] as that for i_t — is r_t . In addition, let D_t be the residual debt at t, measured in the same currency as that used for i_t and r_t .

Hence, the subsidy in terms of present value at time 0 is

$$S_0^g \equiv \sum_1^T (i_t - r_t) \cdot D_{t-1} \cdot \Phi(t,0) \qquad [1]$$

where $\Phi(t,0)$ is the discount factor from t to 0.

If the rate of interest which applies to alternative investments and borrowing between t-1 and t is i_t^*, the present value of the subsidy becomes

$$S_0^c \equiv \sum_1^T (i_t - r_t) \cdot D_{t-1} \cdot \prod_1^t (1 + i_u^*)^{-1} \qquad [2]$$

Of course, i_t^* can be different from i_t , since the former refers to investment and loans in general, while the latter is more appropriate to the kind of operations considered here. In addition, the measure defined by formula [2] depends on the principal repayment schedule because of the residual debt D_{t-1}, which is, however, supposed to be the same for both soft and market loans.

1 Some special cases: the grace period

In the real world, (i) soft loans are not always made available as soon as they are agreed upon, and (ii) they usually benefit from a grace period, during which the principal is not paid back and after which it is paid at a constant rate.

Concerning the first point, in principle, the time of disbursement or of signature are equally acceptable as the initial period. If disbursement is preferred it means that the subsidy is perceived when the loan is made available, so that its economic effects materialise only when the authorities "see" that they are getting resources at soft conditions. On the other hand, by referring to the time of signature one assumes that the authorities (or economic actors in general) behave according to the perceived present value of the future stream of benefits; and it is obvious that this perception occurs at the moment of signature, that is, before disbursement. In short, the borrower may adjust his behaviour when the financial flow is actually made available or he may also anticipate a flow, as long as he believes it will be available.

In what follows the second hypothesis has been accepted as more plausible: time 0 is therefore the time of signature[10].

Of course, another way to proceed is to analyse the subsidy as a benefit which belongs to each period in which it occurs, as the difference between what should have been repaid by the borrower according to market conditions, and what is repaid according to ECO conditions. As will be shown in Section 3.6, the present value of the subsidy as a whole does not change; but it may be of some interest to compare the subsidy both as an anticipated stream of benefits, and as it matures through the duration of the loan.

As for the second point, if τ is the number of periods covered by the grace period, so that the first principal repayment is at $(\tau+1)$, principal installments are equal to $L/(T-\tau)$, where L is the amount of the loan. Residual debt is:

$$D_t \begin{cases} L & t = 1,2,3,\ldots,\ \tau \\ L\ (T-t)/(T-\tau) & t = (\tau+1),(\tau+2),\ldots,T \end{cases} \qquad [3]$$

When the interest rate on alternative investments and borrowing is the same, [2] becomes

$$S_0^c = L \cdot \left[\sum_{1}^{\tau+1} (i_t - r_t) \cdot \prod_{1}^{t} (1+i_u^*)^{-1} + \sum_{\tau+2}^{T} \frac{T-t+1}{T-\tau} (i_t - r_t) \cdot \prod_{1}^{t} (1+i_u^*)^{-1} \right] \qquad [4]$$

This is the most general expression for the present value of the subsidy when residual debt behaviour is described by [3] and the interest rate on investment is the same as that on borrowing.

Furthermore, if it is assumed that

i) the interest rate on alternative loans is the same as the interest rate on investments;

ii) such interest rate, denoted by [redacted], is equal to the market interest rate for the loan under scrutiny (i_t);

iii) the actual (subsidised) interest rate (r_t) is constant over time ($r_t = r$); and

iv) the market interest rate (i_t) is constant too ($i_t = i$), so that the same happens to discount factors.

Under conditions (i)-(iv), [4] simplifies into

$$S_0^c = L \cdot \frac{i-r}{1} \cdot \left[1 + \frac{(1+i)^{-T} - (1+i)^{-\tau}}{i(T-\tau)} \right] \qquad [5]$$

and, as a percentage of the loan,

$$S_0^c = 100 \cdot \frac{i-r}{i} \cdot \left[1 + \frac{(1+i)^{-T} - (1+i)^{-\tau}}{i\,(T-\tau)} \right] \qquad [6]$$

which is the basic formula used in the subsidy evaluation for a single loan by Raynauld (1988)[11], Önis-Özmucur (1989) and, in continuous time, by Horvarth (1975, 1976) and Phaup (1981).

In particular, if the nominal grace period has length τ, G is the actual grace period, and d is the time it takes to make the money available after the signature (so that $d \equiv \tau - G$)[12], the formulas [5] and [6] above are acceptable only when d = 0, so that $\tau = G$.

Let us now formalize Raynauld's case, where $G = 0 \neq \tau$. This assumption calls for two caveats. For if the loan is disbursed at the end of its grace period, its actual life is T-d. As a consequence, not only the actual grace period has to be taken into account properly when carrying out the estimates, but the duration of the loan is d periods shorter, and the whole loan is to shifted d periods forward. As a matter of fact, other recent studies have neither cut, nor shifted the loans, thereby estimating the subsidy as

$$100 \cdot \frac{1-r}{1} \left[1 + \frac{(1+i)^{-T}}{i\,T} \right]$$

whereas it would have been more appropriate to use

$$100 \cdot \frac{1-r}{i}\left[(1+i)^{-d} + \frac{(1+i)^{-T} - (1+i)^{-\tau}}{i\,(T-\tau)}\right] \qquad [7]$$

which becomes

$$100 \cdot \frac{1-r}{i}\left[(1+i)^{-d} + \frac{(1+i)^{-T} - (1+i)^{-d}}{i\,(T-\tau)}\right] \qquad [8]$$

when G = 0 (and $\tau = d$).

The use of Raynauld's formula raises three further problems: the choice of the market interest rate i, the switching from one kind of time subdivision to another, and its meaning under uncertainty.

According to Raynauld, the rate i is approximated by the rate of return on medium- and long-term government bonds in the lender country, which estimates the costs of funds to the lender, plus a spread. This choice is justified by the assumption that loans would not have been offered at a lower rate than this.

Secondly, when estimates are carried out by setting each period equal to one k-th of a year, the periodic interest rate becomes

$$r_t^k \equiv (1 + r_t)^{1/k} - 1$$

As a consequence, if the duration of the loan is T years with a grace period of t years, the adoption of the correct periodic interest rate leads to a subsidy equal to[13]

$$100 \cdot \frac{i^k - r^k}{i^k}\left[1 + \frac{(1+i^k)^{-Tk} - (1+i^k)^{-\tau k}}{i^k\,(T-\tau)\,k}\right]$$

If r^k is approximated by r/k — or if r is a nominal annual rate — the subsidy becomes[14]

$$100 \cdot \left[1 - \frac{r}{ki^k}\right]\left[1 + \frac{(1+i^k)^{-Tk} - (1+i^k)^{-\tau k}}{i^k\,(T-\tau)\,k}\right]$$

2 Uncertainty

The formulas in the previous sections usually apply to *ex-post* data. However, if the simplifying hypothesis of certainty is abandoned, the use of *ex-post* data for present-value formulas deprives such data of part of their meaning. Furthermore, *ex-post* estimates of *ex-ante* evaluations are not a satisfactory measure of the subsidy or of expectations about the subsidy.

As a matter of fact, a better *ex-post* evaluation should be stated in terms of future value[15]. As for *ex-ante* expectations, when computing the present value of the subsidy referring to a single loan one should consider future principal repayments, interest rates and exchange rates.

The first are usually fixed on a contractual basis.

On the other hand, interest rates can be either fixed (by contract[16]) or floating. In the latter case no certain prediction about their future value can be made. Likewise, future exchange rates cannot be predicted.

As a consequence, the subsidy as present value can be treated as a fixed quantity only under the hypothesis of perfect foresight. In particular, Raynauld's version — which is that used by the OECD — requires one of the following sets of assumptions:

A) a fixed contractual interest rate both actual and market — plus (i) and (iv) above, or

B) r contractually fixed plus (i), (ii) and (iv) above, or

C) stationary expectations plus (i) and (iv) above, or

D) perfect foresight in addition to the hypotheses (i) to (iv) above.

If a compound-amount or future-value approach is used, the problem of variable quantities does not arise, since an *ex-post* evaluation requires true values by definition.

3 Loans obtained and paid back in the same currency

Returning to the present-value approach, assume that loans are made available as soon as they are committed. If all loans are obtained and repaid in the same currency, the country subsidy is the sum of the subsidies on the loans outstanding at 0 as well as on those to be extended in the future[17].

As concerns the loans outstanding at 0, there are two possible interpretations, each of which leads to a different definition of the country subsidy.

In a restrictive sense, loans outstanding at 0 are those extended at 0. In a broader sense, they are both those signed in the past and not completely reimbursed at 0, and those signed at 0.

The subsidy corresponding to the strict interpretation is an entirely forward measure, which assigns at time 0 the value of the subsidies foreseen at 0, due to contracts dated at or after 0. The corresponding measure in the broad interpretation, on the contrary, assigns at 0 both the subsidies foreseen at 0 on loans still to be extended, and those on loans granted now or in the past.

Formally, the subsidies for the country at 0 are defined respectively as

$$\sum_{0}^{N}{}_{n} S_0(n) \qquad [9]$$

where $S_0(n)$ is the current value of the subsidies due to the loans signed at n, with n varying from the beginning of our period (0) to the horizon N, and

$$\sum_{-N}^{N}{}_{n} S_0(n) \qquad [10]$$

where $S_0(n)$ is the same as above if $n \geq 0$, and is only part of the subsidy due to the periodic payments dated 0 or after 0 for loans granted previously.

Despite this difference, starting from the general definition of the subsidy for a single loan S_0^g, if only one loan is authorised in each time period, the aggregate subsidy can be formalized as

$$S_0(n) \equiv \sum_{n+1}^{T(n)}{}_{t} [i_t(n) - r_t(n)] \cdot D_{t-1}(n) \cdot \Phi\ (t,0) \qquad [11]$$

with

$$D_t\ (n) \equiv 0 \quad \textit{if } t < 0 \qquad [12]$$

where T(n) is the duration of the loan signed at n, $i_t(n)$ and $r_t(n)$ are the market and the subsidised interest rates due in the period (t-1, t) on the loan received at n.

In the formula above $D_t(n)$ is the residual debt at t of the loan obtained at n. When $n \geq 0$, $D_t(n)$ is the initial amount of the loan; when $n < 0$, $D_t(n)$ is null for $t < 0$. As a matter of fact, with the definition [12] for loans signed before 0 only the part of the subsidy due to installments paid at or after 0 is considered.

