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June 12, 1974

ECONOMIC ANALYSIS OF PROJECTS

STAFF REVIEW

Attached please find Appendix III to the above-captioned paper referred to in Mr. van der Tak's memorandum to the Staff Policy Review Committee dated May 31. The memorandum, the paper on Economic Analysis of Projects and the notice of the meeting were circulated on June 4, 1974 (PRC/s/M/74-7).

Frank Vibert
Secretary
Policy Review Committee

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IVORY COAST

CURRENCY EQUIVALENTS

Currency Unit: CFA Franc (CFAF)

A fixed parity exists between the CFA and the French francs:

FF 1 = CFAF 50

The CFA franc floats against the dollar. Between February 12, 1973 and the end of November 1973, the rate has fluctuated as follows:

US$ 1= CFAF 205-230

Throughout this report the following rates have been used for the conversion of CFA francs into US dollars and vice versa:

1968 and earlier years:	US$ 1 = CFAF 247
1969:	US$ 1 = CFAF 256
1970:	US$ 1 = CFAF 278
1971:	US$ 1 = CFAF 272
1972:	US$ 1 = CFAF 256
1973:	US$ 1 = CFAF 230

WEIGHT AND MEASURES

1 Metric Ton (t)	= 2,205 lbs.
1 Kilogram (kg)	= 2.2 lbs.
1 Kilometer (km)	= 0.62 mile
1 Meter (m)	= 3.28 feet

APPENDIX III

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APPENDIX III: EXAMPLES OF APPLICATION

Part I. Introduction

1. The purpose of this appendix is to demonstrate in a specific country context the proposed methodology for the economic analysis of projects. The appendix presents estimates of the required country parameters for Ivory Coast and applies the results to three projects which were recently approved by the Bank for Ivory Coast.

2. The presentation groups the estimation results into three main categories: Parts II and III derive all the main shadow prices (except the shadow wage rate) required for analysis, Part II presenting those estimates which are necessary for efficiency pricing (i.e., the conversion factors and the marginal productivity of capital) and Part III the additional estimates required for social pricing, (i.e., the consumption rate of interest, the distribution weights, the value of public income, and the accounting rate of interest). In Part IV we present estimates of four shadow wage rates for Ivory Coast. In view of the overlap in analytical arguments needed to derive the efficiency and social pricing components of the shadow wage rates, it proved convenient to discuss them jointly. Part V concludes the appendix by applying the national parameters and the shadow wage rates to three projects in order to illustrate the implications of the proposed methodology for project selection.

3. Like any desk study this one suffers from shortcomings which might have been corrected with more direct exposure to country information and access to original material in the country itself. Nevertheless, the present study shows that the proposed shadow pricing methodology can be

implemented in a specific country context, and that it offers a reasonable and systematic framework for assessing the tradeoff between growth and income distribution in project selection. The information need is increased by the proposed method, but it does not appear to go far beyond what a rigorous application of conventional cost-benefit analysis would require of the country and project economists.

4. Before proceeding to a detailed discussion of the shadow price estimates, the next 11 paragraphs present in summary form the main results. Paragraphs 5 to 12 outline the shadow price estimates and paras. 12 to 16 describe the project evaluation results. The more detailed analysis is contained in paras. 17 to 40 for the efficiency prices, paras. 41 to 76 for the additional parameters required for social pricing, and paras. 77 to 102 for the project evaluations.

5. Table 1 illustrates the main estimates for the efficiency and social component of shadow prices. For all conversion factors it was found that reliance on simple estimation formulae may lead to misleading results, unless the appropriate formula is chosen carefully in line with the conditions prevailing in a specific country. Where possible, one should avoid having to rely on the simplified formula, but should instead estimate the necessary spending propensities for individual commodity groups entering the conversion factor. The standard conversion factor may be regarded as the inverse of a shadow exchange rate (SER) so that the above estimate of 0.83 implies a SER of 1.2 times the official exchange rate.

6. Two alternative estimation approaches were used for the marginal productivity of capital (q): The macro-economic approach utilizing aggregative

Table 1: Summary of Country Parameters

Parameter	Case 1	Case 2	Paras.
Standard Conversion Factor	0.83	0.83	
Conversion Factor for Consumption Goods	0.84	0.84	
Conversion Factor for Capital Goods	0.90	0.90	
Conversion Factor for Construction 1/	0.73	0.73	
Marginal Product of Capital (%)	10	10	
n	0.5	1.0	
CRI (%)	5.0	7.5	
Growth rate of per Capita Consumption (%)	3.3	3.3	
ρ	3.35	4.20	
Summary Distribution Measure (D)	0.91	1.00	
s	0.4-0.5	0.4-0.5	
Value of public income	2.5	1.7	
ARI (%)	7.4	8.5	

Note: 1/ Assuming labor is shadow priced at the value of the SCF.

output, investment and employment data, and the micro-economic approach, based on interest information and industry profit data. There is good reason to believe that the former method substantially overestimates the true value of q, while the latter probably somewhat underestimates it; on balance the likely range for q appeared to be between 8% and 12% with a central value of 10%.

7. Turning then to the social pricing parameters, the objective function parameters, n (the elasticity of marginal utility with respect to consumption), and ρ (the rate of pure time preference) were derived together with the consumption rate of interest (CRI) by reviewing the policy directions of the Ivorian government. Two cases of possible parameter combinations were accepted for further work:

Case 1: n = 0.5, and CRI = 5.0%

Case 2: n = 1.0, and CRI = 7.5%

Given a growth rate of 3.3% for per capita consumption, the implied values of ρ are 3.4 % for Case 1 and 4.2 % for Case 2. Case 1 represents governmental value judgements which attribute a high priority to fast growth, and a low priority to income distribution. In Case 2 moderate emphasis is placed on both objectives. The former case was judged to represent more closely the attitudes of the Ivorian government, and was the one most consistent with the evidence available on the critical consumption level.

8. Given these parameters, one can estimate the marginal distribution weights, d, for different consumption groups in the Ivory Coast, and the summary distribution measure (D). The latter was estimated to be

Case 1: D = 0.91

Case 2: D = 1.00

9. The value of public income (v) was deduced from the value of public investment on the assumption that public income is allocated optimally between investment and other uses. The resulting estimates of v, together with the estimated values of n, were cross-checked against an independent estimate of the critical consumption level (CCL). On the basis of this cross-check, the following values for v were accepted for further work:

Case 1: v = 2.5 (implying a CCL of CFAF 15,414 at approximately the 3th percentile)

Case 2: v = 1.7 (implying a CCL of CFAF 47,987 at approximately the 45th percentile)

10. Finally, the accounting rate of interest (ARI) was estimated as the internal social rate of return on the marginally-acceptable public project:

Case 1: ARI = 7.4%;

Case 2: ARI = 8.5%

The estimates of the ARI are based on a value of s = 0.5, where (1-s) is the private marginal propensity to consume out of total returns on the marginally-acceptable project.

11. Table 2 presents estimates of shadow wage rates (SWR) for different types of labor. The shadow wage for urban unskilled labor is based on the assumption that the urban rate of unemployment remains constant because of its role as an equilibriating mechanism. It follows that the SWR must allow

for the additional migrants who move to the urban sector in response to the creation of one job. However, even allowing for migration, the SWR is still below the market wage, w.

Table 2: Shadow Wage Rates

	SWR/w			Paras.
	Efficiency SWR/$_w$	Case 1	Case 2	
Urban Unskilled Labor	0.31	0.60	0.59	
Rural non-Ivorian African Labor				
i) Regional Strategy	0.33	0.50	0.02	
ii) National Strategy	0.40	0.90	0.90	

12. The SWR for rural non-Ivorian African labor depends on whether or not benefits accruing to non-Ivorian labor are valued in the same way as benefits accruing to Ivorian labor. If they are (i.e., the government adopts a regional strategy) then the SWR is consistently lower than if they are not assigned any value (i.e., the government adopts a national policy). For other types of labor (e.g., skilled and rural Ivorian unskilled) the ratio SWR/w is set equal to the SCF on the grounds that the relevant labor markets are operating reasonably efficiently so that the only adjustment involves transforming wages in domestic terms into their equivalent in terms of the value of foreign exchange. Finally, for non-African expatriate labor the ratio of the shadow wage to the actual wage falls between SCF (= 0.83) and unity, depending on the proportion of income that is repatriated.

13. Three different project types were selected to illustrate the impact of the new methodology under different circumstances. Given the ex-post nature of the desk study and its purpose of illustrating the methodology rather than reappraising the particular projects, a number of simplifications were made, relating first, to the conversion procedure used to convert cost and benefit streams from domestic into foreign terms, and second, to the distribution of benefits among the beneficiaries. However, the result of the analysis is judged to reflect the directions and the approximate degree of change introduced by the application of the new methodology. Table 3 presents the main results which are then reviewed briefly in the following three paragraphs.

Table 3: Results of Project Appraisals

	Internal Rate of Return (%)			
	Grand Bereby 1/ Rubber Estate Project	Third Highway Project		Cocoa Project
		Routine Maintenance	Betterment Works	
Case 1 n=0.5, CRI=5%, ARI=7.4%	12.8	37.1	-1.7	21.3
Case 2 n=1.0, CRI=7.5%,ARI=8.5%	14.6	> 100	26.2	25.1
Efficiency Case n=0, CRI = q = 10.0%	13.4	> 100	> 50	23.8
Bank Appraisal n=0, CRI = q = 10-12%	13.2	> 50	50	19.9

1/ In line with the Bank appraisal, the results for this project assume that the government adopts the regional strategy.

14. The Grand Bereby Rubber Estate Project which was marginal under traditional Bank economic justification methods easily passes the rate of return criterion under the proposed methodology. The main reason for this change is that the project involves almost exclusively public sector costs and benefits. Thus, a larger proportion of project returns goes to the Government than in the hypothetical marginal project, which determines the ARI, i.e., the cut-off rate of return. The study also shows the impact on the rate of return of using alternative SWR assumptions for the non-African rural labor component.

15. Rates of return for the Third Highway Project were substantially reduced by applying the proposed methodology. For one of the components (road betterment) the rate of return actually falls below the ARI, given Case 1 assumptions. The attractiveness of the project is reduced because nearly all benefits of the project are assumed to accrue to the private sector in proportion to the existing income distribution. If one allows for saving, and/or a better income distribution impact (since the project takes place mainly in the rural, poorer areas of the country), the projects may remain acceptable (although at reduced rates or return) under all alternative cases here considered. Thus the review of this project brought into the foreground the potential importance of allowing for the savings component in private benefits, and the need to specify carefully the income levels of expected beneficiaries.

16. The application of the proposed methodology to the Cocoa Project only slightly changed the absolute level of the rate of return to this project, although it improved somewhat relative to the ARI. The explanation is that the

beneficiaries of the project happen to be close to the critical consumption level, so that their net benefit from the project is assigned the same value as public income. The impact of social pricing on the rate of return is therefore roughly equivalent for the Rubber Project and the Cocoa project, but for different reasons. In the Rubber Project it is due to nearly all benefits as well as costs being public; in the Cocoa project, however, it is due to the beneficiaries being close to the critical consumption level at which point the foreign exchange cost of private benefits (i.e., consumption) is exactly offset by the social benefit of the same, so that one may proceed as if all benefits accrue to the public sector. This underscores the importance under the new methodology of giving greater consideration to the income and consumption effects of the project than in the past.

Part II. Efficiency Pricing Parameters

Conversion Factors

17. In this section we estimate the conversion factor for consumption, (paras. 21-24); the Standard Conversion Factor, SCF (paras. 25-27); the conversion factor for capital goods (paras. 28); and the conversion factor for one non-tradable, construction (para. 29).

18. As a starting point, the general formula for conversion factors is specified in Appendix I, para. 22, as

$$\beta = \sum_j a_j \lambda_j / p_j \qquad (1)$$

where a_j is the proportion of marginal expenditure devoted to the j^{th} commodity, $\sum_j a_j = 1$, λ_j is the shadow price and p_j the market price of the j^{th} commodity. If one may assume that export demand and import supply are infinitely elastic;[1/] that marginal changes in expenditure on non-tradables can be neglected;[2/] and that all income elasticities of spending are unity and (or) the relative size of the average (marginal) propensities to spend on importables and on exportables are approximately reflected by the relative size of imports and exports, equation (1) reduces to the simple formula (Annex, para. 15)

$$\beta = \frac{M + X}{M(1+t_m) + X(1-t_x)} \qquad (2)$$

1/ This assumption will be further discussed and relaxed below.

2/ This assumption is justified if either a_j for non-tradables is small, or if λ_j/p_j for non-tradables is approximately equal to the conversion factor.

where M(X) is the c.i.f. value of imports (f.o.b. value of exports) and t_m(t_x) is the average tax on imports (exports). Alternatively, if one may assume that all exportables are exported and all importables imported; and that income elasticities for import commodities are all unity the formula for the conversion factor becomes

$$\beta = \frac{1}{1 + t_m} \qquad (3)$$

since the exportable terms drop out of equation (2), and the importable terms cancel.

19. When these special assumptions are abandoned,[1/] the marginal propensities to consume exportables and importables have to be estimated. Where data for direct estimates are not available, income elasticities and average propensities to spend can be used instead to estimate marginal propensities. In any case, since marginal and average propensities can be measured directly only in domestic price terms, adjustments must be made to transform them into foreign currency terms. Noting that

$$a_j = \frac{\varepsilon_j APC_j}{\sum_j \varepsilon_j APC_j} \qquad (4)$$

where ε_j is the income elasticity, and APC_j is the average propensity to

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1/ Marginal changes in expenditure on non-tradables continue to be neglected, except in the case of the conversion factor for capital goods, where construction is taken into consideration.

spend on the j^{th} commodity, equation (1) may be written as

$$\beta = \frac{\frac{\varepsilon_m APC_m}{1 + t_m} + \frac{\varepsilon_x APC_x}{1 - t_x}}{\varepsilon_m APC_m + \varepsilon_x APC_x} \qquad (5)$$

where subscripts m and x refer to importables and exportables respectively.[1/]

20. Equation (5) is the basic equation used below except that it is further modified to account for less than infinite demand elasticities of those commodities in which Ivory Coast contributes a major share of total world trade, i.e., coffee, cocoa, and wood. For these exportables the border prices in equation (5) have to be replaced by marginal revenue products.[2/] Short of estimating marginal revenue products separately, one can assume that the export duties levied by Ivory Coast on these commodities are optimal and that therefore the duties equal the inverse of the export demand elasticities. As a result domestic prices may be used instead of border prices in equation (5) for these exportables.[3/]

1/ For a detailed derivation of equation (5), see J.F. Linn, Ivory Coast Case Study of Shadow Pricing, IBRD, Office of the Vice President, Western Africa Region, mimeo, p. 2.