Obviously, if a maximum of M loans with different contractual agreements (interest rates, currencies or periodicity) are received in each time period, the subsidy becomes:

with

$$S_0^n \equiv \sum_{1}^{M} \sum_{n+1}^{T(n,m)} [i_t(n,m) - r_t(n,m)] \cdot D_{t-1}(n,m) \cdot \Phi\ (t,0) \qquad [13]$$

$$D_t\ (n,m) \equiv 0 \qquad if\ t < 0 \qquad [14]$$

where T(n,m) is the duration of the m-th loan authorised at n, $i_t(n,m)$ and $r_t(n,m)$ are its market and subsidised interest rates for the period (t-1,t), and $D_t(n,m)$ is its residual debt at t.

4 Loans obtained and paid back in different currencies

If loans are obtained and repaid in different currencies, the procedure suggested in Raynauld (1988) applies and the subsidy can be computed as a percentage of the loan itself before summing up over different lines of credit. The country subsidy is thus the weighted average of these percentages, the weights being the amounts of the loans expressed in a single currency at a given exchange rate.

As a consequence, if a maximum of M loans are extended at n, the amount of which is L(n,m), the subsidy becomes (with $n \geq 0$)

$$\sum_{0}^{N} S_0(n) = \frac{\sum_{0}^{N} \sum_{1}^{M} e_n(m) \sum_{n+1}^{T(n,m)} [i_t(n,m)_t - r_t(n,m)] \cdot D_{t-1}(n,m) \cdot \Phi\ (t,0)}{\sum_{0}^{N} \sum_{1}^{M} L(n,m) \cdot e_n(m)} \cdot 100 \qquad [15]$$

where $e_n(m)$ is the exchange rate at n between the currency of the m-th loan, $c_n(m)$, and a reference currency, denoted with c, so that $e_n(m) \equiv c/c_n(m)$.

If n takes both positive and negative values the formula is then

$$\sum_{-N}^{N} S_0^n(n) = \frac{\sum_{-N}^{N} \sum_{1}^{M} e_n(m) \sum_{n+1}^{T(n,m)} [i_t(n,m)_t - r_t(n,m)] \cdot D_{t-1}(n,m) \cdot \Phi\ (t,0)}{\sum_{-N}^{N} \sum_{1}^{M} L(n,m) \cdot e_n(m)} \cdot 100 \qquad [16]$$

with

$$D_k(n,m) \equiv 0 \qquad \text{if } t < 0. \qquad [17]$$

5 Uncertainty and special cases for the country subsidy

In the aggregate case under uncertainty, the analysis includes future interest rates as well as future debts arising from loans which are expected to be signed in the future; the reason being, once again, that the behaviour of the borrower — and thus the present value of the subsidy — is affected from the time expectations are formed.

In order to avoid the randomness connected with residual indebtedness, it is preferable to take into account only the loans already extended/signed[18].

With reference to the two types of aggregation outlined previously — see [9] and [10], respectively — only the loans authorised at 0 can be considered for the first formula, and loans received before or at 0 for the second formula.

Formally, if M loans are received at 0, [9] reduces to

$$S_0\ (0) = \sum_{m}^{M} \sum_{1}^{T(0,m)} [\ i_k(0,m) - r_k(0,m)\ ] \cdot D_{t-1}(0,m) \cdot \Phi\ (t,0) \qquad [18]$$

when all the loans are in the same currency (cf. [9] and [13] above), and to

$$\frac{S_0(n) = \sum_{1}^{M} e_0(m) \sum_{n+1}^{T(n,m)} [i_k(0,m)_t - r_k(0,m)] \cdot D_{t-1}(0,m) \cdot \Phi\ (t,0)}{\sum_{1}^{M} L(0,m) \cdot e_0(m)} \cdot 100 \qquad [19]$$

when they are in different currencies, i.e. when [15] holds.

If at most M loans are agreed on in each past time period and at 0, [10] becomes

$$\sum_{-N}^{0} S_0(n) = \sum_{-N}^{0} \sum_{1}^{M} e_0(m) \sum_{n+1}^{T(n,m)} [i_k(n,m)_t - r_k(n,m)] \cdot D_{t-1}(n,m) \cdot \Phi\ (t,0) \qquad [20]$$

with

$$D_t(n,m) = 0 \qquad \text{if } t < 0. \tag{21}$$

for the single-currency case, while it is

$$\sum_{-N}^{0} S_0(n) = \frac{\sum_{-N}^{0} \sum_{1}^{M} e_n(m) \sum_{n+1}^{T(n,m)} [i_t(n,m)_t - r_t(n,m)] \cdot D_{t-1}(n,m) \cdot \Phi\ (t,0)}{\sum_{-N}^{0} \sum_{1}^{M} L(n,m) \cdot e_n(m)} \tag{22}$$

for the multi-currency case.

The two formulas mean:

(i) the subsidy at each point in time is measured as the present value of the subsidies for loans extended at that time;

(ii) the subsidy at each point in time is the present value of the subsidies due in the future on loans authorised before or at that time.

The estimate of both of them with actual *ex-post* interest rates generally implies a perfect foresight assumption, so that the present value computed with *ex-post* interest rates coincides with the *a priori* evaluation of it.

In particular, the evaluation of formula [19] under one of the sets of assumptions I) to IV) in Sections 2 gives the Raynauld (1988) formula for the country subsidy.

6 Decomposition of the subsidy's present value into addenda for each period (under certainty)

Let us restrict the analysis to the present-value case. The present value of a financial operation is defined as

$$\sum_{0}^{T} f_t\ \Phi\ (t,0)$$

in which f_t is the cash flow at t; such value can be decomposed into T addenda c_t , which pertain to the period (t-1,t).

This can be done by means of the financial notion of outstanding. If the financial operation under scrutiny has an internal rate of return R, its outstanding is defined as the present value, computed at rate R, of the cash flows which will be paid or received in the future

$$w_t \equiv \sum_{t+1}^{T}{}_{v} f_v (1+R)^{t-v} \qquad [23a]$$

or, equivalently, as the final value at t of the cash flows already paid or received

$$w_t \equiv -\sum_{0}^{t}{}_{v} f_v (1+R)^{t-v} \qquad [23b]$$

The notion of outstanding allows us to state that the addendum of the present value for the period (t-1,t) is:

(i) the outstanding at t-1, considered as an outflow;
(ii) the outstanding and the cash flow at t, considered as inflows.

Since both of them must be discounted, the share is:

$$c_t \equiv -w_{t-1} \cdot \Phi\ (t-1,0) + (w_t + f_t) \cdot \Phi\ (t,0)$$

Note (see [23b]) that w_s follows the recurrence relation

$$w_t = w_{t-1}(1+R) - f_t \qquad with\ w_0 \equiv -f_0\ .$$

Substituting for f_t and reminding the recurrence relation for discount factors the following shares are obtained:

$$c_t = w_{t-1} \cdot (R - i_t^*) \cdot \Phi\ (t,0)$$

The addenda c_t have the property that their sum equates the present value of the financial operation:

$$\sum_{1}^{T}{}_{t} c_t = \sum_{0}^{T}{}_{t} f_t\ \Phi\ (t,0) \qquad [24]$$

The period quota for the single-loan present value of the subsidy, [redacted], can be defined as the difference between the c_t for the concessional credit and the c_t for the non-concessional loan. Formally, if variables referring to hard credit are denoted with bold types, the shares of the subsidy are:

$$c_t(S_0^0) \equiv [w_{t-1}\, R - w_{t-1}\, R - (w_{t-1} - w_{t-1}) \cdot i_t^*\,] \prod_1^t (1+i_u^*)^{-1}$$

In particular, for a single hard loan the cash flows are:

$$\begin{aligned} f_0 &= D_0 = L \\ f &= -i\, D\,, \qquad t \le \tau \\ f_t &= -D_0\, [1+i_t\,(T-t+1)]\,/\,(T-\tau)\,, \qquad t > \tau \end{aligned}$$

while for soft loans the same cash flows hold, with r_t instead of i_t.

As a consequence, the outstandings are:

$$w_t = L\,[-(1+R)^t + \sum_1^\tau r_v\,(1+R)^{t-v} + \sum_{\tau+1}^t r_v\,(T-v+1)(1+R)^{t-v}]\,/\,(T-\tau) + \\ - [1 - (1+R)^{t-\tau}]\,/\,[(T-\tau)R] \qquad [25a]$$

and

$$\boldsymbol{w_t} = L\,[-(1+R)^t + \sum_1^\tau r_v\,(1+R)^{t-v} + \sum_{\tau+1}^t r_v\,(T-v+1)(1+R)^{t-v}]/(T-\tau) + \\ - [1 - (1+R)^{t-\tau}]/[(T-\tau)R] \qquad [25b]$$

These streams of payments do have an internal rate of return[19], so that the c_t of a single loan can easily be computed, according to [24].

In the particular case of constant interest rates, the internal rate of return on the loan coincides with the interest rate paid on it, and the outstanding coincides with the residual debt with opposite sign. It follows that if both the market and soft interest rates are constant, or are supposed to be constant, as in Raynauld (1988), both the "market" and the "subsidised" outstandings are equal to the opposite of the residual debt. The latter, in turn, is always assumed to be the same under hard and soft conditions, so that the following equalities hold:

$$w_{t-1} = w_{t-1} = -\,D_{t-1} \qquad [26]$$

and the formula for c_t becomes

$$c_t = - D_{t-1} (r-i) \prod_{1}^{t} (1+i_u^*)^{-1} \qquad [27]$$

In the case described by Raynauld (1988) i_t and r_t are assumed to be constant; in addition, i_t * is also assumed to be constant and equal to i, so that the expression for c_t turns trivially into

$$c_t = - D_{t-1} (r-i)(1+i)^{-t} \qquad [27]$$

In this particular case the share of the present value corresponding to the period (t-1,t) is simply the difference between the interest which would have been paid under market conditions (iD_{t-1}) and that actually paid (rD_{t-1})[20,21].

7 A comparison with previous OECD studies

As for each single loan, the subsidy estimate accepted in Raynauld (1988) and Önis-Özmucur (1989) can be obtained as a special case of the subsidy understood as present value of the interest gains associated to a soft-credit operation.

Under certainty both the actual and the market interest rate are supposed to be constant over the loan life; the cost of alternative sources and the profitability of alternative uses of funds is thus the same and it is equal to the market interest rate on the loan.