2/ Distribution effects of relative price changes are here neglected.

3/ A further possible modification is the disaggregation of import flows by source, considering separately imports from Eruopean countries, and those from non-European countries. This allows explicitly for the preferential trading practices between the Ivory Coast and the European countries (in particular the EEC). It was found, however, that the effect on the conversion factors is negligible; see Linn, pp. 3, 8. Note also that equation (5) assumes that the Ivorian government will continue its existing pattern of mutual trade preferences with the EEC: and that the Ivorian Balance of payments is in long-term equilibrium and that therefore no devaluation will take place in the forseeable future.

21. Conversion factor for consumption (β). From import and export data averaged over the years 1968 to 1972 (Table 4) one can estimate the simple conversion factor for consumption goods from equation 2, assuming that the average tariff on imports is 25% and the average export duty 15%.[1/] The resulting conversion factor is 1.03. Alternatively, if one assumes that all exportables are exported and all importables imported (equation 3), the conversion factor becomes 0.80.

Table 4: Imports and Exports of Consumption Goods
(CFAF Billions)

	1968	1969	1970	1971	1972	5-Year Average
Imports (M)[a/]	28.8	29.3	36.6	38.2	40.5	34.7
Exports (X)[b/]	70.1	73.7	90.2	85.9	85.1	81.0

Sources: a/ **CESP**, Table 3.3 (Animals and Animal Products, Plant Products, Processed Food Products, Paper and Paper Products, Textiles, Cars), where CESP stands for IBRD, Current Economic Situation and Prospects of the Ivory Coast, December 1973 (Green Cover), Report No. 196-IVC.

b/ CESP, Table 2.2 (Coffee, Instant Coffee, Cocoa, Cocoa Products, Bananas, Pineapples and Pineapple Products, Cola Nuts, Palm Oil and Kernels, Cotton and Cotton Products).

22. For the more complex estimation procedure (equation 5), consider first the import side. Using 1970 data from the input-output table presented in the Ivorian Five-Year Plan 1971-1975, tariff rates were estimated for individual commodity groups by dividing tariff revenue by import value for

1/ These average tariff rates were derived from a rough inspection of the tariff structure and a judgement of the country economist; they are not directly related to the more detailed tariff estimates presented below.

each group. Average expenditure propensities for importables were also derived from the input-output as the share of expenditure on a particular commodity group in total expenditure. The elasticities were derived from a household expenditure survey of rural families in the South-East Region of Ivory Coast, performed in 1964/65 (Table 5 summarizes the computation on the importables).

23. On the export side, export duty rates were determined by major export commodities from inspection of the Tariff Code, while the average propensity to consume and the income elasticities were derived from the above mentioned expenditure survey. Input-output data could not be used for this purpose, since they are not detailed enough, and since they do not specify revenues from export duties by commodity group. Table 6 summarizes the export data. Note that it is assumed that coffee, instant coffee, cocoa, cocoa products, and wood face an inelastic foreign demand; and that for most of the export products the average propensity to consume is zero or negligible. The main exceptions are wood, bananas, and cotton, with the last one having the largest overall weight.

24. Using these import and export data the conversion factor from equation (5) was computed to be 0.838, which we may round off to 0.84.[1/] Comparing these results with the conversion factors estimated from the simple formulae (para. 18), it appears that in the case of the Ivory Coast the

1/ Using an expenditure survey of rural households in the South-East Region of Ivory Coast as an alternative data source for average propensities and income elasticities, a conversion factor of 0.836 was derived; see Linn, p. 8. Considering that both data sources lead to the same (rounded off) result, one can infer that rural and national conversion factors for consumption are approximately equal.

Table 5: Computation of Marginal Propensities to Spend on Importables

	Tariff rate[a] (%)	Final Consumption				Total Domestic Uses[1]			
		APC_m[b] (%)	e_m[c]	$e_m APC_m$	$\frac{e_m APC_m}{1+t_m}$	APC_m[b] (%)	e_m[d]	$e_m APC_m$	$\frac{e_m APC_m}{1+t_m}$
Animals (and Products)	2.3	23.6	0.8	18.88	18,46	16.6	0.8	13.28	12.98
Industrial Agriculture	44.5	1.2	0.9	1.08	0.75	3.0	0.9	2.70	1.87
Fishing	3.1	3.3	0.5	1.65	1.60	2.1	0.5	1.05	1.02
Grains and Flower	6.4	5.7	0.5	2.85	2.68	4.1	0.5	2.05	1.93
Cans, Tea, Coffee, Cocoa	42.8	1.2	1.0	1.20	0.84	0.7	1.0	0.70	0.49
Drinks, etc.	127.2	5.3	1.0	5.30	2.33	3.3	1.0	3.30	1.45
Other Food	44.9	4.9	0.5	2.45	1.69	3.3	0.5	1.65	1.14
Energy, Water	0.5	4.8	1.5	7.20	7.16	7.8	1.1	8.85	8.81
Extractive Activities	8.3	0.2	1.5	0.30	0.28	0.1	1.0	0.10	0.09
Metals	25.6	0.0	1.9	0.0	0.00	1.8	1.2	2.16	1.72
Construction materials	15.8	0.0	1.9	0.0	0.00	1.8	1.2	2.16	1.87
Fertilizer	0.0	0.0	0.0	0.0	0.00	0.3	1.2	0.36	0.00
Chemicals and Rubber	32.8	3.8	1.5	5.70	4.29	3.6	1.2	4.32	2.25
Wood Products	42.8	1.2	1.5	1.80	1.26	2.1	1.2	2.52	1.76
Vehicle Assembly and Repair	25.6	4.1	2.0	8.20	6.53	5.5	1.1	6.05	4.82
Mechanical and Electr.Prod.	24.7	4.6	1.5	6.90	5.53	5.6	1.7	9.52	7.63
Textiles	35.6	13.5	1.3	17.55	12.94	10.0	1.3	13.00	9.59
Leather and Shores	38.9	2.2	1.3	2.86	2.06	1.4	1.3	1.82	1.31
Fats	17.7	2.3	1.0	2.30	1.95	2.1	1.0	2.10	1.78
Rubber and Plastic Prod.	47.2	1.4	1.5	2.10	1.43	1.6	1.2	1.92	1.30
Various Ind. Products	30.9	2.5	1.5	3.75	2.86	3.0	1.2	3.60	2.75
Totals				92.07	74.82			83.21	66.56

Notes: 1/ Final Consumption plus intermediate uses.

Sources: a) Input-Output Table for 1970 from Cote d'Ivoire, Plan Quinquennal, 1971-75, pp.88-89; obtained as ratio of tariff revenue over imports for each commodity group.

b) ibid; obtained by taking ratio of final (or total domestic) uses per commodity group over total final (domestic) uses.

c) SEDES, Region du Sud-Est, Les Budgets Familiaux, Paris 1967; these are elasticities estimates from household expenditure data for different income groups.

d) for items 1-7, 17-19, where final use is predominant in total domestic use, these are as for final consumption; for items 8-16,20,21, where intermediate uses are predominant, elasticities were computed from import and GNP data on 5 yr average basis.

Table 6: Computation of Marginal Propensities to Consume Exportables

	Duty Rate (%) [a/]	APC_x (%) [b/]	e_x [c/]	$APC_x e_x$	$\frac{APC_x e_x}{1 - bt_x}$	Implied Export Demand (Price) Elasticity [3/]
Coffee	23	0.0 [1/]	0.5	0.00	- [2/]	4.3
Instant Coffee	0	0.0 [1/]	0.5	0.00	- [2/]	0.0
Cocoa	23	0.0 [1/]	0.5	0.00	- [2/]	4.3
Cocoa Products	16	0.0 [1/]	0.5	0.00	- [2/]	6.3
Wood	27	1.2	0.5	1.80	- [2/]	3.7
Bananas	12	4.9	0.5	2.45	2.78	
Pineapple and Products	10	0.0 [1/]	0.5	0.00	0.00	
Cola Nuts	14	0.0 [1/]	0.5	0.00	0.00	
Palm Oil and Kernels	7	0.7	0.5	0.35	0.38	
Cotton *and Products)	5	4.3	1.3	5.59	5.88	
TOTAL				20.19	9.04	

Sources: a/ Cote d'Ivoire, Code des Tarifs, 1973
b/ SEDES, Region du Sud-Est, Les Budgets Familiaux, Paris 1967.

Notes: 1/ Zero or negligible.
2/ Export commodity with finite foreign demand elasticity.
3/ Computed as the ratio $1/t_x$ on the assumption that t_x, the export duty is levied at an optimal rate for those export commodities in which the Ivory Coast contributes a significant amount to world supply.

formula which assumes that all tradeables are actually traded (equation 3) provides an estimate much closer to the result obtained by the detailed analysis, than the simple formula based on the proportionality of tradeables and traded goods (equation 2). The reason is that with the exception of a few commodities (most importantly textiles) Ivory Coast is only a marginal consumer of its own export commodities. This situation will be true for most less developed countries which have a low diversification in their export structure, and which specialize in primary products that neither are part of the domestic consumption basket, nor enter as intermediate goods into the domestic production process. Ivory Coast is, of course, a good example for this type of economy. In countries, where the import substitution process has gone further and the export structure is more diversified, containing a significant amount of items which are also domestically consumed, the simple formula based on the proportionality assumption (equation 2) may lead to better results.

25. Standard Conversion Factor (SCF) The data for the two simple estimation equations are shown in Table 7, where import and export data were used together with total import and export duty revenues to calculate the tariff rates. For the case where the proportionality assumption between traded and tradeable goods are made (equation 2), the SCF is 1.00. For the alternative assumption that all tradeables are traded (equation 3), the SCF is 0.86.

Table 7: Data for Computation of Standard Conversion Factor (Simple Cases)

CFAF Billion

	1968	1969	1970	1971	1972	5-Year Average
Total Imports	77.9	86.3	107.7	110.8	114.3	99.4
Total Exports	104.9	118.2	130.2	126.6	139.5	123.9
Import Tariff Revenues	12.9	12.5	15.4	18.7	21.3	
Export Duty Revenues	10.8	12.4	15.5	17.5	19.0	
Average Import Tariff (%)	16.6	14.5	14.3	16.9	18.6	16.2
Average Export Duty (%)	10.3	12.3	11.0	13.4	13.3	12.1

Source: CESP, Tables 3.2, 3.3, 5.1.

26. For the less limited approach of equation 5, the Ivorian input-output data are again used for the import side, but this time, intermediate uses are considered in addition to final uses when computing the average propensities (cf. Table 5). On the export side the same data are used as before except that the intermediate uses of wood are also considered, which increases the average propensity to spend from 1.2% to 2.1%. As regards the income elasticity data, for those items where final uses constituted a major part of total domestic uses, the previously applied elasticities were employed. However, where intermediate uses constituted an important share of total uses, income elasticities were estimated from actual trade data on the assumption that the income elasticity of imports equals the overall income

elasticity of importables.[1/] The resulting SCF is 0.830.

27. This is again more closely approximated by the simple formula based on the assumption that all tradeables are traded (equation 3), than by the simplification assuming proportionality (equation 2). The reasons are the same as those spelt out in para. 24. For the present study, an SCF of 0.83 will be used in further estimation exercises. This is equivalent to a foreign exchange premium of 20% or a SER of 1.20. Considering that a number of non-tariff protective measures have not been incorporated into this analysis, an SCF of 0.83 may somewhat overestimate the true SCF. But there seems little reason to believe that it would be below 0.80. For the purposes of sensitivity analysis the range of 0.85 to 0.80 might usefully be explored. With respect to future developments in the SCF, the Ivorian 5-Year Plan data from the Plan projections, suggest that with proportionality assumptions (equation 2), the simple SCF for 1975 and 1980 lies at 0.95; if exports are given zero weight (equation 3), the SCF in both periods is at .80. The slightly lower values projected for the SCF in future years reflect somewhat higher levels of average import tariff rates. For practival purposes it seems reasonable to assume that the SCF remains approximately constant over the foreseeable future.

28. Conversion factor for capital goods. If non-tradeables are neglected this factor may be approximated by unity, since Ivory Coast does not export capital goods, and in effect does not levy tariffs of any significance on the imports of capital goods, due to pervasive exemptions from tariffs on imported

1/ A further important assumption in this estimation is that there were no relative price changes over the years. For more details on the data, results, and limitations of this estimation exercise, see Linn, p. 12.

machinery, etc., which are granted to most enterprises.[1/] However, for present purposes, non-tradeables should not be neglected since construction forms a substantial part of capital formation, the marginal propensity to spend on construction is not negligible, and since the ratio of accounting to nominal prices of construction may be different from the conversion factor for capital goods in general.

This may be allowed for by assuming first that the income elasticity of all capital goods is unity, and then using the proportion of construction in total capital goods to approximate the marginal propensity to spend on construction and other capital goods respectively. From the input-output table for 1970 in the Ivorian 5-year Plan it is found that the proportion of capital expenditure going to construction is 37.8%. Furthermore, the conversion factor for construction is estimated below (para. 29) to be 0.77 or 0.73, depending on the shadow price of labor. These various elements may then be combined to complete the capital goods conversion factor as follows:

$$\left(\frac{1}{100}\right)(1.0 \times 62.2 + 0.77 \times 37.8) = 0.91 \text{ for } \frac{SWR}{W} = SCF = 0.83;$$

$$\left(\frac{1}{100}\right)(1.0 \times 62.2 + 0.73 \times 37.8) = 0.90 \text{ for } \frac{SWR}{W} = 0.70.$$

Based on this rather crude estimate, it will be assumed for the ensuing estimation procedures that the capital goods conversion factor equals 0.90

1/ See IBRD, Current Status and Prospects of the Industrial Sector in the Ivory Coast, 1974 (Draft version); this report will be generally referred to as Industry Report.

29. Conversion factor for construction. This factor for a non-tradeable can be estimated on the basis of the input-output data for Ivory Coast, including the import tariff information previously used for the computation of the conversion factors for tradeable goods (cf. Table 5 above). Table 8 shows the domestic values of the various inputs to the construction sector, including salaries and "other value added" items. For the tradeable goods the tariff data may be used to compute individual conversion factors by applying the formula $/\overline{1}/(1 + t_m)\overline{/}$. These conversion factors in turn are multiplied with the domestic input values of tradeables to obtain the border price equivalent. For non-tradeables and "other value added" the SCF was used. In the case of salaries and wages two alternatives were tried: first, using the SCF, i.e., assuming that the output foregone by the labor force employed in construction is valued at SCF to obtain the border price equivalent; and second, shadow pricing labor at 70% of the domestic value. This value was chosen between 60% (SWR for urban unskilled labor) and 83% (SCF), since only part of labor employed in construction is unskilled and drawn from the urban sector. Thus, the value of labor employed must lie between the value of urban unskilled labor and the full value of labor in foreign terms. The resulting conversion factors for construction are 0.769 for the case where labor is shadow priced at 0.83, and 0.734, when labor is shadow priced at 0.70.

The Marginal Productivity of Capital, q.

30. The estimation of the marginal productivity of capital may be based on macro and micro data (cf. Appendix II, para. 18, 19). For Ivory Coast both approaches are explored, the macro-economic approach in paras. 30-36, and the micro-economic approach in paras. 37-40. Taking the macro-economic estimation procedure first, one multiplies the incremental employment/capital ratio with the marginal product of labor and

Table 8: Valuation of Imports for Construction Sector

Imports	Domestic Value[a/] (CFAF million)	Conversion Factor[1/b/]	Border Value[2/] (CFAF million)
Energy	2,308	0.995	2,297
Metals	3,643	0.796	2,900
Construction Mat.	5,591	0.864	4,828
Chemicals, etc.	749	0.753	564
Wood Prod.	2,734	0.700	1,915
Vehicles	866	0.796	689
Mechanical & Electr.	2,521	0.802	2,022
Textiles	2	0.738	1
Rubber	328	0.679	223
Various Indust.	640	0.764	489
Construction	530	0.830	440
Transport	1,965	0.830	1,631
Rent	495	0.830	381
Other Services	1,386	0.830	1,150
Salaries	13,463	0.830 (0.700)[3/]	11,174 (9,424)
Other Value Added	10,605	0.830	8,840
Taxes	3,610	0	0
Total	51,436	0.769 (0.734)	39,544 (37,749)

Notes: 1/ Computed as $1/(1+t_m)$, or SCF for non-tradeables.
2/ Computed by multiplying domestic value with conversion factor.
3/ Alternative SWR

Sources: a/Côte d'Ivoire, Plan Quinquennal 1971-75, p.88/89
b/Table

subtracts the resulting term from the incremental output-capital ratio. One thus obtains an estimate of the marginal productivity of capital in domestic prices. In order to express it in foreign currency terms it must be multiplied by the ratio of the Standard Conversion Factor over the Conversion factor for capital goods. Paras. 31-35 present the estimation results for the intermediate parameters, while para. 36 presents the resulting estimate for q.

31. The incremental output/capital ratio: This is the inverse of the more conventional ICOR and may be estimated from output and investment data for Ivory Coast. The cost of living index for Africans was used to deflate the output figures,[1/] while a price index of exports of machinery from France was used for capital goods, considering that most capital goods are imported from France. Table 9 presents the necessary data and transformations and indicates that the average value of the incremental output/capital ratio for the period 1965 to 1972 was 0.39 (equivalent to an ICOR of 2.56). If only the last three years are taken, a lower value (0.35) may be observed; CPP estimates for the period 1970-1979 are even lower (0.31). These values are summarized with their corresponding ICOR values in Table 10. For our present analysis, it has been assumed that the central value of the ratio is 0.35, while sensitivity analysis will consider of values 0.4 and 0.3.

32. The incremental employment/capital ratio: Interpolating from the

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1/ Cost-of-living indeces are notoriously unreliable and not necessarily appropriate GNP deflators; in the present case, however, it is the only available price deflator.

Table 9: Output/Capital Ratio, 1965-1972
(CFAF bill)

Year	a/ Output	b/ Deflator	Real Output	ΔOutput	c/ ΔCapital	d/ Deflator	Real ΔCapital	ΔOutput / ΔCapital
1965	236.8	78.6	301.3		43.6	82.7	52.7	
1966	257.3	81.9	314.2	12.9	44.6	85.0	52.5	0.24
1967	274.4	83.7	327.8	13.6	45.9	84.8	54.1	0.26
1968	325.1	88.3	368.2	40.4	54.0	85.3	63.3	0.75
1969	364.0	92.1	395.2	27.0	61.8	90.3	68.4	0.43
1970	414.0	100.0	414.0	18.8	83.8	100.0	83.8	0.27
1971	445.1	99.2	448.7	34.7	92.4	105.2	87.8	0.41
1972	480.0	99.5	482.4	33.7	93.4	104.7	89.2	0.38
						Average:		0.35

Sources:
a/ CESP, Table 2.1.
b/ CESP, Table 9.1, for 1970=100, African Cost of Living Index.
c/ CESP, Table 2.2.
d/ Bulletin Mensuel de Statistique; data provided by IBRD, Economic Analysis and Projections Department; price index for exports of machinery from France, based on Franc currency value; 1970=100.

Table 10: Alternative Estimates of Output/Capital Ratio

		$\frac{\Delta \text{ Output}}{\Delta \text{ Capital}}$	ICOR
	1965-1972	0.39	2.56
	1970-1972	0.35	2.86
CPP	1967-1972	0.38	1.64
CPP	1970-1979	0.31	3.25

growth of Ivorian employment from 1965 to 1970 data,[1/] one may estimate this ratio for the period 1965 to 1972. Table 11 indicates that the incremental labor/capital ratio has continuously dropped over the recent years. This is further considered in conjunction with the values for the marginal productivity of labor estimated in the next paragraphs.

Table 11: Employment/Capital Ratio, 1965-72

Year	Employment[a/] (in thousand)	Δ Employment (in thousand)	Real Δ Capital[b/] (CFAF bill)	$\frac{\Delta \text{ Employment}_t}{\text{Capital}_{t-1}} \times 10^{-6}$
1965	1,880		52.7	
1966	1,935	55	52.5	1.04
1967	1,991	56	54.1	1.07
1968	2,048	57	63.3	1.05
1969	2,108	60	68.4	0.95
1970	2,165	57	83.8	0.83
1971	2,228	63	87.8	0.75
1972	2,292	64	89.2	0.73

Sources: a/ Employment Report, Vol. 2, Table 1 (Stat. App.), using the 1965 and 1970 employment figures and extrapolating the other years by applying the annual average compound rate of growth of 2.9%

b/ Table 9.

33. The marginal productivity of labor: Aggregate labor productivity estimation is difficult in the case of Ivory Coast, since a large proportion of employment is in the informal, i.e., non-wage sector of the economy. In combining informal sector income estimates with modern sector wage information

1/ All employment and earnings data are taken from IBRD, Ivory Coast: Special Report on Employment, Vol. II, December 3, 1973 (Green Cover); this source is here generally referred to as Employment Report.

only a rough approximation of the average national marginal productivity of labor can be hoped for. Starting with informal sector incomes, available data show that in 1970 the annual average income per worker was CFAF 73,000 (derived by dividing informal sector earnings by informal sector employment; see Table 12). This calculation is based on the assumption that informal sector incomes correspond quite closely to national minimum wages, which is confirmed by the Employment Report.[1/] The further assumption is made that real labor productivity did not change between 1965 and 1970, and that as a result the CFAF 73,000 figure applies for both years.

Table 12: Informal Sector Productivity, 1970

	Average Annual Earnings (in CFAF thous.)	Employment (in thousand)	Total Wage Bill (in CFAF mill.)
Rural (Primary) Sector	67	1,452	97,284
SMIG (Const. & Services)	121	79	9,559
White Collar (Industrial)	156	60	9,360
All Informal Sector	73	1,591	116,203

Source: Employment Report, p. 29 and Table 2 (Stat. App.), assuming that SMIG wages approximate informal sector incomes (cf. Employment Report pp. 32, 42 for justification).

1/ The estimate of CFAF 73,000 may be on the high side, since at another place the Employment Report estimates informal sector value added per worker as equal to this figure. The value added measure is likely to be larger than the marginal productivity of labor, since the remuneration to other factors is included in it. One might argue that in the informal sector this component of value added is of relatively small importance.

34. In the formal sector, wage data, although imperfect, may be relied upon to provide proxies for the marginal productivity of labor. The wage data are presented in Table 13 and deflated to reflect real wages.

Table 13: Formal Sector Wages and Salaries, 1965, 1970

Year	Annual Average Wage (CFAF thous.) [a/]	Price Deflator [b/]	Real Average Wage (CFAF thous.)
1965	326	78.6	415
1970	465	100.0	465

Sources: a/ Employment Report, Annex Table A.11

b/ Table 9.

35. Combining the informal and formal sector productivity data into a weighted national average, it is found that the national marginal productivity of labor increased between 1965 and 1970 from CFAF 150,000 p.a. to CFAF 179,000 p.a. (cf. Table 14).

Table 14: National Labor Productivity, 1965, 1970 [a/]

(Earnings in CFAF thousand p.a., Employment in thousands)

Year	Informal Sector Earnings [b/]	Informal Sector Employment [c/]	Formal Sector Earnings	Formal Sector Employm.	Total Earnings	Total Employm.
1965	73	1,468	415	425	150	1,893
1970	73	1,591	465	590	179	2,181

Sources: a/ Tables 12 and 13.

b/ Assumes that informal sector productivity remained unchanged between 1965 and 1970.

c/ Employment Report, Table 2 (Stat. App.).

36. Multiplying the 1965 and 1970 marginal labor productivity data with the corresponding values of the employment/capital ratio one finds that labor's share in marginal output remained virtually constant over these five years at 0.15.[1/] Subtracting then the share of labor from the incremental capital/output ratio one obtains the marginal productivity of capital in domestic terms. Multiplication with the ratio of the SCF over the conversion factor for capital (0.83/0.90 = 0.92) yields the marginal productivity of capital in foreign currency terms. Table 15 summarizes the possible values, which fall into the range of 13.8% (for a low output/capital ratio) and 23.6% (for a high output/capital ratio).

Table 15: Alternative Values for the Marginal Productivity of Capital

$\frac{\Delta \text{ Output}}{\Delta \text{ Capital}}$	0.30	0.35	0.40
q	0.138	0.184	0.230

37. For the micro-economic estimation procedure two sources of information on the marginal productivity of capital are available: the interest rate structure in the country, and evidence on profits in Ivorian industry. Looking first at the interest rate structure, Table 16 presents various rates in force during 1973. This includes an estimate of the real interest rate, obtained by deducting the average rate of increase in the

1/ This leads to the interesting conclusion that the share of labor in total income remained virtually unchanged over the years, with increases in productivity being offset by a declining labor-capital ratio. One implication of this is that if one projects a constant share of labor, and a falling incremental output/capital ratio, one also has to project a falling q. Here it is assumed that all three are constant at the estimated values.

cost of living index over the years 1965 to 1972, which amounted to 3.5% p.a. (cf. Table 9). Since these rates are largely managed by central bank operations, they cannot be taken to reflect accurately the marginal returns to capital in the country. 1/ However, they may be used in connection with the data on Ivorian industry profits to obtain a more accurate picture of the value of the opportunity cost of capital.

Table 16: Lending Interest Rates in the Ivory Coast, 1973 (in %)

	Short Term	Medium term	Long Term
Discountable at BCEAO	7.5 - 9.5	7.25 - 8.25	7.5 - 9.25
Non-discountable at BCEAO	8 - 11	11	8.75-10.25
Real Rate (for 3.5% inflation)	5	4.5	5

Note: Although a seven-year average of inflation rates from 1965-1972, this approximately reflects the 1971 rate of increase in prices, which is to be used below in conjunction with 1971 profit data.

Source: Industry Report, p. 28, for nominal rates; the real rates are computed for discountable (risk free) loans.

38. Actual pre-tax profits on equity in 1971 ranged from -5.1% to 39.8% between 14 industrial sectors covering 114 firms (Industry Report (Pursell), C4, p. 21), with an average profit rate of 15.3%. Adding to this an average return on equity from royalties of 2.0%, a total average return on equity of 17.3% is obtained. But considering at Ivorian industry was financed to 48% by equity, 18% by long-term borrowing, and 34% by medium term borrowing, one can compute a weighted rate of return on all invested

1/ Cf. J. Schmedtje, "On Estimating the Economic Cost of Capital", IBRD Report No. EC-138, October 21, 1965.