Under uncertainty, Raynauld's estimate requires either stationary expectations or perfect foresight, plus the hypotheses above: more precisely, it requires one of the hypothesis sets A to D of Section 3.2.

As concerns the aggregate subsidy, it can be computed at each point in time by summing over the loans committed at that time.

In the future, however, the country will benefit not only from these subsidies, but also from subsidies on

a) future loans; and

b) loans already extended, but with interest payments due in the future.

These should be taken into account when computing an aggregate subsidy. In particular, it seems reasonable that a given year's subsidy should include at least the loans committed in that year, even if they were made available afterwards.

Their actual grace period should also be taken into account, without overlooking the fact that a loan does not produce a subsidy between commitment and disbursement.

NOTES

8. Soft loans and soft conditions are used as synonyms of export-credit loans and conditions, respectively.

9. If the loan is received in currency A while interest (at rate equal to r_t) is paid in currency B one must (i) compute the value of the loan in currency B and (ii) choose i_t and $\Phi(t,0)$, the discount factor from t to 0 with reference to currency B.

   The first step corresponds to actual practice, at least for Brazil, since installments are computed and paid in currency B.

   The second step is a shortcut in order to take into account the fact that interest-rate differentials among currencies tend to reflect expected variations in the exchange rate.

10. As will be explained shortly, this preference is also justified by the grace-period question.

11. Where it is assumed that the loan is made available at the end of the grace period.

12. The nominal grace period is the difference between the date of the first installment on principal and that of the loan signature; the actual grace period, which is the relevant variable for estimation purposes, is the difference beween the date of the first installment and that of actual disbursement.

13. Cf. formula [6], above.

14. This is actually the formula proposed by Raynauld (1988) for k payments a year.

15. See the appendix to Chapter 3, in Colombatto-Luciano *et al.* (1991).

16. Of course, that applies to r_t and i_t , not to i_t^*.

17. As regards the latter, since certainty is now assumed, the conditions of the loans to be signed in the future are known. These loans, in addition to those already available and to those already signed (but not yet available), are thus part of the subsidy expected by the country, and should therefore be included in the country subsidy.

18. Since it often happens that there is no coincidence between signature and availability, only the loans which have already been signed have been considered.

19. Such rates can be derived by solving the following:

$$1 = \sum_{1}^{\tau} r_v (1+R)^v + \sum_{\tau+1}^{v} r_v (T-v+1)(1+R)^{-v} / (T-\tau) + \\ - [(1+R)^{-T} - (1+R)^{-\tau}] / [(T-\tau)R] \qquad [26a]$$

and

$$1 = \sum_{1}^{\tau} r_v (1+R)^v + \sum_{\tau+1}^{v} r_v (T-v+1)(1+R)^{-v} / (T-\tau) + \\ - [(1+R)^{-T} - (1+R)^{-\tau}] / [(T-\tau)R] \qquad [26b]$$

20. It can be demonstrated that a proper aggregation of these shares makes it possible to shift from Raynauld's (1988) measure to the other criterion widely used in the literature [cf. Fleisig-Hill (1984) and also Colombatto-Luciano *et al.* (1991), Chapter 2, Section 6.2].

21. Cf. also Peccati (1990) for a presentation of the idea of a present-value splitting up under certainty and Luciano-Peccati (1990) for a similar analysis under uncertainty.

IV THE ESTIMATES

1 The data

The data set which has been made available for this work reports transactions with semi-annual payments: as a consequence, subsidies and present-value shares have been computed with reference to half-year periods.

In order to group loans according to their beneficiaries, the following industries have been singled out[22]:

- food
- textiles and clothing
- other consumer goods
- cereals
- chemical products
- paper and cellulose
- plastics and rubber
- iron, steel and non-ferrous metals
- other raw materials
- coal
- oil
- transport equipment
- other equipment and machinery

As already explained, services (with no further specification) were included in the last-named industry, on the assumption that the corresponding loans were linked to imports of fixed capital.

The year in which the loan was agreed was known, but not the date of disbursement. Hence, it was assumed that the financial resources were actually made available at the middle of the year of agreement. In some estimates, however, it has also been assumed that disbursement took place half way between the middle of the year of agreement (signature) and the end of the grace period. The caveats mentioned in Sections 3 and 3.7 have nevertheless been respected.

The emphasis has been laid upon sectoral subsidies; the subsidy for Brazil as a whole plays a secondary role and has been computed in two different ways. A first version weights the rate of subsidy for each sector according to the weight of each sector in ECOs; a second version weights the subsidy rates according to the weight of each sector in total 1985 Brazilian imports[23].

The market interest rate i(m) was defined as the government-bond yield[24] of the country issuing the currency in which interest is paid, plus a spread.

The spread entering our estimates differs from the actual spreads applying to Brazil in 1985-89, for the data on non-subsidised loans, and hence on spreads, are

significant only until 1986; after that year financial operations between Brazil and the market virtually ceased. As a consequence, spreads after 1986 were supposed to be constant and equal to the highest value reported by *Euromoney*[25] over the 1977-86 period.

Values for the rate of return on investment in Brazil were also needed: since subsidies are generally positive, their values must be discounted with the opportunity cost of capital, denoted with i_t^* or i_t^{**} not with the cost of the debt.

In this context, two different discount factors were utilised: one describing differential returns in terms of financial-investment opportunities(i_t^*); the other in terms of GDP growth (i_t^{**})[26]. There are compelling reasons which lead us to prefer one to the other; as a matter of fact, it depends on whether the opportunity cost is evaluated from a financial point of view (for it is after all a financial operation) or from a global point of view (for the borrower in this case should be concerned with the welfare of the country, proxied by GDP).

In the first case i_t^* is the difference between the real interest rate[27] in Brazil and that in the country issuing the currency in which the loan is denominated, plus the money market rate of such country[28]. In the second i_t^{**} is the difference between real GDP growth rates[29] in the two countries (as above), plus the money-market rate. It should be pointed out that in both cases one needs variables expressed in the currency of the lender country (see Section 3.1). In fact, the definitions above allow us to say — in both cases for Brazil — what the nominal interest rate would have been if quoted in the lender country's currency (i_t^*) and what the nominal GDP growth rate would have been if quoted in the lender country's currency (i_t^{**}).

2 The results

Tables 4.1 to 4.6 show the estimates for the rate of subsidy derived using the various criteria, as discussed in the previous section. The tables concerning only the main industries — cf. Section 2 — have been reported.

In order to make our results comparable with other OECD papers, estimates have been carried out both across industries and for Brazil as a whole.

As a first step (A), attention was devoted to Raynauld's version, with and without a grace period[30]. A second version (B), on the other hand, refers to the same hypotheses, but with the inclusion of the correct semi-annual interest rate, rather than its approximation, with and without a grace period.

A second set of estimates was then attempted.

On the one hand, the most restrictive assumptions about the delayed availability of the financial resources were removed — constancy of the parameters and the coincidence between the discount rate and the market interest rate — by assuming (C) an effective grace period equal to half the nominal one; (D) variable interest rates, with and

without a grace period; (E) a rate of return on Brazilian investment different from the market cost of the single loan, with and without a grace period.

On the other hand, the idea of future-value shares was implemented by estimating (F) the shares due to each single period when the interest rate is held constant, the grace period is null and the nominal semi-annual soft subsidised rate is used (in accordance with Raynauld's hypotheses); (G) the corresponding shares with the nominal grace period and the actual interest rate. These shares were finally aggregated over the existing and future loans, as if the latter had been perfectly foreseen in 1985 (time 0).

****

Estimates for each sector under (A) were carried out according to the following formulas[31]:

$$100 \cdot \frac{\sum_{1}^{M_j} e_0(m) L(0,m) \frac{i^k(m) - r(m)/k}{i^k(m)} \cdot \left[1 + \frac{\Omega}{ki^k(m)[T(0,m) - \tau(0,m)]}\right]}{\sum_{1}^{M_j} L(0,m)\ e_0(m)} \qquad [29a]$$

where

$$\Omega \equiv (1+i^k(m))^{-T(o,m)k} - (1+i^k(m))^{-\tau(0,m)k}$$
$$i^k(m) = (1+i(m))^{1/k} - 1$$
$$k = 2$$

with a grace period[32], and

$$100 \cdot \frac{\sum_{1}^{M_j} e_0(m) L(0,m) \frac{i^k(m) - r(m)/k}{i^k(m)} \cdot \left[1 + \frac{(1+i^k(m))^{-T(0,m)k}}{ki^k(m)\,T(0,m)}\right]}{\sum_{1}^{M_j} L(0,m)\ e_0(m)} \qquad [29b]$$

without a grace period (which is Raynauld's case, *stricto sensu*).

The results for Brazil as a whole are summarised in Table 4.5[33]: in particular, the subsidy turns out to be positive over the 1985-1989 period, with a peak of 20.78 per cent in 1988[34].

At an industry level, it is important to recall that the presence of a negative rate of subsidy (e.g. iron, steel etc. in 1986) is caused by the sign of the difference between the market interest rate and the interest rate agreed upon between Brazil and the exporter[35].

It may also be emphasised that the inclusion of the grace period (see 29a) causes a rise in the estimated rate of subsidy (see columns 29a and 29b compared). This increase depends on the relation between the following quantities:

$$\frac{\Omega}{ki^{k}(m)\ [T(O,m)-\tau(0,m)]} \qquad \text{in [29a]}$$

$$\frac{(1+i^{k}(m))^{-T(o,m)k}}{ki^{k}(m)\ T(O,m)} \qquad \text{in [29b]}$$

As a matter of fact, both the denominator and the numerator in [29b] are greater than in [29a]. However, since in our case the subsidy in [29b] is lower than in [29a], the fall in the denominator, going from [29a] to [29b], must overcompensate the fall in the numerator. It is worth stressing that this result applies to the absolute value of the subsidy; for the sign of the subsidy in [29b] does not depend on the content of the square brackets, but on the difference between the market and the actual interest rate, which show up in the same way in [29a] and [29b].

The correct semi-annual interest rate is

$$r^{k}(m) = (1+r(m))^{1/k} - 1$$

for the j-th industry.

The inclusion of this rate (estimates B) leads to a subsidy computed as follows:

$$100 \cdot \frac{\sum_{1}^{M_j} e_0(m)L(0,m)\ \frac{i^{k}(m)-r(m)}{i^{k}(m)} \cdot \left[1+\frac{\Omega}{ki^{k}(m)[T(0,m)-\tau(0,m0)]}\right]}{\sum_{1}^{M_j} L(0,m)\ e_0(m)} \qquad [30a]$$

with a grace period, and

$$100 \cdot \frac{\sum_{1}^{M_j} e_0(m)L(0,m)\ \frac{i^{k}(m)-r(m)}{i^{k}(m)} \cdot \left[1+\frac{(1+i^{k}(m))^{-T(0,m)k}}{ki^{k}(m)T(0,m)}\right]}{\sum_{1}^{M_j} L(0,m)\ e_0(m)} \qquad [30b]$$

without a grace period.

The results indicate that estimates B generate a larger subsidy than estimates A[36].

This can be explained by pointing out that r/2 overestimates the true, agreed-upon interest rate, so that the difference between the market and the actual interest rate turns out to be lower than what it really is. Thus the simplified version underestimates the effective subsidy. Of course, the greater the value of r, the lower the bias[37].

It is worth pointing out that the subsidy according to [30a] is not only greater than that generated by [29a], but also than that by [29b]. The first difference is due to the switching from the nominal to the actual semi-annual cost of the debt. The second means that the introduction of the nominal grace period provokes a fall in the estimate of the subsidy, which is not enough to compensate for the increase due to the aforementioned switching.

****

As is known, loans are usually made available only some time after the signature. Accordingly, the set of estimates (C) has been run by setting the actual grace period G equal to half the nominal one τ. The semi-annual interest payment is its crude version (following [7] in Section 3.1), so that Raynauld's version of the subsidy (corresponding to [29b] above) becomes

$$100 \cdot \frac{\sum_{1}^{M_j} e_0(m) L(0,m) \; \frac{i^k(m) - r(m)/k}{i^k(m)} \cdot [1+(i^k(m))]^{-\tau(0,m)k/2} + \Omega/\alpha}{\sum_{1}^{M_j} L(0,m) \; e_0(m)} \qquad [29c]$$

with

$$\Omega \equiv (1+i^k(m))^{-T(0,m)k} - (1+i^k(m))^{-\tau(0,m)k}$$
$$\alpha \equiv k i^k(m)[T(0,m) - \tau(0,m)]$$

The results can be examined in their aggregate form in column 29c[38]. If compared with the standard version (i.e. Raynauld's, described in [29b]), the delayed availability of the financial resources leads to a fall in the absolute value of the subsidy. As a matter of fact, this variation reflects the content of the square brackets in [29b] and [29c]. Since the new addendum of [29c] is lower than one, the rate of subsidy following [29b] is greater than that computed after [29c].

****

As mentioned above, estimates D remove the constant rate hypothesis, and include formula [5] in Section 3.1 with [4] (in the same section) as a reference for each loan.

Semi-annual interest rates have been computed exactly, so that according to D, in general terms, the subsidy for the j-th sector is

$$\frac{\sum_{1}^{M_j} e_0(m) \cdot L(0,m) \cdot \Omega(t)}{\sum_{1}^{M_j} L(0,m) \cdot e_0(m)} \qquad [31]$$

In the case with a grace period one has

$$\Omega \equiv \sum_{1}^{\tau(\cdot)k+1} (i_t^k(m) - r_t^k(m)) \cdot \prod_{1}^{t} (1+i_u^k(m))^{-1} + \sum_{\tau(\cdot)k+2}^{T(\cdot)k} \frac{T(0,m)k-t+1}{[T(0,m)-\tau(o,m)]k} (i_t^k(m) - r_t^k(m)) \prod (1+i_u^k(m))^{-1} \qquad [32a]$$

In the case without a grace period one has

$$\Omega \equiv (i_1^k(m) - r_1^k(m)) \cdot (1+i_1^k(m))^{-1} + \sum_{2}^{T(\cdot)k} \frac{T(0,m)k-t+1}{T(0,m)k} (i_t^k(m) - r_t^k(m)) \prod_{1}^{t} (1+i_u^k(m))^{-1} \qquad [32b]$$

The results obtained by applying this criterion are presented in columns 31-32a and 32b, with and without a grace period, respectively[39]. No general conclusion can be derived by analysing the subsidy in its formal version. The data show, however, that when the interest rate tends to increase over a given time period, the adoption of a variable-rate hypothesis, instead of a constant-rate hypothesis (compare [30a] with [32a]), generates two kinds of effects. There is an interest-rate effect (of ambiguous sign); and a discount-rate effect, which determines a smaller (higher) subsidy with increasing (decreasing) rates. For instance, the 1989 results, which show a higher subsidy in the variable-rate case, imply that the interest-rate effect has been positive and stronger than the (negative) discount-rate effect.

****

The distinction between the market interest rate and the rate used in discount factors (which reflects the cost of the debt or the profitability of investment in the Brazilian economy[40], and still depends on m because of the currency) for each loan, forms the object of the E set of estimates. In particular the present value formalized in [4] has been adopted, with $i_t^*(m) \neq i_t(m)$, as well as the correct semi-annual interest rate.

Hence, the j-th sector subsidy is the now the same as in [31], with Ω redefined as

$$\Omega \equiv \sum_{1}^{\tau(\cdot)k+1} (i_t^k(m) - r_t^k(m)) \cdot \prod_{1}^{t} (1 + i_u^{*k}(m))^{-1} + \\ + \sum_{\tau(\cdot)k+2}^{T(\cdot)k} \frac{T(0,m)k - t + 1}{[T(0,m) - \tau(o,m)]k} (i_t^k(m) - r_t^k(m)) \prod (1 + i_u^{*k}(m))^{-1} \qquad [32a]$$

with a grace period, and

$$\Omega \equiv (i_1^k(m) - r_1^k(m)) \cdot (1 + i_1^{*k}(m))^{-1} + \\ + \sum_{2}^{T(\cdot)k} \frac{T(0,m)k - t + 1}{T(0,m)k} (i_t^k(m) - r_t^k(m)) \prod_{1}^{t} (1 + i_u^{*k}(m))^{-1} \qquad [33b]$$

without a grace period.

The results are displayed in the last columns of each table. In this case subsidies appear to be always larger, in absolute value, than those calculated by assuming equality between the two rates[41] (compare columns 31-32a with 31-32ai[*])[42].

Since i > i[*] and i > i[**] (in general), and since the two rates are the cost of indebtedness (i) and the rates of returns on investment (i[*] or i[**]), respectively, the usual methodology underestimates the discount factor, and, in turn, leads to a further reduction of the subsidy present value.

Of course, the results obtained with i[*] differ from those with i[**] because of the difference between financial and real investment opportunities. For instance, if the subsidy ratio computed through i[**] is greater than that computed through i[*] (see columns 31-33a-i[*] and 31-33a-i[**]), it follows that the rate on real investment (i[**]) must necessarily be lower than that on financial opportunities (i[*]).

****

As for the i-th sector, the present-value shares due to the first period (semester) of the loan follow (estimates F):

$$100 \cdot \frac{\sum_{1}^{M_j} L(0,m) \cdot e_0(m) \cdot [I^k(m) - r(m)/k] (1 + I^k(m))^{-1}}{\sum_{1}^{M_j} L(0,m) \cdot e_0(m)} \qquad [34a]$$

whereas for the following periods the subsidy turns out to be

$$100 \cdot \frac{\sum_{m}^{M_j} L(0,m) \cdot e_0(m) \cdot [i^k(m) - r(m)/k] \ (1+i^k(m))^{-t} \cdot \frac{T(0,m)k - t + 1}{T(0,m)k}}{\sum_{m}^{M_j} L(0,m) \cdot e_0(m)} \qquad [34b]$$

The results — not reported here — show that the duration of loans characterising the industry "other equipment and machinery" is longer than the others (except in 1989). In addition, the maximum duration of loans in all sectors tends to decrease over time. In 1985, there were loans extended with a duration of more than 20 years, while in 1989, none of the loans had a duration of more than nine years. With respect to the decomposition itself, the addenda are decreasing in absolute value over time; this reflects the fact that the residual debt falls with time.

Similarly, the estimates corresponding to [30a], still comparable to Raynauld's[43], follow

$$100 \cdot \frac{\sum_{m}^{M_j} L(0,m) \cdot e_0(m) \cdot [I^k(m) - r^k(m)] \ (1+I^k(m))^{-t}}{\sum_{m}^{M_j} L(0,m) \cdot e_0(m)} \qquad [35a]$$

when $t \leq \tau+1$.

When $t > \tau+1$, the above becomes

$$100 \cdot \frac{\sum_{m}^{M_j} L(0,m) \cdot e_0(m) \cdot [i^k(m) - r^k(m)] \ (1+i^k(m))^{-t} \cdot \frac{T(0,m)k - t + 1}{T(0,m) - \tau(0,m)^k}}{\sum_{m}^{M_j} L(0,m) \cdot e_0(m)} \qquad [35b]$$

The results — not reported here — show once again that the shares are decreasing over time. This means that the presence of the actual interest and of the grace period does not modify the effect of the residual-debt decrease over time.

In a comparison between the single shares as estimated by [34] and [35], it can be verified that the former are almost always smaller than the latter. This means that the increase of the estimate of the overall subsidy, as one goes from [29b] to [30a], is not necessarily confirmed on a yearly basis when the estimate is carried out through present-value shares.

****

The final set of estimates considers period shares on aggregate, so as to obtain for each year the sum of shares of the loans outstanding in that period. If present values are computed with respect to 1985, [29b] becomes[44]

$$100 \cdot \frac{\sum_{0}^{t-1} \sum_{1}^{M_j} e_0(m)\ [i^k(m) - r(m)/k]\ D_{t-1}(n,m)}{(1+i^k(m))^t \sum_{0}^{t-1} \sum_{1}^{Mj} L(n,m)\ e_n(m)} \qquad [36]$$

where the residual debt at t-1 is given by

$$D_{t-1}(n,m) = \begin{cases} L(n,m) & \text{when } t-1 = n \\ L(n,m)\ \dfrac{T(n,m)-t+1}{T(n,m)} & \text{when } t-1 \geq n+1 \end{cases}$$

and t = 0 in 1985, beginning of the second half year.

The results are reported in the appendix, Table 12.

On the other hand, in correspondence with [30a], the estimate of the subsidy follows

$$100 \cdot \frac{\sum_{0}^{t-1} \sum_{1}^{M_j} e_n(m)\ [i^k(m) - r^k(m)]\ D_{t-1}(n,m)}{(1+i^k(m))^t \sum_{0}^{t-1} \sum_{1}^{Mj} L(n,m)\ e_n(m)} \qquad [37]$$

with

$$D_{t-1}(n,m) = \begin{cases} L(n,m) & \text{when } t-1 = n+\tau(n,m) \\ L(n,m)\ \dfrac{T(n,m)-t+1}{T(n,m)} & \text{when } t-1 \geq n+1+\tau(n,m) \end{cases}$$

The results are reported in the appendix, Table 13.