Capital of 9.0%: $0.48 \times (17.3 - 3.5) + 0.18 \times 5.0 + 0.34 \times 4.5 = 9.0$. The value of 9% for the marginal productivity of capital (in domestic terms) is likely to represent an underestimate of the true value, since it may be argued that the average rate of return on equity is too low to be fully representative of the opportunity cost of capital in the Ivory Coast. The Industry Report points out that the average pre-tax returns on equity are depressed by the poor returns for some ventures, reflecting avoidable failures due to "lack of adequate project preparation, insufficient knowledge about the market and deficient management." (p. 32); industry may be one of the less profitable sectors in Ivory Coast (p. 33); and industrial investors' attitudes appear to imply a necessary expected minimum return of 20 to 30% if an investment is to be made (p. 3); but this of course must be deflated for high risk premia based on the expatriate's fear of potential changes in commercial policies, requiring him to plan for a short pay-back period. Finally, the 1970 Industry Report (Report No. AW-17a, Vol. III) states (p.11) that gross profits on equity between 15 and 30% are regarded as normal by the Ivorian government. This suggests that if one were to consider as the opportunity cost of equity finance the return on equity possible in the best alternative use of equity funds, a (nominal) rate of 25% may be regarded as quite possible. Using this rate together with the other interest rate figures inflation rates, and financing ratios above specified, one obtains a rate of return to capital of 12.7% (for 17% and 20% return on equity, the opportunity cost of capital is respectively 8.9% and 10.3%).[1/]

1/ The only factor in the opposite direction, i.e., tending to lower the value of the marginal productivity of capital, is the fact that before 1973 the interest rate structure was somewhat lower than shown in Table 14, due to lower discount rates of the regional central band (BCEAO).

39. Further information may be obtained from Bank financed projects and from past Bank estimates of the opportunity cost of capital. The following list summarizes the estimated internal economic rate of return for some recent Bank projects:

Cocoa I:	20 - 35%
Oil Palm II:	16 - 18%
Highway III:	15 - 30%
Highway IV:	16 - over 50%
Rubber I:	13.2%

Moreover, the region has generally used the range of 10 - 12% as an estimate for the opportunity cost of capital. Thus it does not seem unreasonable to conclude from the micro-data presented that the marginal productivity of capital falls within the range of 9-13%. For the purposes of our present analysis, this estimate however still has to be translated into border price terms by applying to it the ratio of the SCF over the conversion factor for capital. Table 17 shows the resulting values for q, given alternative values for the marginal productivity of capital in domestic terms:

Table 17: Alternative Values for the Marginal Productivity of Capital, q

Marginal Productivity of Capital, % (in domestic terms)	9	11	13
q (%)	8.3	10.1	12.0

40. From the micro-data the range of reasonable values for the marginal productivity thus seems to be between 8.3 and 12%, which differs substantially from the range obtained from the macro-economic estimation procedure. The reasons for this discrepancy lie probably mostly in the limitations of the

simple macro-formula used, which in particular omitted the returns to other factors of production and the increased productivity resulting from technological progress. Moreover, the difficulties in estimating reliable values for the macro-economic parameters, are such that not much confidence can be placed in the resulting values for q. It is therefore suggested, that primary reliance be placed on the estimates from micro-economic data and 10% be taken as the most probably central value.

Part III. Social Pricing Parameters

Value Judgements: The CRI, n, and ρ.

41. The consumption rate of interest is defined in the Annex Para. 23 as:

$$CRI = i = ng + \rho \qquad (6)$$

where n: elasticity of marginal utility with respect to consumption
g: growth rate of per capita consumption
ρ: rate of pure time preference.

This section will attempt to estimate the CRI and n, while ρ is determined as a residual (within reasonable limits). The estimation of n is based on the perceived value judgements of the Ivorian government regarding the trade-off between intra-temporal and intertemporal consumption groups, while the size of the CRI will be judged mainly on the basis of whether or not the government is oriented towards high economic growth. It is of course notoriously difficult to determine unequivocally a government's set of value judgements, partly because one has to separate word from deed, partly because one has to distinguish between policy priorities and actual policies as determined by numerous constraints under which the government operates in the application of its various economic policy instruments. An attempt is here made to go beyond general policy statements into an analysis of the priorities as exhibited in the detailed provision of the Ivorian national plan and other economic policy provisions, on the assumption that project selection may be used as an additional policy instrument to circumvent certain political structural, technical, and institutional constraints.

42. Looking at the government's intra-temporal, inter-personal value judgement, the fact that the Ivory Coast income tax is progressive, and that the government increased minimum wages in 1973 differentially and progressively for higher and lower wage categories, is evidence that n is at least greater than zero.[1/] The Ivorian 1971-1975 Five-Year Plan objectives and policies provide further information.[2/] Three objectives are explicitly stated in the Plan: a high economic growth rate, increased participation of Ivorians in the national economy, and what might be termed "social development". Stress on the first of these objectives represents a continuation of the past policy orientation in Ivory Coast, and from a closer inspection of the plan implementation policies it appears that growth presently retains the high priority it enjoyed in the past. The second objective of Ivorization has come to play a greater role in past years, while the third objective appears somewhat ambiguous in its intent and cannot necessarily be equated with a concern for improved income distribution. The Plan specifies a number of areas in which the third objective is to be realized: regional development policy, infrastructure development, housing, health, and education. These will be briefly considered in turn, to determine to what degree the redistribution objective is implicit in, or realized by, the programs envisaged in the Plan.

1/ A quantitative evaluation of the income tax and minimum wage legislation showed further that the value of n is likely to be no larger than unity, and probably smaller; see Linn, pp. 19 ff. However, the data base makes these estimates very unreliable, and more importantly, conceptual difficulties abound in the attempt to view the existing tax and minimum wage structure as a reflection of the government's current distribution weighting system.

2/ See Ivory Coast, Five Year Plan for Social, Economic, and Cultural Development, 1971-75, Abridged Edition.

43. Looking at regional decentralization, the main question is whether the government's regional development program, which is designed to help hitherto stagnating regions of the country, is indeed a reflection of the distribution objective, or rather an extension of the growth objective, considering that a planned development of the outlying provinces may actually maximize growth due to structural conditions and externalities. Favorable distribution effects may or may not occur following their growth strategy. With regard to the major development projects underway in the outlying regions, as e.g., Kossou Dam, San Pedro Port, etc., the growth objective was probably the major reason for these programs, while in the case of the price support schemes for cotton growers in the North, or small holder components in agricultural projects, the distribution objective may have played a major role. Furthermore, the emphasis on regional development policy in Ivory Coast must not be overstated. The Employment Report notes (p. 45) that "on a per rural worker basis, investment in agriculture in the south was eight times higher than in all other regions." In summary, the regional development program of the Ivorian Government is limited in scope and may well be the result of growth maximisation, instead of income redistribution objectives.

44. Activities in the other policy areas (infrastructure development, housing, health, and education), for which the Five Year Plan and the associated investment programs (Loi-Programme des Investissements Publics, 1971-73, 1973-75) show an increasing share in total expenditures, do not necessarily reflect a strong redistribution priority either. The infrastructure development program for small communities, especially the water supply

projects, have probably the most unequivocally redistributive impact, while for instance the program in Abidjan does not specify where the infrastructure works are to take place within the city, and who as a result will benefit. Similarly, in the case of health expenditures, for which a growing share in expenditure is earmarked, no provisions can be found in the plan which would ensure that they will be aimed at the most needy. On the contrary, equal weight appears to be given to rich and poor. In the case of education, primary education receives a relatively small share of the planned expenditure increases. This may be desirable from the growth maximisation point of view, since there exist bottlenecks of trained technical personnel in Ivory Coast, but there can be little doubt that it is primary education which is most needed by the poorer segments of the population. Finally, the housing policy although ostensibly aimed to provide low cost housing, at best appears to have left unchanged the welfare of the urban poor. The slum eradication program in Abidjan, which consisted of large scale leveling of slums, resettled on average only 20% of the displaced (Employment Report, Annex B, p. 5) and most frequently replaced the shacks with rental units too expensive for the urban poor (Employment Report, Annex C, p. 4). Similarly, there can be little doubt that the housing policy of SICOGI has benefitted the richer segments of the population, and in particular the government and civil servant class, which among the Ivorian nationals must be counted as one of the upper income groups. Finally, the Master Plan of Abidjan hardly touches on the question of housing needs for the poorest sections of the city, and the two most prominent development projects (Riviera, and a road development program) most likely have a regressive impact. In summary,

it may be questioned whether the government objectives and policies are designed to change the traditional policies where the "fortunate few"[1/] were the main beneficiaries not only of education, but also infrastructure, health, and housing development.

45. In general, the 1971-75 Plan did not specify the nature of the individual projects and the likely beneficiaries, which leads one to the conclusion, as expressed in the Employment Report (p. 45), that "past investment allocations in the Ivory Coast can be said to have been based primarily on increasing output and incomes in the aggregate, although important regional and agricultural efforts have been made as the authorities have become aware of the growing disparities in income between groups and areas". This growing awareness may indeed by spreading among Ivorian policy makers, but with the continued strategy of maximal growth, there are strong constraints placed on the attempts to introduce more social and redistributive measures into the development efforts.[2/]

46. In view of these quantitative and qualitative considerations a reasonable interpretation of the Ivorian government objective function puts the value of n between 0.5 and 1.0, and probably closer to 0.5; and suggests a low CRI in the range of 5% to 7.5%, and probably closer to 5%. Given an estimate of the growth rate of per capita consumption (g), the value for the rate of pure time preference (ρ) is then implicit (in equation 6). One can estimate the per capita consumption growth rate for the Ivory Coast from three sources: First, averaging past growth experience, it is found that g was

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1/ See the book of R. Clignet and P. Foster with the same title, "The Fortunate Few", Northwestern University Press, 1966.

2/ See, for example, R. E. Stryker, :Local Perspective on the Development Strategy in the Ivory Coast", in M. Lofchie, ed., State of the Nations: Power Structure in Independent Africa.

3.9% p.a. between 1967 and 1972 (cf. Table 18). Second, the CPP projections for Ivory Coast GNP and domestic savings growth indicate a projected growth in consumption of 3.3% p.a.; finally, from the 1971-75 Plan projections, an average annual growth in per capita consumption of 4.2% p.a. may be derived. We have adopted here the low CPP value of 3.3%, especially considering that the impact of the oil crisis will probably further dampen the growth performance of the Ivory Coast.

47. This leads us to retain the following combinations of value judgements for further consideration:

Case 1: CRI = 5.0% and n = 0.5, and ρ = 3.4%

Case 2: CRI = 7.5%, and n = 1.0, and ρ = 4.2% 1/

From the evidence reviewed in para. 42 to 45 it appears that the value judgements of the Ivorian government are more closely represented by Case 1. However, both cases will be carried through the remainder of this study in order to test the sensitivity of further results to variations in the value judgements.

1/ Somewhat higher estimates of ρ have been derived from private sector consumption and savings choices. But it is not clear whether a government or the Bank would be well advised to follow individual time preferences as a guideline. Presumably, private pure time preference derives from generalized risks facing the individual, e.g. death, political instability, etc. For society as a whole some of these risks do not apply, in the sense that society as such does not cease existence except under very extreme and unlikely circumstances. On the other hand, different political systems may result in different rates of time prefenence for the policy maker in line with his dependence on popular support.

Table 18: Growth in Real Per Capita Consumption, 1967-1972

	1967	1968	1969	1970	1971	1972	5-Year Average
Private Consumption (CFAF bill) a/	178.7	200.9	210.4	236.2	261.5	283.0	
Public Cons. (CFAF bill) a/	38.8	42.8	53.4	63.5	74.6	85.3	
Total Cons. (CFAF bill)	217.5	243.7	263.8	299.7	336.1	368.3	
Population (thousand) b/	4,586.0	4,738.0	4,890.0	5,065.0	5,232.0	5,405.0	
Per Capita Cons. (CFAF)	47,427.0	51,435.0	53,947.0	59,171.0	64,239.0	68,141.0	
Price Index (1960=100) c/	124.6	131.4	137.1	148.9	147.7	148.2	
Real Per Capita Cons. (1960 CFAF)	38,063	39,144.0	39,349.0	39,739.0	43,493.0	45,979.0	
Change in Real P.C. Cons. (1960 CFAF)		1,081.0	205.0	390.0	3,754.0	2,486.0	
Growth in Real P.C. Cons. (%)		2.8	0.5	1.0	9.5	5.7	3.9

Sources: a/ CESP, Table 2.2

b/ CESP, Table 1.1

c/ CESP, Table 9.1, using the cost of living index for Africans.

The Consumption Distribution Weight, d

48. The consumption distribution weight, d, for a particular beneficiary group will usually have to be estimated in the specific project context where non-marginal changes in consumption are the rule (see the Annex, paras. 19, 20, and Appendix I, para. 7). Only in those cases where it may be assumed that the project results in marginal consumption changes for people with comparable levels of per capita consumption, can the marginal consumption distribution weight be applied (see the Annex, paras. 17 and 18). Table 19 shows the average per capita consumption levels for five percentile groups of the population in Ivory Coast and the associated values of the marginal consumption weight.

The Summary Distribution Measure

49. The summary distribution measure which is to be applied to minor or non-attributable benefits is defined in Appendix I, para.9 as:

$$D = \frac{\sigma^{n}(\sigma - 1)^{1-n}}{(n + \sigma - 1)}$$

where Gini coefficient = $1/(2\sigma - 1)$ (Appendix II, para. 8).
A value of 0.43 for the Gini coefficient was computed by the DRC[1/] for Ivorian income distribution (1959 data; national coverage). For the South-East Region household expenditure survey data were used here to compute the Gini coefficient according to he formula:

$$\text{Gini coefficient} = 1 - \sum_{i=0}^{m-1} (f_{i+1} - f_i)(Y_i + Y_{i+1})$$

1/ See Jain and Tiemann.

Table 19: Regional Consumption Distribution Weights, d, in Ivory Coast

Population Percentile (%)	Percentage of Total Consumption 1/ (%)	Average Per Capita Consumption in Percentile Group (CFAF) 2/	Marginal Distribution Weights 3/ n = 0.5	n = 1.0
0 - 20	7.5	25,553	1.63	2.67
21 - 40	12.0	40,884	1.29	1.67
41 - 60	15.0	51,106	1.15	1.33
61 - 80	25.0	85,179	0.89	0.80
81 - 100	40.5	137,985	0.70	0.49
Total Population	100.0	68,141		

Note: 1/ This column is derived from S. Jain and A. E. Tiemann, "Size Distribution of Income Compilation of Data", DRC Discussion Paper No. 4, August 1973, by slightly increasing the percentages for the lower income groups and reducing those for higher income groups. This was necessary since we assume here that the Gini coefficient of consumption distribution is 0.40, while Jain and Tiemann have estimated a Gini coefficient of income distribution equal to 0.43 (see below, para. 49).