The most evident outcome of the estimates based on [36] and [37], apart from the longer loan life in "other equipment and machinery", can be noticed by comparing Tables (12) and (13). On aggregate, the estimate based on the hypothesis [30a] again becomes greater than that based on [29b]. The use of the actual semi-annual cost of the debt and of the grace period repeats in each yearly share the increases which it generates on the whole present value of the subsidy. Thus the effect mentioned when comparing

[34] and [35], concerning the increase in the estimated subsidy as one goes from [29b] to [30a], no longer applies in this framework.

The sectoral distribution of the subsidy across industries is very irregular since it is concentrated in "cereals" and "other equipment and machinery". For that reason and considerations put forward in Section 2, the subsidies to Brazil have also been computed by weighting the sectoral rate of subsidy with the weight of each sector in Brazilian total imports in 1985. The difference between the standard estimate (Table 4.5) and the weighted estimates (Table 4.6) shows that the structure of subsidised imports differs greatly from that of total imports[45].

NOTES

22. The original data set is actually organised according to a different grouping criterion; the one put forward here, on the other hand, follows the balance-of-payments classification suggested in the publications by the Banco do Brazil.

23. See Section 2.

24. Cf. also IMF, *International Financial Statistics*, various years, row 61.

25. Transactions only in dollars were considered, since spreads seemed to be independent of currencies, at least up to 1986.

26. The need for a nominal rate comparable with that of the loan currency can be satisfied by considering the opportunity cost of capital in the borrowing country. Such cost differs from the money-market rate in the currency-issuing country for an amount which is supposed to be equal to the difference between the Brazilian real interest rate (real GDP growth rate) and that of the country issuing the currency. Thus, the opportunity cost has been computed as the sum of such difference and the money-market rate.

27. Cf. IMF, *International Financial Statistics*, various years, rows 60c and 99b.*p* x.

28. Cf. also IMF, *International Financial Statistics*, various years, row 60c.

29. Cf. IMF, *International Financial Statistics*, various years, row 99b.*p* x.

30. The term "without a grace period" is to be understood in Raynauld's way. Actually, Raynauld's work is not directly comparable with our estimates "with a grace period".

31. Cf. the previous sections for the notation; the dependence of the interest rate on time 0 has been dropped.

32. T and τ are measured in years.

33. Cf. also the appendix: Table 1 (with a grace period) and Table 2 (without a grace period).

34. As a matter of fact, such a peak is due to the behaviour of the "other equipment & machinery" sector, where the rate of subsidy is 23.71 per cent. This sector's results are heavily subsidised and highly representative (83 per cent of the loans extended in 1988, according to our data set).

35. Cf. the content of the square brackets in (29b), which is greater than zero.

36. Cf. also the appendix: Table 3 (with a grace period) and Table 4 (without a grace period).

37. It can be shown that the deviation of the true semi-annual interest-rate differential from the simplified differential falls as r increases.

38. Cf. also the appendix, Table 5. It should be pointed out that in this case the int(grace) function has been used, since the original data describe the grace period in half years, not years.

39. Cf. also the appendix: Table 6 in the case with a grace period, Table 7 without a grace period.

40. Indeed, the appropriate formula involves two interest rates for discounting purposes: the cost of the debt and the profit on investment. However, it would have been necessary to adopt a future-value methodology; instead, for the sake of comparability with the values described in the formulas [29] to [32] above, a unique discount factor has been used, which has been computed with reference to the profitability of investment in Brazil, rather than to the cost of the debt.

41. It may be worth recalling that this is actually the criterion adopted in Raynauld (1988).

42. Cf. also the appendix: Table 8 for i_t^* and Table 10 for i_t^{**}, both with a grace period; Table 9 for i_t^* and Table 11 for i_t^{**}, without a grace period.

43. The market and the discount rates are kept equal and the parameters are held constant.

44. The formula is obtained by referring [28] to semi-annual payments, and using the aggregation methodology [27b].

45. It should be emphasized, however, that our data do not allow any comment on such a structure.

Table 4.1
Subsidy rates (%) for "textiles & clothing" according to different estimates

	29a	29b	30a	30b	29c	31-32a	31-32b	31-33a	31-33b	31-33a	31-33b
Year								i*	i*	i**	i**
1985	-1.42	-1.25	-1.08	-0.95	-1.42	-1.77	-1.52	-1.86	-1.60	-1.74	-1.50
1986	-2.25	-1.86	-1.75	-1.43	-1.71	-0.17	-0.15	-0.11	-0.09	-0.07	-0.06
1987	4.34	3.29	4.72	3.60	3.24	8.59	6.26	9.80	7.05	10.60	7.55
1988	2.26	1.83	3.36	2.71	1.67	3.74	2.84	4.20	3.16	4.47	3.49
1989	-2.63	-1.78	-2.00	-1.29	-1.86	1.09	0.98	1.20	1.08	1.33	1.20

Source: Banco Central do Brasil; author's calculations.

Table 4.2
Subsidy rates (%) for "cereals" according to different estimates

	29a	29b	30a	30b	29c	31-32a	31-32b	31-33a	31-33b	31-33a	31-33b
Year								i*	i*	i**	i**
1985	5.43	4.20	5.83	4.51	4.12	4.99	3.86	5.22	4.03	4.99	3.86
1986	3.66	2.78	4.00	3.03	2.83	4.32	3.29	4.52	3.42	4.45	3.37
1987	4.67	3.41	5.07	3.70	3.69	2.07	2.02	2.12	2.07	2.13	2.08
1988	-1.63	-1.50	-1.15	-1.05	-1.63	2.43	2.16	2.70	2.41	2.91	2.60
1989	-1.54	-1.04	-0.87	-0.55	-1.22	-0.30	-0.14	-0.25	-0.10	-0.26	-0.10

Source: Banco Central do Brasil; author's calculations.

Table 4.3
Subsidy rates (%) for "coal" according to different estimates

	29a	29b	30a	30b	29c	31-32a	31-32b	31-33a	31-33b	31-33a	31-33b
Year								i*	i*	i**	i**
1985	11.40	9.46	11.82	9.83	9.01	14.03	11.50	16.86	13.75	16.95	13.80
1986	-8.07	-7.63	-7.27	-6.89	-8.07	-4.72	-4.52	-5.05	-4.84	-4.91	-4.71
1987	0.90	1.46	1.65	2.00	2.00	5.92	3.80	6.93	4.30	7.85	4.69
1988	-9.15	-8.60	-8.22	-7.72	-9.15	-2.81	-2.70	-2.90	-2.78	-2.94	-2.82
1989	-0.47	-0.33	0.49	0.40	-0.29	4.07	3.03	4.53	3.33	5.05	3.67

Source: Banco Central do Brasil; author's calculations.

Table 4.4
Subsidy rates (%) for "other equipment" according to different estimates

	29a	29b	30a	30b	29c	31-32a	31-32b	31-33a	31-33b	31-33a	31-33b
Year								i*	i*	i**	i**
1985	3.48	2.69	4.54	3.61	1.64	2.51	1.89	3.39	2.58	4.03	3.11
1986	0.24	5.62	6.31	5.87	5.86	7.13	6.65	8.11	7.57	8.47	7.90
1987	18.86	15.93	19.10	16.14	14.63	24.06	20.11	29.19	24.10	35.03	28.47
1988	23.71	18.04	24.14	18.41	14.89	31.45	24.13	37.64	28.44	45.66	33.86
1989	2.30	2.00	2.80	2.43	2.10	370.00	4.30	5.43	4.59	5.76	4.86

Source: Banco Central do Brasil; author's calculations.

Table 4.5
Subsidy rates (%) for "Brazil" according to different estimates

	29a	29b	30a	30b	29c	31-32a	31-32b	31-33a	31-33b	31-33a	31-33b
Year								i*	i*	i**	i**
1985	5.29	4.17	5.92	0.01	3.73	4.97	3.90	5.67	4.44	5.76	4.53
1986	2.20	1.67	2.67	2.05	1.59	4.10	3.23	4.66	3.66	4.95	3.89
1987	5.78	4.72	6.23	5.06	4.76	7.04	5.71	0.04	6.55	9.37	7.36
1988	20.78	15.80	21.27	16.22	13.05	27.91	21.43	33.36	25.23	40.39	29.39
1989	0.33	0.39	1.06	0.96	0.36	3.49	2.82	3.84	3.08	4.20	3.35

Source: Banco Central do Brasil; author's calculations.

Table 4.6
Subsidy rates (%) for "Brazil (weighted average)" according to different estimates

	29a	29b	30a	30b	29c	31-32a	31-32b	31-33a	31-33b	31-33a	31-33b
Year								i*	i*	i**	i**
1985	4.39	3.46	5.13	4.09	2.92	3.76	2.94	4.37	3.41	4.58	3.59
1986	7.07	5.77	7.48	6.10	5.39	9.84	7.95	11.65	9.35	12.71	10.13
1987	9.05	7.42	9.42	7.71	7.17	10.00	8.41	11.87	9.86	13.95	11.39
1988	23.21	0.04	23.64	18.08	14.68	30.82	23.70	36.83	27.89	44.61	33.16
1989	0.54	0.57	1.20	1.10	0.56	3.29	2.73	3.59	2.96	3.88	3.18

Source: Banco Central do Brasil; author's calculations.

V FINAL COMMENTS

1 Summary of the main findings

This study has two key aspects. It adopts significant methodological improvements for evaluating and estimating the subsidy implicit in export-credit transactions. Furthermore, the results obtained, although highly dependent on the quality of the sample available, shed some light on the characteristics of the Brazilian approach to export-credit facilities.

2 The methodology

The standard method of estimating the implicit subsidy in a financial transaction, (typically, a multiperiod loan, with grace period) is based on an extended set of conditions. In particular,

i) the discount rate used in computing present values, which is equivalent to that applicable to alternative borrowing opportunities, is equal to the market rate for the loan under scrutiny; this rate, however, usually refers to the cost of funds, not the rate of return on alternative investments;

ii) the rate mentioned above is considered constant over time; as a consequence, stationary expectations are involved in the calculation of the subsidy;

iii) discrepancies between the nominal (contractual) grace period and the actual grace period tend to be overlooked.

At various stages and levels of this study these restrictions were removed and replaced by more realistic assumptions. For example, a complete set of estimates has been obtained by adopting:

i) an alternative interest rate (i^{*}) reflecting the alternative conditions for investments in financial markets;

ii) an alternative interest rate (i^{**}) reflecting the alternative conditions for investments in the real sector;

iii) both constant and variable interest rates;

iv) both the null-grace period hypothesis and a more realistic positive-grace period hypothesis.

All these improvements are additive and do not replace the standard methodology; thus, the results which follow may still be compared with those obtained in the literature.

Finally, two other issues have been analysed in depth: the decomposition of the present subsidy value into single addenda — one for each period of the loan's duration — and uncertainty. The former provide the estimates reported in Tables 12-13. The latter has been discussed in Section 2.

3 The results

The data set provided by the Banco Central do Brazil included 581 export-credit operations in the 1985-1989 period.

Brazil in the ECO context is significant for it is the world's second greatest recipient of export credits. In 1987, a highly critical year for Brazil's external debt, ECOs amounted to $11.8 billion, that is 9.5 per cent of total indebtedness.

Nevertheless, according to our data, for the whole five-year period soft transactions totalled about $2 billion compared to total imports in the same period of about $150 billion, i.e. only 1.3 per cent of Brazilian imports.

As a matter of fact, the period covered by our sample does raise some problems. To start with, the most indebted developing countries faced severe difficulties in obtaining financial resources from abroad in the second half of the 1980s[46]. Furthermore, export credits were hit particularly hard by the financial drought of the period, given the high dependence of ECOs on private agencies.

In addition, the Brazilian situation was particularly worrying, as the country's foreign-debt crisis reached a peak. After the interest moratorium all official and non-official (private) agencies ceased to consider soft financing for Brazil. The situation eased somewhat in the second half of 1988 (when an agreement with the IMF was reached), but many restrictions were then imposed, such as

i) exposure ceilings and transaction limits;

ii) case-by-case review of the projects to be financed;

iii) short-term financing only.

As for the rate of subsidy, the Brazilian case is characterised by very large variations during the 1985-1989 period. The unweighted aggregate reaches a maximum of of 33.4 per cent in 1988 and a minimum of 3.8 per cent in the following year. The same applies to import-weighted estimates.

In general, the rate of subsidy turns out to be high, but the amount of the subsidies remains low (as long as the data set is actually the totality), about 0.8 per cent of total Brazilian imports of goods and services. The impact on the economy as a whole cannot have been great.

Furthermore, it should be recalled that the borrowing country does not usually reap the full potential benefit of the ECO subsidy. On the one hand, subsidised export flows

may be overpriced (so as to compensate for part of the subsidy); on the other, such flows may generate a substitution effect, in which an importer is induced to buy (and to produce at home) a sub-optimal set of commodities.

Both situations are hard to assess in the Brazilian case. Serious microeconomic distortions (the substitution effect) are likely to arise only if a given industry is offered a long-enough and large-enough stream of ECOs. But if the economy turns out to be affected by significant substitution effects even when such restrictions are not met, the microeconomic distortions may be even more harmful. Our statistical evidence is very poor in this respect and thus no clear-cut conclusion can be drawn[47].

Moreover, it is known that the possibility of facing overpriced imports depends, among other things, on the import elasticity of the borrower. No reliable estimate has been obtained for the Brazilian economy in the second half of the 1980s.

Subsidy rates (percent) for 13 sectors
[formulas (31-33a), i*]

	1985	1986	1987	1988	1989
Food	0.0	3.6	5.6	18.9	6.6
Textiles and clothing	-1.9	-0.1	9.8	4.2	1.2
Other consumer goods	2.4	3.4	5.5	9.3	6.1
Cereals	5.2	4.5	2.1	2.7	-0.2
Chemical products	3.5	4.7	5.2	5.8	0.0
Paper and cellulose	0.0	8.1	8.3	0.0	4.4
Plastics and rubber	0.0	5.5	0.0	0.0	0.0
Iron/steel/non-ferrous metals	1.8	-20.2	4.3	16.2	7.2
Other raw materials	0.0	0.0	6.4	0.0	0.0
Coal	16.9	-5.1	6.9	-2.9	4.5
Oil	2.1	21.7	0	24.2	0
Transport equipment	-12.2	5.1	8.3	6.6	7.8
Other equipment & machinery(*)	3.4	8.1	29.2	37.6	5.4
BRAZIL (unweighted)	5.7	4.6	8.2	33.3	3.8
BRAZIL (weighted)	4.4	11.7	11.9	36.8	3.6

(*) services included.

It is quite likely, however, that Brazil benefited from subsidised imports not only through ECOs, but also by means of other, more relevant, channels (such as officially supported export credits, ODA loans, etc.).

Of course, these may also have altered the trade and production structure of the Brazilian economy. A piece of non-conclusive evidence in this respect is the growing degree of anomaly shown by the Brazilian import structure:

World/Brazilian import geographical structures (Rank-correlation coefficients)

1966	0.934
1971	0.964
1975	0.944
1985	0.747
1987	0.838

Source: author's calculation from OECD data.

The rank-correlation coefficient between the geographical import structures of Brazil and the rest of the world declines over time. Further work on the dynamics of the competitive structure of the Brazilian economy thus seems justified.

It would have been important to assess Brazilian import prices relative to the rest of the world; the lack of data on import unit values from the United States, the most important exporter to Brazil, has made this unfeasible.

However, on the whole it is likely that subsidised imports did not have a serious impact on relative international prices, given the small weight of Brazil's trade in total world trade.

NOTES

46. The total net inflow of external funds to developing countries fell from $66.5 billion in 1980 to $33.5 billion in 1985 and $25.6 billion in 1989.

47. A possible exception is the case of "cereals", an industry characterised by an unusually large share of ECOs (42 per cent of total transactions, 37.6 per cent of total value). It is likely that some exporters have tried to get rid of their excess supply by subsidising exports, so that the relative price of wheat has fallen, at the expense of Brazilian agriculture.

REFERENCES

Banco Central do Brazil, *Boletim Especial: Series Historicas do Setor Externo 1971-85*, 1988.

Banco Central do Brazil, *Creditos Oficiais e Multilaterais*, 1990.

Fleisig, H. and, C. Hill, "The Benefits and Costs of Official Export Credit Programs of Industrial Countries: an Analysis", *World Bank Staff Working Papers*, 59, The World Bank, Washington, D.C., 1984.

Horvarth, J., "Are Eximbank Credits Subsidized? Toward an Empirical Analysis", in P. Marer (ed.), *US Financing of East-West Trade*, International Development Center, Bloomington, Indiana, 1975.

Horvarth, J., "The Scope of the International Grant Economy: the Case of Eximbank", in M. Pfaff (ed.), *Frontiers of Social Thought*, North Holland, Amsterdam, 1976.

Luciano, E. and, L. Peccati, "A Decomposition for Random Discounted Cash Flows", *Working Paper*, FUR Conference, 1990.

Peccati, L., "Multiperiod Analysis of a Levered Portfolio", *Revista AMASES* (Proceedings of the Eighth Meeting of the Euro Working Group), 1, 1990.

Phaup, D., "Export Credit Competition", *Working Paper*, Union College, Schenectady, New York, 1981.

Raynauld, A., *The External Financing of Tunisia's Imports*, OECD Development Centre, Paris, 1988.

Önis, Z and , S. Özmucur, *Capital Flows and External Financing of Turkey's Imports*, OECD, Paris, 1991.

APPENDIX

Table 1. Formula (29a)

Hp:	a) constant interest rates, b) semi-annual interest rate = r/2, c) semi-annual alternative interest rate = $\sqrt{(1+i)}-1$, d) with grace period. Ratio (*)				
Sector	1985	1986	1987	1988	1989
Food	0.000	2.927	6.958	11.790	3.206
Textiles & clothing	-1.424	-2.248	4.343	2.262	-2.627
Other consumer goods	2.235	2.879	2.416	5.311	2.177
Cereals	5.432	3.662	4.668	-1.628	-1.544
Chemical products	2.940	3.642	0.345	1.935	0.000
Paper and cellulose	0.000	5.428	-9.086	0.000	1.787
Plastics & rubber	0.000	5.745	0.000	0.000	0.000
Iron, steel and non-ferrous metals	2.164	-27.668	0.544	7.998	3.697
Other raw materials	0.000	0.000	6.997	0.000	0.000
Coal	11.399	-8.065	0.898	-9.154	-0.470
Oil	2.809	12.703	0.000	19.366	0.000
Transport equipment	-9.254	2.807	3.376	0.623	5.734
Other equipment and machinery (**)	3.478	6.025	18.863	23.710	2.298
BRAZIL	5.285	2.203	5.780	20.780	0.326
BRAZIL (weighted average)	4.385	7.078	9.049	23.208	0.536

(*) 100 ≠ Subsidy / Principal.

(**) services included.

Source: 'Banco Central do Brasil' (1988, 1990); author's calculations.

Table 2. Formula (29b)

Hp:	a) constant interest rates, b) semi-annual interest rate = r/2, c) semi-annual alternative interest rate = √(1+i)-1, d) with grace period. Ratio (*)				
Sector	1985	1986	1987	1988	1989
Food	0.000	2.626	5.979	8.551	2.636
Textiles & clothing	-1.250	-1.863	3.291	1.830	-1.778
Other consumer goods	2.053	2.724	2.139	4.880	1.939
Cereals	4.201	2.780	3.412	-1.495	-1.040
Chemical products	2.915	3.350	0.203	1.763	0.000
Paper and cellulose	0.000	4.451	-5.823	0.000	1.642
Plastics & rubber	0.000	5.280	0.000	0.000	0.000
Iron, steel and non-ferrous metals	1.899	-21.729	0.560	6.269	3.121
Other raw materials	0.000	0.000	6.501	0.000	0.000
Coal	9.462	-7.633	1.459	-8.597	-0.328
Oil	2.523	10.291	0.000	17.793	0.000
Transport equipment	-6.724	2.535	2.378	0.406	4.148
Other equipment and machinery (**)	2.694	5.621	15.932	18.038	1.995
BRAZIL	4.165	1.669	4.722	15.798	0.389
BRAZIL (weighted average)	3.458	5.770	7.421	17.699	0.574

(*) 100 ≠ Subsidy / Principal.

(**) services included.

Source: 'Banco Central do Brasil' (1988, 1990); author's calculations.