2/ This column is derived by dividing the proportion in total consumption (CFAF 368.3 billion) of a particular income group by the proportion in total population (5,405 thousand) of the same group.

3/ The distribution weights are derived by applying the formula $d = (\bar{c}/c)^n$, where $\bar{c}$ is the national average per capita income level (CFAF 68,141) and c is the average per capita income level in the particular percentile group (See Appendix I, equation 10).

where f_i is the cumulative population share of the i^{th} observation;

y_i is the cumulative expenditure share of the i^{th} observation; and

m is the number of observations.[1/]

Table 20 summarizes the cumulative distribution data used in this computation. The value of the Gini coefficient corresponding to it is 0.35.

Table 20: Distribution of Household Expenditure in the South-East Region, 1963-1964

Total Annual Expenditure per Person (CFAF)	Cumulative Population Shares (f_i) (%)	Cumulative Expenditure Shares (y_i) (%)
0 - 14,999	11.1	3.6
15,000 - 19,999	30.4	13.7
20,000 - 24,999	44.4	22.4
25,000 - 29,999	57.4	32.6
30,000 - 34,999	71.9	46.4
35,000 - 39,999	77.9	53.1
40,000 - 49,999	87.3	65.5
50,000 - 69,999	94.7	79.0
70,000 and over	100.0	100.0

Source: SEDES, op.cit., p. 33

1/ Taken from Jain and Tiemann, p. ii.

50. The value of 0.40 for the Gini coefficient is used in the derivation of D, on the grounds that on the one hand national consumption expenditures are likely to be less equally distributed than the expenditure of the rural population of the South-East Region, while on the other hand, the national consumption distribution is likely to be more equal than the income distribution, and thus the value of 0.43 is too high. Using the value of 0.40 for the Gini coefficient one can compute D from the formula in para. 49: for n = 0.5, D = 0.91 and for n = 1.0, D = 1.0.

The Value of Public Income, v

51. The value of public income is estimated in terms of the consumption stream generated by a unit of public investment, assuming optimal allocation of public funds. The plausibility of the resulting estimates are then checked by relating them to estimates of the critical consumption level (CCL), i.e., that level where the government judges private consumption as valuable as public income (see Annex, paras. 22 to 25).

52. Consider first the estimation of the value of public investment. When neglecting reinvestment of the returns to the public sector, the value of public income and investment may be determined by use of the simple formula presented in the Annex, equation 14:

$$v = q/\beta i \qquad (8)$$

Using equation (8) for different combinations of values for q and i, with $\beta = 0.84$ throughout, corresponding values can be estimated for v (Table 21). If one lets the range of CRI = i be 5% to 7.5%, and lets the range of q be

8% to 12%, then the possible values of v fall between 1.27 and 2.86, implying a premium on public income over average private consumption ranging from 27% to 186%. For the central value of q = 10%, v = 2.38 with i = 5%, and v = 1.59 with i = 7.5%.

Table 21: Value of Public Income: Simple Case
$v = q/\beta i$; $\beta = 0.84$

q % \ i%	5	7.5
8	1.90	1.27
10	2.38	1.59
12	2.86	1.90

53. In the more complex case, where it is assumed that the government and the private sector save and reinvest some of the returns from public investment, the value of public income (investment) may be estimated by using equation (2) in the Appendix II:

$$v = \frac{q - sq}{i - sq} \quad \frac{1}{\beta} \qquad (9)$$

where (1-s) is defined as the portion of q diverted to private consumption. 1/

1/ Note that equations (8) and (9) are based on the following assumptions: public income, public investment, and private savings are all equally valuable; all consumption benefits accrue to the man at the average consumption level; and all parameters remain constant over time.

The value of (1-s) may be approximated by estimating the private sector marginal propensity to consume out of total GDP, using historical data, CPP projections, and Five-Year Plan estimates. Table 22 presents the historical data, which show an average value for (1-s) of 0.57 for the last seven years; for the last three years it lay at a higher average value of 0.65. The CPP

Table 22: Private Sector Marginal Propensity to Consume 1965-1972 (CFAF bill)

Year	GDP	ΔGNP	Private Consumption	ΔCons.	$\frac{\Delta Cons.}{\Delta GDP}$
1965	236.8		153.7		
1966	257.3	20.5	163.0	9.3	0.45
1967	274.4	17.1	178.7	15.7	0.92
1968	325.1	50.7	200.9	22.2	0.44
1969	364.0	38.9	210.4	9.5	0.24
1970	414.0	50.0	236.2	26.0	0.52
1971	445.1	31.1	261.5	25.3	0.81
1972	480.0	34.9	283.0	21.5	0.62
7 year average					0.57
last 3 year average					0.65

Source: CESP, Tables 2.1, 2.2

projections in turn provide a lower estimate of 0.55; while Plan data suggest that (1-s) = 0.63. An intermediate value of 0.60 is here chosen for further estimation uses, which implies that s = 0.40. This value probably represents

a low estimate of the true value of s, since public investment is likely to generate on average higher public income and other investment activity, given that the financial profits from public investment accrue directly to the public sector (c.f. Appendix II, para. 20). As a result, the following estimates of v may be on the low side as well, since q > i.[1/]

54. The value of public income may then be estimated using the values of s = 0.40, and β = 0.84. Table 23 summarizes the values for v given alternative assumptions concerning q and i. For low values of i and high values of q, v becomes unrealistically large, and even for the central

Table 23: Value of Public Income: With Reinvestment

$$v = \frac{q - sq}{i - sq} \cdot \frac{1}{\beta}$$

β = 0.84
s 0.40

q % \ i %	5	7.5
8	3.09	1.31
10	7.10	2.03
12	35.50	3.09

value of q = 10% and i = 5%, the premium on public income amounts to 610%. For lower values of q, and/or higher values of i more acceptable results are obtained, e.g., a premium of 209% for i = 5% and q = 8%, and a premium of 31% for i = 7.5% and q = 8%.

1/ Ideally one should cross check the macro-economic estimate with its micro economic counterpart, as described in Appendix II, para. 21. This was not possible given the available time and resources.

55. The low estimate of s notwithstanding, equation (9) probably overestimates the true value of v for two main reasons. First, the formula assumes that all the parameters remain unchanged over time (see Appendix II, para. 10). But second, and possibly more important, contrary to what has been assumed here, public investment and consumption may not be equally valuable. In Ivory Coast it appears that the government is constrained in its use of public funds, and finds itself forced to divert more of its funds to current expenditures (in particular civil servant salaries, etc.) than is thought optimal. This is witnessed by its stated desire to reduce the rate of growth in civil servant employment and salaries, and to increase the savings component of the (semi-) autonomous public enterprises.[1/] Moreover, the Ivorian tax laws specify certain business profit tax remissions, if profits are reinvested in Ivory Coast.[2/] This and the explicit policy that public investments are to be increased[3/] indicates that the government cannot at present obtain all the public investment it desires. Thus the value of public income (which must be viewed as being the weighted average of the values of public capital and current expenditures) must be below the value of public investment estimated here. If these considerations are taken into account, it appears reasonable to expect that the value of public income actually comes closer to the value estimated by the simple method first explored. However, before accepting this conclusion, given the uncertainty about the value of public income as derived from macro-economic data, one must first cross-check the plausibility of these results by relating them to estimates

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1/ CESP, pp. 11 ff; CPP, p. 6.

2/ Industry Report (Pursell), pp. 32 ff.

3/ Ivory Coast, Five Year Plan 1971-75, p. 10.

of the critical consumption level.

56. As a first step in the determination of the critical consumption level (CCL) it will be useful to define the available information on the relationship between per capita consumption and population percentiles. It is possible to derive point estimates of population percentiles and their associated per capita consumption level by using the average consumption value for percentile population ranges found in Table 19 to approximate graphically a smooth function relating population percentiles to per capita consumption (see Figure 1). For example, 40% of the population have a consumption of less than CFAF 46,000 per head.

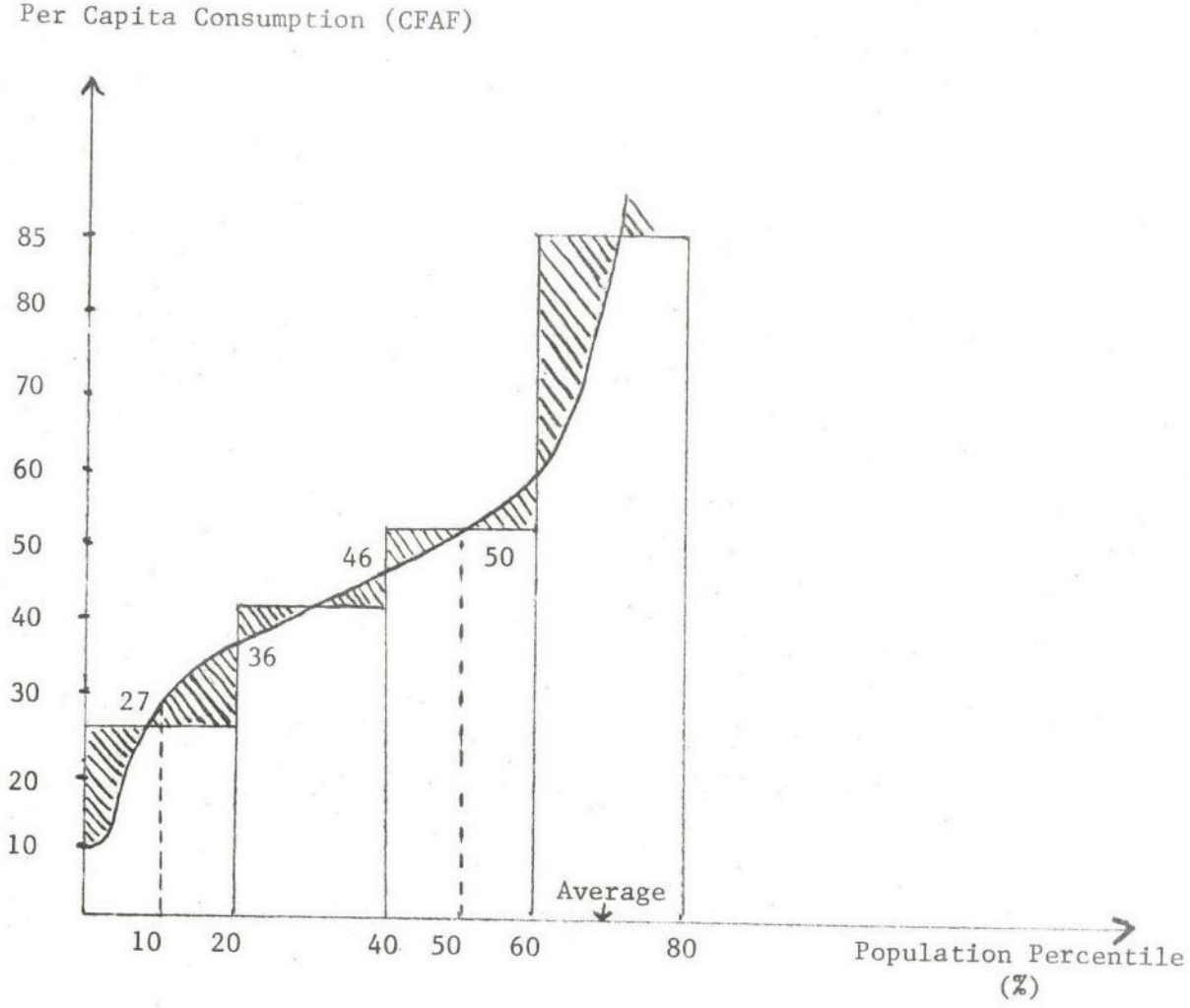
57. As a second step one can derive alternative values of public income (v), associated with assumptions concerning the critical consumption level. Table 24 shows different population percentiles and their associated per capita consumption level, as read off from Figure 1. Assuming that the CCL is set alternatively at each of these consumption levels one can compute the implied value of public income (v) from the condition that at the critical consumption level $d = v\beta = (C/C_i^*)^n$, where C_i^* denotes the CCL at the i^{th} percentile.

Table 24: Value of Public Income (v) Given Different Critical Consumption Levels

Population Percentile	C^* (CFAF)	$\bar{C}/C^*$	Value of Public Income (v) (n = 0.5)	(n = 1.0)
At Subsistence (approx. 0-1st. %ile)	10,000	6.81	2.85	8.11
At Average of 0-20th %ile	25,553	2.67	1.78	3.15
At 10th %ile	27,000	2.52	1.73	3.00
At 20th %ile	36,000	1.89	1.50	2.25
At 40th %ile	46,000	1.48	1.33	1.76
At 50th %ile	50,000	1.36	1.27	1.62

Figure 1

The Consumption Distribution Function in the Ivory Coast



Note: The height of the bars indicates the average per capita consumption level for the population percentile range, as read off from Table 19. The smooth function was then derived by hand, by approximatedly making the shaded area above the curve equal to the shaded area below the curve for each percentile range. This derivation procedure is very rough, and should only be used where detailed information on consumption (income) distribution by small percentile ranges is not available. It was moreover assumed that the subsistence consumption level lies at CFAF 10,000 per annum. This is substantially below the urban minimum of 36,000 assumed by H. Joshi ("Migration and Urban Employment Problems: a Study of the Ivory Coast", Institute of Economics and Statistics, Oxford University, March 1973, mimeo, p. 36); but note that per capita income in the Savannah region of the Ivory Coast as estimated in the Ecmployment Report (p. 32) is CFAF 3400, which however must be without non-marketed income. Average per capita income in Ivorian agriculture is about CFAF 28,000 (computed from Employment Report, p. 29).

58. Next, one may derive the CCLs implied by the values of v previously computed from the public investment approach (see paras. 52 to 54). Table 25 shows the various central values of v, given different assumptions concerning value judgements and degree of reinvestment of returns from public projects. The corresponding CCLs are computed from the equation

$$C^* = (v\beta)^{-1/n} C$$

and the population percentile levels can be read off from Figure 1, given these CCLs.

Table 25: Critical Consumption Levels Implied by Alternative Values of v (as estimated from the value of Public Investment) 1/

		v	C^*	%ile
No Reinvestment	Case 1 (n = 0.5, i = 5.0%)	2.38	17,207	4
	Case 2 (n = 1.0, i = 7.5%)	1.59	50,851	52
Reinvestment	Case 1 (n = 0.5, i = 5.0%)	7.10	1,918 2/	0
	Case 2 (n = 1.0, i = 7.5%)	2.03	39,849	25

Note: 1/ Assuming q = 10%.

2/ This consumption level is far below the subsistence level of CFAF 10,000

59. Finally, one has to assess whether the Ivorian government gives any consumption subsidies; if so, at what consumption groups they are directed; and what this implies for the critical consumption level and therefore for

the value of public income. It was found that in the Ivory Coast general consumption subsidies are not frequently used; however, in the budget of the national government some transfers are recorded under the heading of "Assistance and Subventions", comprising such items as "Help for the Needey", payments to orphanages, etc.[1/] These payments may be assumed to approximate consumption subsidies, and they appear to be directed mainly at beneficiaries at or near the subsistence level.[2/] Considering this information one can return to Tables 24 and 25, where one finds that for Case 1 and a CCL near the subsistence level compatible results are obtained in both tables, provided the case without reinvestment is chosen. Specifically, with a CCL at subsistence (CFAF 10,000) a value of v of 2.85 is obtained, while the value of v = 2.38 as derived from the public investment formula without reinvestment is associated with a CCL of CFAF 17,207 falling on the 4th percentile level. These two sets of values are close enough to allow a reasonable consolidation to an intermediate value of v 2.5 implying a CCL of CFAF of 15,414 falling at about the 3rd percentile level. No similarly compatible results are obtained for any other combination of assumptions concerning value judgements, and public investment formulae given a CCL at or near the subsistence level. For instance, assuming no reinvestment, but Case 2 value judgements, one finds a value for v in Table 24 far above that in Table 25, and a CCL in Table 25 which is far above the subsistence level. Similarly, if Case 2 assumptions and the reinvestment case are combined, a level of the CCL is obtained from Table 25 which does not match the assumption that the CCL in the Ivory Coast is at or near the subsistence level. These results strengthen the previous

1/ Direction des Budgets et Comptes, Budget General de Fonctionnement, Gestion 1973 p. V-3, "Depenses d'assistance et subventions diverses".

2/ This matches the results in paras. 42 to 45, where it was found that the Ivorian government gives a low priority to an equitable income distribution. Ceteris paribus this also implies a low CCL.

conclusions that Case 1 value judgement assumptions more closely reflect the Ivorian government's attitudes.

60. In summary, one finds that Case 1 value judgements and a value of v = 2.5 best reflect the Ivorian conditions, although they are likely to represent a lower bound on the values of n and i, and an upper bound on the value of v. For the purposes of sensitivity analysis Case 2 value judgements will continue to be considered and it is further assumed that they are associated with a value of v = 1.7, which implies a CCL of CFAF 47,987 falling on about the 45th percentile. For this combination of parameter values Tables 24 and 25 show compatible results, when v is estimated in Table 25 by assuming no reinvestment. Case 2 can safely be assumed to use upper bound values for n and i, and a lower bound value for v. Table 26 summarizes the parameter values for Case 1 and Case 2 as used in the remainder of this appendix.

Table 26: Value of Public Income: Consolidated Results

	i%	n	v
Case 1	5.0	0.5	2.5
Case 2	7.5	1.0	1.7

61. In conclusion of this estimation effort it can be said that the combination of parameter values for Case 1 may be accepted with a substantial

degree of confidence,[1] although some caveats regarding their reliability are in order. The first relates to the quality of data and general information available, which was very limited at every turn. The second, and perhaps more important, caveat relates to the fact that governments, including the Ivorian government, hardly seem consistent agents when measured against the rigorous framework of the present methodology. For instance tax exemptions for relatively high levels of incomes and consumption subsidies to government employees, treated in isolation, might be interpreted to imply very different policy parameters than here derived.[2] Thus there remains some uncertainty about the value of public income in particular; however, taken together the parameters associated with Case 1 appear to reflect a consistent evaluation of the Ivorian government's objectives.

The Accounting Rate of Interest, ARI

62. The accounting rate of interest is defined in Appendix II, equation (6) as

$$ARI = sq + (1-s)q/v\beta \qquad (10)$$

Table 26a shows the alternative values for ARI computed from equation (10) for the two cases of v derived in the previous section. Different values were also tested for s and q.

1/ For the DRC Ivory Coast model, L. Goreux reports shadow prices on public funds and additional investments of 20 to 70%. Although somewhat lower than the here derived results, they are of the same general magnitude Note that the DRC model concentrates on evaluating the effects of alternative savings constraints and considers income distribution only in its inter-regional aspects.

2/ For greater detail on these issues, see Linn, pp. 63, 64.

Table 26a: The Accounting Rate of Interest for Different Values of v, s, and q

	v	ARI(%) for q=10%			ARI(%) for s=0.5		
		s=0.4	s=0.5	s=0.6	q=8%	q=10%	q=12%
Case 1	2.5	6.9	7.4	7.9	5.9	7.4	8.9
Case 2	1.7	8.2	8.5	8.8	6.8	8.5	10.2

Taking the central value of q=10%, the minimum likely value for ARI is 6.9% in Case 1 and 8.2% in Case 2; the upper bound on ARI is q itself (see Appendix II, para. 23). Considering that s=0.4 is a low estimate, s=0.5 was taken to approximate the value of s for the marginally-acceptable project, whose internal social rate of return equals the ARI. Testing the effect on the ARI of switching to the higher and lower bound of q, [1/] given s=0.5, one finds that with q=8%, ARI=5.9% for Case 1 and ARI=6.8% for Case 2. When q=12%, the corresponding values for ARI are higher, viz. 8.9% and 10.2% respectively. The intermediate values of the ARI for q=10% will be taken as the baseline of comparison during the rest of this appendix; i.e., ARI=7.4% for Case 1, and ARI=8.5% for Case 2.

1/ Changing q also implies changing v, if the public investment approach is chosen; cf. above para.52. However, for the present purposes it is assumed that the critical consumption level estimates of v continue to apply, even as q changes.

Part IV. The Shadow Wage Rate, SWR

63. In most general terms the SWR may be defined following equation (2) of the Annex as

$$\text{Social Price} = \text{Efficiency Price} + C(\beta - \omega) \qquad (11)$$

where β indicates foreign exchange cost and ω indicates the social benefit of the increased consumption, C. In this part we will derive the SWR for four types of labor in the Ivory Coast: Ivorian labor, excluding the urban unskilled, but including all rural Ivorian labor; urban unskilled labor; non-Ivorian rural African labor; and non-African expatriate labor. The Ivorian economy is sufficiently large, and the labor market sufficiently heterogeneous, to warrant this disaggregation for the purpose of estimating the SWR.

Ivorian Labor (Excluding Urban Unskilled)

64. In general, it may be assumed that all Ivorian labor is fully employed year-round. The only exception are the urban unskilled, which are discussed separately. Given this full employment assumption, the output foregone elsewhere may be assumed to equal the wage paid to the worker in his new position, i.e., he is drawn from a comparable employment sector. The SWR there equals the efficiency price since there is no increase in consumption resulting from the new job:

$$\text{SWR} = \text{Efficiency Price} = \alpha w \qquad (12)$$

where α is the accounting ratio used to obtain the border value of the foregone output. For the purpose of the project analysis in Part IV below we assume that the accounting ratio α equals the SCF, and therefore

$$\text{SWR}/w = \text{SCF} = 0.83. \qquad (13)$$

This result is subject to a number of limitations: First, although the conditon of full employment may be justified in general, rural labor requirements in certain areas of the country are subject to seasonal fluctuations; where this is the case, shadow pricing of labor may have to allow for this.[1/] Second, there is evidence that wages in the modern private and in the public sector are above marginal product (Employment Report, p. 7), which would imply that the use of w as a proxy for output forgone in the employment of labor in these sectors leads to an upward bias on the efficiency price component. Finally, it is possible that labor employed in the industrial sector is drawn from lower productivity rural employment, in which case again the use of w in the context of industrial projects would not be justified. If any one of the factors applies, it is likely that not only the efficiency price component changes, but that there is also a consumption change associated with the added employment, which must be taken into account in the computation of the social price of labor.

Urban Unskilled Labor

65. The urban unskilled labor market in LDCs typically involves high unemployment and high rural-urban migration rates, which are generally taken to be caused by a persistent gap in the real income levels between urban and rural inhabitants. However, other factors also play a role, such as the maximisation motive of the rural laborer, the urban labor market structure, the financing of the urban unemployed, and finally the absorbtive capacity of

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1/ For an example of shadow pricing seasonal rural labor, see S. Ettinger, "The Opportunity Coast of Rural Labor in Parts of Nigeria", April 1973, mimeo.

the city population in the case where the unemployed are financed by their urban receptors. Numerous alternative migration models may be formulated and applied to the determination of the SWR for urban unskilled labor;[1/] their degree of acceptability will vary depending on the particular socio-economic conditions. One characteristic common to many of these models is that they imply a constant rate of urban unemployment, which in turn implies that the migration response, M, i.e., the number of migrants who will come to the city as one additional job is created, can be expressed as the ratio of total urban labor force, L, to total urban employment, N:

$$M = L/N \quad [2/] \qquad (14)$$

66. Assuming a migration effect of an added urban job as specified in equation (14), consider SWR for urban unskilled labor. If wage earners do not save and their disutility of effort is valued at zero, the SWR is given by equation (19) of the Annex:

$$SWR = m + (w-m)(\beta - d/v), \qquad (15)$$

where m is the output foregone. In the present context the efficiency price component in equation (19) has to be modified to allow for the fact that with an added job in the city M migrants are attracted, reducing agricultural product by αmM, where α is the conversion factor for the foregone output;

1/ For a discussion of a number of alternative models cf. D. Mazumdar, "The Rural-Urban Wage Gap, Migration, and the Shadow Wage", draft, IBRD, undated mimeo; for an extension of Maxumdar's framework and application to the Ivorian setting, see Linn, pp. 68 ff. the present discussion represents a condensation of some of the discussions in the latter source.

2/ See Mazumdar, pp. 9 ff., and Linn, pp. 70 ff.

and the consumption component must be adjusted to allow for the changes in consumption induced by the job creation and resulting migration for each income group affected. Assuming that the consumption conversion factors for all consumption groups are identical, one can then write the entire SWR formula as follows:

$$SWR = \alpha mM + \sum_i \Delta C_i (\beta - d_i/v) \qquad (16)$$

where ΔC_i is the change in consumption of the i^{th} consumer group, and $(\beta - \frac{d_i}{v})$ the corresponding weight.

67. The remaining step is to specify carefully the changes in consumption resulting from employment and migration. For this purpose it is necessary to use a particular model context, since the consumption effects will depend on who finances the urban unemployed and to what extent. In Ivory Coast, available evidence on migration motivation, migration flows, and reception practices support the use of a model which assumes that the unemployed rural-urban migrants are financed by their urban receptors who share their incomes, y_c, equally with the new arrivals; however, they will accept immigrants only as long as the expected net change in urban incomes resulting from migration is non-negative. Three consumer groups may then be distinguished: First the existing urban population experiences a change in consumption (income), to be weighted by $(\beta - d_1/v)$, amounting to $(w - My_c)$, i.e., the wage earned in the new job, w, minus the consumption of the immigrants, My_c. Second, each of the M migrant experiences a discreet increase in consumption from y_a, the average agricultural consumption to y_c, weighted by $(\beta - d_2/v)$. Finally, the remaining rural population experiences a change in per capita consumption,

weighted by $(\beta - d_3/v)$, i.e., the consumption of the migrant minus his marginal product lost, multiplied by the number of migrants, M. The three consumption effects can then be added up with their appropriate weights, resulting in the following equation for the SWR, considering also the efficiency price of labor.[1/]

$$SWR = \alpha mM + (w - My_c)(\beta - \frac{d_1}{v}) - M(y_a - y_c)(\beta - \frac{d_2}{v}) + M(y_a - m)(\beta - \frac{d_3}{v}) \quad (17)$$

68. In order to estimate the urban SWR, so specified, the parameters were derived from the limited amount of data available in a desk study. Table 28 presents the data base, as drawn from the Employment Report, which emphasizes deficiencies in their reliability. The resulting estimates of the SWR, summarized in Table 27, should be considered as indicative only.

Table 27: SWR for Urban Unskilled Labor (CFAF thousand)

		Efficiency Price	Social Price	M
Case 1	SWR	49.4	96.4)	
	(SWR/w)	(0.31)	(0.60)	
			)	1.19
Case 2	SWR	49.4	95.0)	
	(SWR/w)	(0.31)	(0.59))	

1/ It is useful to cross-check the correct specification of the consumption change by ensuring that the unweighted elements of the change in consumption collapse into the aggregate consumption change (w-mM). Note also that when using the marginal distribution weights it is assumed that the changes in consumption are spread equally over the rural and urban populations respectively. An alternative approach would assume that the consumption gain or loss is restricted to a particular family unit, in which case one would have to estimate the average number of members per urban and rural family, and then distribute the consumption changes on a per capita basis per family. In that case discrete distribution weights would have to be used.