Table 3. Formula (30a)

Hp:	a) constant interest rates, b) semi-annual interest rate = r/2, c) semi-annual alternative interest rate = $\sqrt{(1+i)}-1$, d) with grace period. Ratio (*)				
Sector	1985	1986	1987	1988	1989
Food	0.000	3.448	7.597	12.046	3.697
Textiles & clothing	-1.076	-1.752	4.722	3.360	-1.996
Other consumer goods	2.604	3.234	2.737	5.524	2.833
Cereals	5.830	4.004	5.066	-1.147	-0.873
Chemical products	3.329	3.895	0.835	2.248	0.000
Paper and cellulose	0.000	5.712	-7.590	0.000	2.282
Plastics & rubber	0.000	6.018	0.000	0.000	0.000
Iron, steel and non-ferrous metals	2.376	-25.596	0.965	8.354	4.179
Other raw materials	0.000	0.000	7.393	0.000	0.000
Coal	11.819	-7.272	1.651	-8.216	0.487
Oil	3.507	13.172	0.000	19.369	0.000
Transport equipment	-7.501	3.078	3.774	1.110	5.851
Other equipment and machinery (**)	4.543	6.307	19.095	24.140	2.804
BRAZIL	5.916	2.669	6.225	21.268	1.061
BRAZIL (weighted average)	5.134	7.483	9.421	23.636	1.203

(*) 100 ≠ Subsidy / Principal.

(**) services included.

Source: 'Banco Central do Brasil' (1988, 1990); author's calculations.

Table 4. Formula (30b)

Hp:	a) constant interest rates, b) semi-annual interest rate = r/2, c) semi-annual alternative interest rate = $\sqrt{(1+i)}-1$, d) with grace period. Ratio (*)				
Sector	1985	1986	1987	1988	1989
Food	0.000	3.020	6.528	8.752	3.039
Textiles & clothing	-0.945	-1.428	3.602	2.709	-1.291
Other consumer goods	2.393	3.032	2.431	5.073	2.521
Cereals	4.505	3.031	3.701	-1.054	-0.549
Chemical products	3.221	3.580	0.605	2.049	0.000
Paper and cellulose	0.000	4.685	-4.865	0.000	2.098
Plastics & rubber	0.000	5.531	0.000	0.000	0.000
Iron, steel and non-ferrous metals	2.086	-20.089	0.945	6.544	3.537
Other raw materials	0.000	0.000	6.869	0.000	0.000
Coal	9.833	-6.891	1.995	-7.716	0.396
Oil	3.159	10.650	0.000	17.795	0.000
Transport equipment	-5.424	2.778	2.658	0.884	4.232
Other equipment and machinery (**)	3.611	5.870	16.135	18.414	2.430
BRAZIL	4.689	2.048	5.059	16.221	0.962
BRAZIL (weighted average)	4.093	6.098	7.705	18.075	1.099

(*) 100 ≠ Subsidy / Principal.

(**) services included.

Source: 'Banco Central do Brasil' (1988, 1990); author's calculations.

Table 5. Formula (29c)

Hp:	a) constant interest rates, b) semi-annual interest rate = r/2, c) semi-annual alternative interest rate = $\sqrt{(1+i)}-1$, d) with grace period. Ratio (*)				
Sector	1985	1986	1987	1988	1989
Food	0.000	2.828	6.050	7.832	2.725
Textiles & clothing	-1.424	-1.711	3.236	1.670	-1.855
Other consumer goods	2.235	3.007	2.182	5.311	1.877
Cereals	4.121	2.828	3.690	-1.628	-1.216
Chemical products	3.291	3.642	0.128	1.935	0.000
Paper and cellulose	0.000	4.247	-4.468	0.000	1.787
Plastics & rubber	0.000	5.745	0.000	0.000	0.000
Iron, steel and non-ferrous metals	2.164	-20.723	0.556	6.089	3.053
Other raw materials	0.000	0.000	6.997	0.000	0.000
Coal	9.011	-8.065	2.001	-9.154	-0.289
Oil	2.566	9.237	0.000	19.366	0.000
Transport equipment	-5.536	2.768	2.427	0.484	4.001
Other equipment and machinery (**)	1.639	5.859	14.634	14.890	2.096
BRAZIL	3.732	1.592	4.757	13.048	0.363
BRAZIL (weighted average)	2.923	5.391	7.174	14.683	0.559

(*) 100 ≠ Subsidy / Principal.

(**) services included.

Source: 'Banco Central do Brasil' (1988, 1990); author's calculations.

Table 6. Formula (31; 32a)

Hp:	a) constant interest rates, b) semi-annual interest rate = r/2, c) semi-annual alternative interest rate = $\sqrt{(1+i)}-1$, d) with grace period. Ratio (*)				
Sector	1985	1986	1987	1988	1989
Food	0.000	3.301	5.189	16.719	6.136
Textiles & clothing	-1.770	-0.169	8.594	3.740	1.092
Other consumer goods	2.231	3.201	4.981	8.578	5.668
Cereals	4.990	4.318	2.073	2.426	-0.297
Chemical products	3.167	4.342	4.559	5.331	0.000
Paper and cellulose	0.000	7.347	6.167	0.000	4.179
Plastics & rubber	0.000	5.254	0.000	0.000	0.000
Iron, steel and non-ferrous metals	1.698	-17.892	3.712	14.548	6.579
Other raw materials	0.000	0.000	6.007	0.000	0.000
Coal	14.034	-4.719	5.918	-2.813	4.068
Oil	2.037	17.833	0.000	22.515	0.000
Transport equipment	-10.990	4.599	7.452	5.909	7.482
Other equipment and machinery (**)	2.505	7.127	24.056	31.449	5.074
BRAZIL	4.966	4.102	7.039	27.910	3.485
BRAZIL (weighted average)	3.756	9.842	9.995	30.815	3.286

(*) 100 ≠ Subsidy / Principal.

(**) services included.

Source: 'Banco Central do Brasil' (1988, 1990); author's calculations.

Table 7. Formula (31; 32b)

Hp:	a) constant interest rates, b) semi-annual interest rate = r/2, c) semi-annual alternative interest rate = √(1+i)-1, d) with grace period. Ratio (*)				
Sector	1985	1986	1987	1988	1989
Food	0.000	2.833	4.553	12.034	4.936
Textiles & clothing	-1.522	-0.145	6.258	2.835	0.979
Other consumer goods	2.056	2.942	4.403	7.803	4.972
Cereals	3.863	3.288	2.016	2.162	-0.139
Chemical products	2.839	3.977	3.224	4.798	0.000
Paper and cellulose	0.000	6.099	2.615	0.000	3.805
Plastics & rubber	0.000	4.842	0.000	0.000	0.000
Iron, steel and non-ferrous metals	1.521	-14.642	3.442	10.954	5.518
Other raw materials	0.000	0.000	5.592	0.000	0.000
Coal	11.499	-4.523	3.804	-2.699	3.025
Oil	1.854	14.216	0.000	20.627	0.000
Transport equipment	-7.698	4.060	4.615	5.496	5.208
Other equipment and machinery (**)	1.889	6.646	20.114	24.126	4.303
BRAZIL	3.901	3.227	5.707	21.429	2.823
BRAZIL (weighted average)	2.939	7.954	8.413	23.699	2.727

(*) 100 ≠ Subsidy / Principal.

(**) services included.

Source: 'Banco Central do Brasil' (1988, 1990); author's calculations.

Table 8. Formula (31; 33a)

Hp:	a) constant interest rates, b) semi-annual interest rate = r/2, c) semi-annual alternative interest rate = $\sqrt{(1+i)}-1$, d) with grace period. Ratio (*)				
Sector	1985	1986	1987	1988	1989
Food	0.000	3.569	5.645	18.868	6.591
Textiles & clothing	-1.855	-0.106	9.797	4.196	1.203
Other consumer goods	2.389	3.360	5.504	9.256	6.146
Cereals	5.222	4.515	2.121	2.697	-0.247
Chemical products	3.463	4.677	5.232	5.757	0.000
Paper and cellulose	0.000	8.087	8.307	0.000	4.437
Plastics & rubber	0.000	5.543	0.000	0.000	0.000
Iron, steel and non-ferrous metals	1.771	-20.179	4.269	16.195	7.165
Other raw materials	0.000	0.000	6.434	0.000	0.000
Coal	16.862	-5.051	6.929	-2.904	4.529
Oil	2.144	21.679	0.000	24.173	0.000
Transport equipment	-12.232	5.051	8.279	6.574	7.784
Other equipment and machinery (**)	3.391	8.111	29.190	37.642	5.425
BRAZIL	5.669	4.662	8.202	33.358	3.835
BRAZIL (weighted average)	4.366	11.652	11.874	36.832	3.587

(*) 100 ≠ Subsidy / Principal.

(**) services included.

Source: 'Banco Central do Brasil' (1988, 1990); author's calculations.

Table 9. Formula (31; 33b)

Hp:	a) constant interest rates, b) semi-annual interest rate = r/2, c) semi-annual alternative interest rate = √(1+i)-1, d) with grace period. Ratio (*)				
Sector	1985	1986	1987	1988	1989
Food	0.000	3.030	4.934	13.343	5.285
Textiles & clothing	-1.596	-0.092	7.054	3.164	1.083
Other consumer goods	2.199	3.087	4.860	8.415	5.384
Cereals	4.026	3.423	2.066	2.406	-0.102
Chemical products	3.080	4.278	3.680	5.169	0.000
Paper and cellulose	0.000	6.688	3.538	0.000	4.037
Plastics & rubber	0.000	5.104	0.000	0.000	0.000
Iron, steel and non-ferrous metals	1.584	-16.329	3.958	12.086	5.993
Other raw materials	0.000	0.000	5.983	0.000	0.000
Coal	13.746	-4.835	4.298	-2.784	3.333
Oil	1.948	17.120	0.000	22.126	0.000
Transport equipment	-8.456	4.443	5.078	6.115	5.391
Other equipment and machinery (**)	2.583	7.566	24.100	28.437	4.590
BRAZIL	4.444	3.663	6.549	25.225	3.082
BRAZIL (weighted average)	3.412	9.349	9.855	27.894	2.957

(*) 100 ≠ Subsidy / Principal.

(**) services included.

Source: 'Banco Central do Brasil' (1988, 1990); author's calculations.