Table 28: Data for the Computation of SWR

m = 50,000 CFAF p.a.; derived as 250 x 200 CFAF, the daily average wage in agriculture for field work; from Employment Report, p. 28; average product in agriculture is about 67,000 CFAF, i.e., larger than, and therefore consistent consistent with the value of m (estimated from ibid., p. 29)

w = 160,000 CFAF p.a.; this is the average wage for non-Ivorian African labor in construction, i.e., reflects the wage of unskilled and semi-skilled labor; from ibid., Appendix A, Table A 11; 1970 data

δ = 0.07 (i.e. 7%); annual compound rate of growth 1965-70 for Abidjan; from ibid., p. 11

y_c = 60,000 CFAF p.a.; interpolation of urban per capita incomes in Abidjan and the Center, 1965; from ibid., Stat. App., Table 9; this may underestimate the per capita income in the urban sector in 1970, due to inflation and real income growth

y_a = 20,000 CFAF p.a.; interpolation of rural per capita GDP in Center and North; ibid., Stat. App., Table 9; this also may underestimate 1970 incomes for the same reasons cited for y_c

U = 80,000 (1965); = 140,000 (1970); urban unemployment; ibid., Stat.App.Table 1

L = 363,640 (1965); = 519,520 (1970); urban labor force; ibid., Stat.App. Table 1

N = 283,640 (1965); = 379,520 (1970); urban employment; ibid., Stat.App. Table 1

B = 0.84

α = SCF = 0.83

Distribution Weights:	n = 0.5	n = 1.0
d : Marginally evaluated at y_c	1.07	1.14
d : For discrete change from y_a to y_c	1.37	1.87
d : Marginally evaluated at y_a	1.85	3.41
v :	2.5	1.7

Note: No allowance has been made for general price level differences between rural and urban sectors due to the absence of data (noted also in the Employment Report).

Two comments are in order concerning these results. First, in this migration model the overall consumption effect raises the social cost of additional urban employment above its efficiency cost. Second, it is accidental that the two cases with different distribution parameters should have roughly equal social SWRs; offsetting factors do not necessarily always cancel out, as in this case. 1/

69. Some limitations of this analysis of the SWR of urban unskilled labor should be noted. On the empirical level, differentials in the cost-of-living between urban and rural sectors and migration costs have been neglected; the assumption of equal sharing of income among rural and urban families is probably extreme, although fairly realistic in Ivory Coast (cf. Employment Report, p. 39). Finally, the data probably have to be adjusted to be appropriate for a particular project appraisal. On the methodological side, the limitations of all narrow income maximisation approach to migration are well established; and furthermore, in the case of Ivory Coast, the fact that urban migration involves both Ivorians and non-Ivorians must not be neglected. Strictly speaking, the above analysis only applies to Ivorian rural-urban migrants, but could be extended to incorporate foreign migration.

Non-Ivorian Rural African Labor

70. The SWR of non-Ivorian African Labor drawn into rural employment in Ivory Coast depends on which of two possible policy alternatives is adopted, viz. a "regional" policy on a "national" policy. The former assumes that the decision maker tries to maximize welfare in the region as a whole (i.e.,

1/ See Linn, p. 85 for cases where the sensitivity of the SWR with respect to changes in v and n was significantly greater.

including Mali and Upper Volta) through his employment policy; while the latter assumes that the decision maker is primarily, if not exclusively, concerned with the welfare of Ivorian nationals.

71. If the regional policy is chosen, the consumption costs (and benefits) to the whole region resulting from additional employment in Ivory Coast, must be allowed for in the SWR. For this purpose two groups should be considered: First, the migrants drawn from the neighboring countries (where the marginal product of labor amounts to only about 40% of the wage paid in rural Ivory Coast)[1/] increase their earnings, but remit on average 40% of their income to their families abroad (Employment Report, p. 67). The migrant therefore increases his consumption by the difference between his retained wage (60% of the wage received) and his consumption before he migrated, which is here assumed to equal per capita income in a rural family in Mali or Upper Volta. Second, the migrants' families remaining behind face a change in consumption, consisting of the increase due to the remittances from the migrants, the decrease due to lost output of the migrants, and the increase due to the departure of the migrants leaving fewer mouths to feed. In formal terms this may be expressed as follows:

Migrant's change in consumption: $w - t - y_N$

Family's change in consumption: $t - m + y_N$

where w is the project wage

t is the transfer abroad

Y_N is the per capita consumption of the non-Ivorian rural family

m is the marginal product of the migrant in his previous occupation abroad.

1/ The specification of the analysis draws on the data provided in the Rubber Estate Appraisal Report (No. PA-129a) and thus apply to the South-West Region.

72. The shadow wage for immigrant labor under such a regional policy is then:[1/]

$$SWR - \alpha m + (w - t - y_N)(\beta - \frac{d_1}{v}) + (t - m + y_N)(\beta - \frac{d_2}{v})$$

This indicates that the SWR for foreign rural labor consists of the output foregone abroad, multiplied by the conversion factor which transforms it into border prices; plus the net consumption cost which results from the changes in consumption of the migrant and of his family abroad, appropriately weighted to express it in terms of government inocme. d is the distribution weight given to the consumption change of the migrants (a discrete jump from y_N to (w - t), while d is the consumption weight given to the change in consumption by the families abroad evaluated marginally at the level of consumption y_N. This SWR is appropriate if the decision maker treats all residents as if they were Ivorians and is concerned also with the impact abroad from additional employment in the project. Note that in this case there is no "excess" migration induced by the project, in contrast with the assumptions made earlier with respect to urban migration. Note also that the parameters and conversion factors which are used to weight the consumption changes were estimated on the basis of Ivorian data only and not on the basis of regional conditions.[2/] Moreover, this case presumes a degree of altruism

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1/ Assuming there is no saving and that all changes in effort are valued at zero.

2/ If a regional analysis is generally applied, a consistent application of the methodology would require that all parameters be derived from regional, not Ivorian data.

which may exceed that to be expected from a national government.[1/]

73. The alternative, a national employment policy, is concerned exclusively with Ivorian benefits from development. In that case the cost of employing an additional foreign worker consists of the amount of foreign exchange which is lost to the country due to transfers and the cost of his increased consumption. If the immigrant's consumption is considered entirely a cost, with a zero weight given to his improved living standard,[1/] the SWR of foreign labor under a national policy becomes

$$SWR_N = t + (w - t)\beta$$

74. The SWR as formulated for these two alternative policies may then be estimated, using the parameters presented in Table 30. Table 31 summarizes the results, which depend of course on the values of v and n that are chosen. Table 31 also shows the efficiency price of labor, i.e., the SWR excluding consumption costs.

1/ The Ivorian government has in the past followed an "open door" policy in its immigration policies, but there is evidence that in its investment policy it attempted to favor domestic labor; also, growing concern among Ivorians about unlimited immigration is likely to make continuation of the open-door policy difficult, if not impossible in future; see Linn, pp. 103 ff.

2/ This may be viewed as an extreme form of national employment strategy. A less extreme national policy might still attach distribution weights to the consumption changes experienced by the migrant; i.e., once the migrant is in the country he is treated like a national, while the loss of output and change in consumption aborad are not taken into account. The SWR for foreign labor would then be

$$SWR_N = t + (w-t)\beta - (w-t-y_N)\ (d_1/v).$$

This policy alternative was also tested and found to yield SWRs between the regional and the "extreme" national cases. Since the range is thus defined by these two alternatives, the intermediate case of the more moderate national policy was not further considered in detail.

Table 30: Data for the Computation of the SWR for Non-Ivorian Rural African Labor

w = 50,000 CFAF p.a.; derived as 250x200 CFAF, the daily wage for project workers; from Report PA-129a, Annex 14, p. 1;

m = 20,000 CFAF p.a.; derived as 250x200 CFAF, the estimated income (monetary and non-monetary) from production per employee in Upper Volta; from ibid.;

t/w = 40%; from Employment Report, p. 67;

y_N = 8,333 CFAF p.a.; derived from m, assuming that the average family unit in rural Upper Volta and Mali (as in the Ivory Coast) consists of six members, 2-1/2 of whom are employed;

α = SCF = 0.83

β = 0.84

Distribution Weights:	n = 0.5	n = 1.0
d_1: for a discrete change from y_n to (w-t):	1.34	1.88
d_2: marginally evaluated at y_N:	1.95	3.81
v :	2.5	1.7

Note: These distribution weights are computed for an average regional consumption level of CFAF 31,786 (derived from aggregated per capita consumption data found in the most recent economic reports on the Ivory Coast, Mali, and Upper Volta).

Table 31: SWR of Non-Ivorian Rural Non-Ivorian African Labor, as Proportion of Wage

	Regional Policy	National Policy
Case 1	0.500	0.904
Case 2	0.018	0.904
Efficiency	0.333	0.400

75. The highest SWR is obtained for the national policy alternative, when consumption costs are considered. In fact, the SWR in domestic terms, when divided by the SCF, is above the actual wage rate. Substantially lower SWRs are obtained for the regional policy alternative. Thus the regional approach encourages use of foreign labor while the national approach treats foreign labor as more costly than domestic labor and so discourages the employment of foreigners. Changing value judgements sharply affect the outcome of the regional policy by lowering the SWR with the increase in n and the decline in v (i.e., when proceeding from Case 1 to Case 2). Consequently, for Case 1 the regional social SWR lies above the efficiency SWR, while for Case 2 it is lower. This shows that the consumption weights in Case 1 result in a positive ocnsumption cost, while in Case 2 the consumption weights bring about a negative consumption cost (i.e., a benefit) which partially offsets the loss in output under the regional policy option, and the loss in foreign exchange under the national policy option.

Non-African Expatriate Labor

76. For expatriate project staff the wage paid in domestic terms may be taken as the appropriate SWR, if it is assumed that all income of expatriate staff is either remitted abroad or spent on tariff-exempt importables. Alternatively, the component of expatriate income which is spent domestically could be weighted by an appropriate conversion factor, e.g., the conversion factor for general consumption, and would then be added to the unweighted transfer component. In any case it is probably reasonable to assume that the government follows a national policy towards expatriate consumption gains, thus

not weighting them as a benefit. Note that the ratio of the SWR to the expatriate wage falls between the value of β and unity, depending on the proportion of remittances in total income. In any case, it lies above the SCF which was used to convert Ivorian labor into foreign terms, and thus favors sustitution of Ivorian for expatriate labor.

Part V - Implications for Project Selection

77. In this Part, three projects which were recently approved for Ivory Coast are reviewed by applying to them the efficiency and social prices which were derived above. The exercise concentrates entirely on reformulating the economic justification of the projects without attempting to review the financial conditions or the basic cost and benefit assumptions, except to the extent required by the social pricing analysis. Also, due to data limitations inherent in a desk study, shortcuts are frequently employed where a genuine project appraisal would go into greater detail. It is therefore not a full reappraisal of the particular projects to show in retrospect that they were (or were not) socially justified, but rather an illustration of the application of proposed methodology and the qualitative results that can be expected.

The Grand Bereby Rubber Estate Project, 1973

78. The appraisal report (No. PA-129a, March 6, 1973) summarizes the Grand Bereby Rubber Estate Project as follows (pp. i-ii):

> "The principal objectives of the project are to increase and further diversify agricultural production and exports, and to establish a focus of development in the hinterland of the new port of San Pedro.
>
> The project comprises the first phase of development, 1972 through 1979, of a 13,500 ha. rubber estate. In this first phase all 13,500 ha. would be planted but another 5 years would be required until all the rubber came into production. Full development would be completed in 1988 with the final expansion of processing facilities to meet project production needs.
>
> The Grand Bereby estate would be owned by SOCATCI (Societe des Caoutchoucs de Cote d'Ivoire). SOCATCI would be a state-owned company charged with industrial rubber development in the Ivory Coast. SOCATCI would sign a technical assistance and management contract with Michelin, the French rubber manufacturer, to manage the project which would be SOCATCI's sole operation at present.

> The economic rate of return is estimated at 13.2%. In a sense this is a "regional" rate of return since about 80% of project employees are expected to come from Mali and Upper Volta, countries with poor development and employment prospects, and a shadow rate has been used in assessing the opportunity cost of this labor. Costing labor fully, the rate of return is estimated at 11.5%."

79. Besides these assumptions concerning the costing of labor, the project's economic analysis is based on the following considerations:[1/] First, the life of the project extends over 41 years, with the first rubber sales occuring in the eighth year. Second, all foreign costs and benefits are shadow priced at a rate of 1.25 above the official exchange rate. In the following analysis we shall use instead the conversion factors applied to derive border prices for domestic costs. All other costs are charged fully to the project, except for hospital and school construction, and for housing costs. The original appraisal omits the former on the assumption that the benefits are at least equal to the cost of these social infrastructure works. In our analysis, strictly speaking, one should consider such costs and benefits explicitly, since the costs are borne by the government, while the benefits accrue to private consumers, and thus have to be weighted differentially. However, the appraisal assumption was carried over into the present study, by assuming that the benefits of these works (weighted to reflect the value of public income and the income distribution weights) are at least equal to the costs to the government.[2/] Labor housing

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1/ Report No. PA-129a, Annex 14.

2/ Note that the simple approach now often chosen for omitting certain non-quantifiable benefits (and costs) in Bank projects, which assumes that benefits at least equal costs, needs to be modified under the new methodology, since the weight attached to costs and benefits may considerably alter their relationship with each other.

costs are shadow priced at 50% in the appraisal, on the grounds that "the opportunity cost of the present housing of the labor force is only 50% of that which would be constructed under the project" (Report No. PA-129a, Annex 14, p. 2). Although this rationale does not seem entirely clear on strict economic grounds, it was also carried over into the present analysis, mainly in order to preserve the basic cost structure to be used and thus to show how the new methodology (instead of changed costing assumptions) leads to different results from the traditional Bank approach.[1/] Third, the benefits are defined by the appraisal to consist only of the f.o.b. sales value of rubber produced on the estate, including the export tax levied on it by the government. The same practice is followed here. Fourth, all taxes (with the exception of the export tax on rubber) are netted out in the computation of the economic rate of return. This, too, is done in the present analysis.

80. Since the project agency is a public, government owned organization, which receives its capital from the government and contributes all surpluses to the government sector, one can assume that, except for the labor component, all costs and benefits remain in the Public sector.[2/] The cost and benefit streams therefore do not have to be weighted, except that it is necessary to express them in foreign instead of domestic terms, as discussed in the next two paragraphs. With respect to labor costs, private sector benefits occur

1/ As with hospital and school construction, housing benefits the private sector while the costs are borne by the government; thus again, they ought to be weighted differentially. The approach here chosen (following the original appraisal) would perhaps best be justified by claiming that the consumption benefits to labor from its project housing amount to 50% of the cost to the government if properly weighted by the value of government income and distribution weights.