Table 10. Formula (31; 33a)

Hp:	a) constant interest rates, b) semi-annual interest rate = r/2, c) semi-annual alternative interest rate = $\sqrt{(1+i)}-1$, d) with grace period. Ratio (*)				
Sector	1985	1986	1987	1988	1989
Food	0.000	3.579	5.967	21.073	7.047
Textiles & clothing	-1.741	-0.066	10.597	4.647	1.330
Other consumer goods	2.238	3.332	5.743	9.738	6.618
Cereals	4.989	4.445	2.134	2.908	-0.257
Chemical products	3.270	4.608	5.655	6.047	0.000
Paper and cellulose	0.000	8.013	10.817	0.000	4.664
Plastics & rubber	0.000	5.481	0.000	0.000	0.000
Iron, steel and non-ferrous metals	1.675	-20.616	4.634	17.698	7.826
Other raw materials	0.000	0.000	6.676	0.000	0.000
Coal	16.949	-4.914	7.853	-2.938	5.049
Oil	2.088	24.138	0.000	25.329	0.000
Transport equipment	-11.980	4.993	8.664	7.160	7.999
Other equipment and machinery (**)	4.034	8.467	35.032	45.663	5.760
BRAZIL	5.762	4.951	9.365	40.389	4.197
BRAZIL (weighted average)	4.577	12.712	13.949	44.606	3.881

(*) 100 ≠ Subsidy / Principal.

(**) services included.

Source: 'Banco Central do Brasil' (1988, 1990); author's calculations.

Table 11. Formula (31; 33a)

Hp:	a) constant interest rates, b) semi-annual interest rate = r/2, c) semi-annual alternative interest rate = $\sqrt{(1+i)}-1$, d) with grace period. Ratio (*)				
Sector	1985	1986	1987	1988	1989
Food	0.000	3.017	5.199	14.582	5.630
Textiles & clothing	-1.498	-0.060	7.547	3.487	1.202
Other consumer goods	2.063	3.061	5.066	8.850	5.790
Cereals	3.859	3.366	2.084	2.595	-0.102
Chemical products	2.902	4.215	3.954	5.427	0.000
Paper and cellulose	0.000	6.614	4.526	0.000	4.241
Plastics & rubber	0.000	5.046	0.000	0.000	0.000
Iron, steel and non-ferrous metals	1.500	-16.553	4.295	13.079	6.525
Other raw materials	0.000	0.000	6.203	0.000	0.000
Coal	13.796	-4.705	4.694	-2.818	3.671
Oil	1.899	18.905	0.000	23.172	0.000
Transport equipment	-8.197	4.383	5.279	6.664	5.502
Other equipment and machinery (**)	3.105	7.904	28.474	33.864	4.859
BRAZIL	4.531	3.887	7.357	29.986	3.346
BRAZIL (weighted average)	3.591	10.134	11.389	33.158	3.178

(*) 100 ≠ Subsidy / Principal.

(**) services included.

Source: 'Banco Central do Brasil' (1988, 1990); author's calculations.

Table 12 is not available due to technical reasons

Table 13. Formula (37)
Decomposition of the present subsidy value into addenda due to each period.
(loans extended from 1985 to 1989; 1985 values)

	a	b	c	d	e	f	g
1985 II s.	0	0	0.021	0.835	0.091	0	0
1986 I s.	0	0	0.020	0.787	0.087	0	0
1986 II s.	0.129	-0.029	0.067	0.913	0.428	0.147	1.045
1987 I s.	0.124	-0.028	0.062	0.724	0.401	0.142	1.000
1987 II s.	0.466	0.171	0.137	0.642	0.358	-0.100	0.851
1988 I s.	0.430	0.166	0.122	0.420	0.300	-0.108	0.712
1988 II s.	0.592	0.270	0.161	0.182	0.275	-0.116	0.584
1989 I s.	0.550	0.254	0.139	0.131	0.224	-0.122	0.466
1989 II s.	0.549	0.232	0.279	0.051	0.174	-0.050	0.357
1990 I s.	0.483	0.217	0.248	0.021	0.128	-0.060	0.256
1990 II s.	0.421	0.203	0.219	-0.006	0.085	-0.076	0.163
1991 I s.	0.363	0.191	0.182	-0.008	0.051	-0.094	0.078
1991 II s.	0.303	0.169	0.148	-0.005	0.020	-0.111	0
1992 I s.	0.253	0.146	0.120	-0.003	0.016	-0.126	0
1992 II s.	0.207	0.120	0.093	0	0.011	-0.130	0
1993 I s.	0.174	0.100	0.072	0	0.007	-0.134	0
1993 II s.	0.145	0.081	0.056	0	0.005	-0.135	0
1994 I s.	0.120	0.064	0.045	0	0.003	-0.136	0
1994 II s.	0.091	0.047	0.034	0	0.002	-0.136	0
1995 I s.	0.063	0.033	0.025	0	0	-0.131	0
1995 II s.	0.039	0.019	0.018	0	0	-0.126	0
1996 I s.	0.031	0.015	0.011	0	0	-0.121	0
1996 II s.	0.024	0.012	0.005	0	0	-0.116	0

a. food
b. textiles and clothing
c. other consumer goods
d. cereals
e. chemical products
f. paper and cellulose
g. plastics & rubber
h. iron, steel and non-ferrous metals
i. other raw materials
j. coal
k. oil
l. transport equipment
m. other equipment and machinery (**)
s = semester
(**) Government services included

Table 13. Formula (37) (*suite*)
Decomposition of the present subsidy value into addenda due to each period.
(loans extended from 1985 to 1989; 1985 values)

	h	i	j	k	l	m
1985 II s.	0.001	0	0.292	0.259	-0.061	0.031
1986 I s.	0.001	0	0.280	0.243	-0.057	0.026
1986 II s.	-0.443	0	0.121	0.736	0.103	0.080
1987 I s.	-0.427	0	0.125	0.680	0.100	0.085
1987 II s.	-0.400	1.051	0.181	0.630	0.081	0.151
1988 I s.	-0.387	1.000	0.188	0.584	0.060	0.151
1988 II s.	-0.346	0.861	0.134	0.654	0.142	0.795
1989 I s.	-0.332	0.733	0.128	0.611	0.125	0.765
1989 II s.	-0.089	0.616	0.141	0.547	0.116	0.755
1990 I s.	-0.087	0.509	0.137	0.489	0.097	0.731
1990 II s.	-0.068	0.410	0.133	0.435	0.077	0.706
1991 I s.	-0.058	0.320	0.120	0.402	0.047	0.681
1991 II s.	-0.060	0.238	0.108	0.372	0.022	0.658
1992 I s.	-0.065	0.162	0.098	0.319	0.014	0.636
1992 II s.	-0.069	0.094	0.088	0.270	0.006	0.616
1993 I s.	-0.066	0.045	0.084	0.224	-0.001	0.594
1993 II s.	-0.063	0	0.080	0.186	-0.007	0.573
1994 I s.	-0.058	0	0.067	0.165	-0.004	0.524
1994 II s.	-0.054	0	0.054	0.145	-0.005	0.478
1995 I s.	-0.047	0	0.045	0.126	-0.005	0.435
1995 II s.	-0.038	0	0.036	0.113	-0.002	0.396
1996 I s.	-0.026	0	0.027	0.100	0	0.359
1996 II s.	-.014	0	0.018	0.089	0	0.327

a. food
b. textiles and clothing
c. other consumer goods
d. cereals
e. chemical products
f. paper and cellulose
g. plastics & rubber
h. iron, steel and non-ferrous metals
i. other raw materials
j. coal
k. oil
l. transport equipment
m. other equipment and machinery (**)
s = semester
(**) Government services included

Table 13. Formula (37)(*suite*)
Decomposition of the present subsidy value into addenda due to each period.
(loans extended from 1985 to 1989; 1985 values)

	a	b	c	d	e	f	g
1997 I s.	0.017	0.008	0	0	0	-0.112	0
1997 II s.	0.011	0.005	0	0	0	-0.090	0
1998 I s.	0.005	0.002	0	0	0	-0.069	0
1998 II s.	0	0	0	0	0	-0.050	0
1999 I s.	0	0	0	0	0	-0.032	0
1999 II s.	0	0	0	0	0	-0.015	0
2000 I s.	0	0	0	0	0	0	0
2000 II s.	0	0	0	0	0	0	0
2001 I s.	0	0	0	0	0	0	0
2001 II s.	0	0	0	0	0	0	0
2002 I s.	0	0	0	0	0	0	0
2002 II s.	0	0	0	0	0	0	0
2003 I s.	0	0	0	0	0	0	0
2003 II s.	0	0	0	0	0	0	0
2004 I s.	0	0	0	0	0	0	0
2004 II s.	0	0	0	0	0	0	0
2005 I s.	0	0	0	0	0	0	0
2005 II s.	0	0	0	0	0	0	0
2006 I s.	0	0	0	0	0	0	0
2006 II s.	0	0	0	0	0	0	0
TOTAL	5.590	2.468	2.284	4.684	2.666	-2.207	5.512

a. food
b. textiles and clothing
c. other consumer goods
d. cereals
e. chemical products
f. paper and cellulose
g. plastics & rubber
h. iron, steel and non-ferrous metals
i. other raw materials
j. coal
k. oil
l. transport equipment
m. other equipment and machinery (**)
s = semester
(**) Government services included

Table 13. Formula (37)(*suite*)
Decomposition of the present subsidy value into addenda due to each period.
(loans extended from 1985 to 1989; 1985 values)

	h	i	j	k	l	m
1997 I s.	-0.003	0	0.010	0.078	0	0.289
1997 II s.	0.008	0	0.001	0.067	0	0.255
1998 I s.	0.005	0	0	0.058	0	0.222
1998 II s.	0.002	0	0	0.049	0	0.192
1999 I s.	0	0	0	0.040	0	0.164
1999 II s.	0	0	0	0.032	0	0.138
2000 I s.	0	0	0	0.025	0	0.114
2000 II s.	0	0	0	0.018	0	0.092
2001 I s.	0	0	0	0.012	0	0.072
2001 II s.	0	0	0	0.006	0	0.054
2002 I s.	0	0	0	0	0	0.038
2002 II s.	0	0	0	0	0	0.022
2003 I s.	0	0	0	0	0	0.008
2003 II s.	0	0	0	0	0	0.007
2004 I s.	0	0	0	0	0	0.006
2004 II s.	0	0	0	0	0	0.004
2005 I s.	0	0	0	0	0	0.003
2005 II s.	0	0	0	0	0	0.002
2006 I s.	0	0	0	0	0	0.001
2006 II s.	0	0	0	0	0	0
TOTAL	-3.183	6.039	2.696	8.764	0.848	12.236

a. food
b. textiles and clothing
c. other consumer goods
d. cereals
e. chemical products
f. paper and cellulose
g. plastics & rubber
h. iron, steel and non-ferrous metals
i. other raw materials
j. coal
k. oil
l. transport equipment
m. other equipment and machinery (**)
s = semester
(**) Government services included