2/ This is also based on the assumption that private benefits derived from hospital and school construction and from labor housing have implicitly already been accounted for according to the conditions specified in the previous paragraph.

in addition to public sector costs when consumption changes take place as a result of the employment on the project. This should be reflected in the SWR used for evaluating labor costs.

81. In the cost and benefit streams of the rubber project as originally appraised under traditional Bank practices, capital and operating costs are presented as a mixture of domestic and border prices. Imported inputs are expressed in border prices, since import tariffs are deducted from the domestic value of the commodities together with all other taxes. But all other tradeable inputs (i.e., domestically produced importables and all exportables) and all non-tradeable inputs are expressed in domestic prices. The new methodology would want to express all inputs in foreign terms right from the beginning by taking border prices for all tradeables and applying conversion factors for non-tradeables. In the present exercise, however, it was necessary to rely on a rough approximation which consisted in separating out the foreign exchange component of all inputs according to summary proportionality factors provided in the original appraisal report (on p. 9). The foreign exchange component was then taken at full cost while the domestic component was expressed in border prices by the application of an appropriate conversion factor. Table 32 summarizes the necessary data and shows the total project conversion factor which was derived for each cost component. These conversion factors are then applied to the cost streams to obtain the border price equivalents. For the costs of management and extension servies, the following conversions were made: For expatriate staff full domestic cost was taken (see para. 76 above). Although this is probably based on somewhat extreme assumptions it represents a reasonable first approximation. For

Table 32: Conversion Factors for Capital and Operating Costs

Inputs	Foreign Exchange Component (%)a/	Conversion Factor for Domestic Component	Total Project Conversion Factor1/
Equipment and Materials (incl. Maintenance)	35	SCF = 0.83	0.89
Vehicle Capital	85	0.796b/	0.83
Vehicle Operation	0	SCF = 0.83	0.83
Buildings, Construction, etc.	45	Const. Conv. Factor = 0.772/	0.87
Factory Capital incl. Spares	100	-	1.00
Seeds, Fertilizers, Insecticides	35	SCF = 0.83	0.89
Electricity, Water	0	SCF = 0.83	0.83

1/ Computed by summing the foreign exchange component with the product of the domestic component and the conversion factor for the respective domestic component; applicable only to this particular project's cost streams.

2/ The use of the general construction conversion factor for the domestic component of construction inputs can be taken only as an approximation. Two offsetting factors are at work: First, if labor is priced at full cost in domestic terms (equivalent to an SWR of 0.83), the conversion factor for the domestic component lies above the conversion factor for the entire industry, since labor constitutes a larger proportion in domestic than in total construction costs. To take an extreme case, assume that labor makes up the entire domestic cost component (in fact if only accounts for about 26% according to I-O information), the project's construction cost stream would have to be adjusted by a factor of 0.91 instead of 0.87. But second, if labor is shadow priced below full cost in domestic terms (because of urban unemployment or immigration from abroad, then the project's construction conversion factor would be lower than 0.91, even if labor made up the entire domestic cost component. For instance, with labor shadow priced at 0.70, the total conversion factor for the project's construction cost stream would be 0.84. Thus 0.87 may be taken as a reasonable intermediate value.

Sources: a/ Report No. PA-129a, p.9; b/ Table 8.

local staff the SCF is applied (see para. 63 above). Management operating costs are also valued at SCF, while the Michelin contract fee, which is a transfer of foreign exchange to a company abroad, is valued at full domestic (and foreign exchange) cost.

82. This leaves the labor component on the cost side. 20% of the labor force is Ivorian, and its wage cost is converted into foreign terms by applying the SCF (see para. 63 above). The remaining 80% of the labor force are drawn from neighboring countries, especially Upper Volta and Mali, and the SWR applied to them depends on whether the employment strategy followed by the government is considered to be regional or national (see paras. 70 to 75 above). The total wage bill may then be shadow priced by adding the foreign labor component to the domestic share of labor:

$$SWR = w \times SCF(I/L) + SWR_N(N/L)$$

where I and N are the number of Ivorians and non-Ivorians in the total project labor force L, and SWR is the shadow wage applied to the non-Ivorians (see Table 31). The computation of the labor cost stream assumed that the conversion factors and SWRs remain unchanged for all years. For the conversion factors this implies constancy of the consumption patterns and tariff barriers; while for the SWRs it is based on the assumption that decreases in value of public income are offset by increases in the wage rate, the opportunity cost of labor or in the proportion of wages which migrants send abroad. 1/

1/ Such assumptions are recommended by Little and Mirrless in their newest treatise on project analysis, Project Appraisal and Planning for the Developing Countries, Heinemann Educational Books Ltd, London, 1974, p. 283.

83. All converted costs streams can be added together and compared with the stream of benefits, which is derived simply by taking the sales of rubber, including the export tax when levied; conversion of the original project appraisal figures is not necessary. From these cost and benefit streams the internal rates of return (R/R) can be computed, for different policy assumptions, and compared with the corresponding ARIs (see Table 31a).

Table 32a: Grand Bereby Rubber Estate Project: Internal Rates of Return (in %)

	Regional Policy	National Policy	ARI
Case 1	12.8	11.4	7.4
Case 2	14.6	11.4	8.5
Efficiency	13.4	13.2	10.0 1/
Bank Appraisal	13.2	-	10-12

Note: 1/ This is the value of q.

84. Looking at Table 32a the most important conclusion is that the project passes the R/R test quite easily under any of the policy combinations here considered. In the original appraisal the project was marginal in the sense that its R/R (13.2% with shadow pricing) lay only little above the opportunity cost of capital suggested by the region for use as a discount rate in the Ivory Coast (10-12%). In other words, a project which under traditional Bank appraisal practices was marginal turned into a non-marginal project, especially if the regional policy option is considered appropriate.

The explanation for this result is that the project produces almost exclusively public sector income which, as discussed in Part III, paras. 51 ff., has a relatively high social value in Ivory Coast (v = 2.5 in Case 1, and v = 1.7 in Case 2). This factor was not considered in the original project evaluation. Note also that although the absolute level of the R/Rs of the project are quite close to the original R/R in this particular case, the greater acceptability of the project is mainly due to the lower value of the ARI, i.e., the cut-off rate.

85. Changes in value judgements cost little change in absolute levels of R/RS in this case, since they affect only the SWR, and since labor cost constitutes only a small part of the total cost stream. Only if a significant proportion of the benefits goes to the private sector will the change in value judgements affect the project outcome appreciably. The actual differences in R/R between the various cases and policy options can be explained entirely in this case by the differences in the SWRs applicable to each case (see Table 30).[1/] The higher the SWR the lower is the R/R. This means that the regional policy makes the project appear more attractive than the national policy; the net benefits of the migrants and their families are valued in the former case, while only the cost of increased migrant consumption is accounted for in the latter case (in addition to the foreign exchange cost of remittances). Since the consumption cost is not accounted for with efficiency pricing, the R/R with social pricing is below the R/R for efficiency pricing in the case of the national policy. For the regional policy option the efficiency SWR lies between those of Case 1 and Case 2, and accordingly the efficiency R/R also has an intermediate value.

1/ The slight difference between the R/R for efficiency pricing and the R/R of the original project appraisal is caused by two offsetting factors; the lower SWR in the former case tends to raise the R/R, while the lower implicit SER tends to lower it. On balance these two effects almost cancel each other.

The Third Highway Project, 1972

86. The Third Highway Project in the Ivory Coast consits of (a) the implementation of a four-year highway maintenance and betterment program (1973-76); (b) the strengthening of about 110 km. of paved roads, including partial realignment and widening; (c) the construction of the bride on the Boubo river; and (d) the study of urban infrastructure development in Abidjan.[1/] Only the first of these four components is reviewed here. It in turn consists of two separate parts, a maintenance program, and a betterment program. As far as one can tell from the original appraisal report, no shadow pricing was used, neither with respect to foreign exchange nor with respect to labor.

87. In the present exercise all domestic costs are converted into foreign terms by applying the standard conversion factor. This is simplification; in a full appraisal it would be preferable to use border prices for all tradeables and to decompose all non-tradeables. Here, however, decomposition stopped at the local and foreign cost components shown in the original appraisal report. The latter are already expressed in border prices, since all tariffs were netted out from the imported inputs.

88. On the benefit side, the savings in vehicle operating costs, which in the appraisal report are expressed as private benefits in domestic terms, have to be translated into the numeraire, i.e., uncommitted foreign exchange in the hands of the government. The reduction in operating costs, consisting mainly of reduced fuel, oil, and tire use and in reduced automobile depreciation, provides a saving to the government in terms of foreign exchange

1/ The foreign exchange component of the two programs combined amounted to 51.3% of total project cost (cf. Report No. PTR-115a, p. 17).

equivalent to S(1-t), where S is the domestic (tax inclusive) value of the cost of savings, and tS is the proportion of cost savings accounted for by the tax component in vehicle operating costs.[1/] In addition, one has to account for the increase in consumption resulting from the reduction in road user costs and the associated increase in private disposable income. The cost of this increase in consumption may be expressed as $S(\beta - D/v)$, if we assume first, that all increases in disposable income are actually consumed, and second, that the cost savings are distributed according to the existing income distribution in the country. Whether these two assumptions are acceptable will be reviewed in some more detail below (paras. 91-92). Combining these elements, i.e., foreign exchange savings to the government and (net) consumption costs, the total benefit in any year may be formulated as follows:

$$B = S(1-t) - S(\beta - D/v) = S(1 - t - \beta + D/v)$$

89. From pre-appraisal data it was established that the average value for t in the Ivory Coast is 0.229.[2/] β was previously estimated as 0.84 (para. 24). This leaves the determination of D/v. D was estimated as 0.91 where n = 0.5 (i.e., Case 1) and 1.0, where n = 1 (i.e., Case 2) (para. 49). The value of v is 2.5 in Case 1 and 1.7 in Case 2 (para. 60) Multiplying the estimated value of savings in private vehicle operating costs (S) with $(1-t-\beta+D/v)$ so obtained gives the benefit streams for the two cases. The benefit stream on the basis of efficiency pricing is identical to that

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1/ Using (1-t) to obtain S in foreign exchange terms, it is implicitly assumed that S consits only of imported commodities. This should be close to actual fact.

2/ SETEC, Ivory Coast Transportation Survey, Vol. I, General Report, Phase I, July 1969.

presented in the original Bank appraisal.

90. The R/R derived from these various cost and benefit streams are shown in Table 33.

Table 33: Third Highway Project: Rates of Return (in %)

	Routine Maintenance	Betterment Works	ARI
Case 1	37.1	-1.7	7.4
Case 2	>100	26.2	8.5
Efficiency	>100	61.2	10.0
Bank Appraisal	> 50	50.0	12.0

It suggests that the maintenance component of the project remains clearly acceptable under all value judgement combinations here considered. The betterment component, however, becomes non-acceptable for Case 1 assumptions (n = 0.5, CRI = 5%), although it remains acceptable under Case 2 assumptions (n = 1.0, CRI = 5%). Since we concluded earlier (para. 59) that Ivorian government value judgements are closer to Case 1, the betterment works appear at best marginal and probably should be dropped from the project. However, before accepting this conclusion we should reconsider the two assumptions made in Para. 88 above concerning the income distribution impact and private sector savings behavior.

91. First, the above estimation assumed that the effects of reduced operating costs were spread such as to leave the existing income distribution unaffected. A full project appraisal should try to determine project beneficiaries in greater detail than can be done here; but as a first step,

it might be argued that, since the road improvements under the Third Highway Project take place predominantly in the rural sector of the country, the cost savings are going to be distributed mainly to the poorer rural inhabitants. If it were reasonable to infer that the population benefitting from the project has a per capita consumption of some 75% of the average national level, d can be estimated from Table 1 of the Annex. For Case 1, where n = 0.5, d is then 1.15. Using this value the benefit stream can be recomputed. The assumed change in beneficiaries raises the internal rate of return is raised from -1.7% to 10.7 %, i.e., a project which originally was not acceptable, given Case 1 value judgements becomes acceptable with the revised assessment of who benefits from the project. The proper specification of the distributional impact of a project can therefore be vital to its acceptability, especially when it is on the borderline and when a large proportion of the benefits goes to the private sector.[1/]

92. Second, the assumption was made above that no part of the increase in disposable income resulting from lower operation costs will be saved. Especially since these benefits were assumed to be distributed proportionally to the beneficiaries have a positive marginal propensity to save, probably equal to the marginal propensity to save out of disposable income in the private sector. The data available in the Bank economic reports do not permit an estimation of this parameter, but the CPP predicts an overall domestic marginal propensity to save out of GDP of 18% for 1970-75. If we assume that the private marginal propensity to consume is lower than that of the public

1/ This raises of course the larger question of how to assess expenditure benefit distribution.

sector, the former might then be estimated, say at 10%. Adjusting the benefit formula on that basis to include savings by private beneficiary,[1/] one can recompute the benefit streams. For Case 1 of the betterment works the rate of return, is increased from -1.7% to 4.6% and the project remains non-acceptable, since that the ARI is 7.4%. However, the result shows that the correct specification of the private sector savings propensity may have an important impact on the rate of return to a project, particularly where a significant proportion of the benefits is reaped by the private sector.

The Cocoa Project, 1970

93. The project consists of the new planting of about 19,000 ha. of cocoa and the rehabilitation of about 38,000 ha. of cocoa not yet in full production. Since the economic analysis of both components is essentially identical, only the new planting is here reviewed. The project is carried out on small family farms and includes provision of improved seeds; credit to farmers for seasonal inputs and equipment and the cash required for hired labor; extension services; training facilities; a warehous; vehicles; prospecting and survey and a study for a second phase cocoa planting program. New planting (and resulting cocoa production) proceeds in four successive cycles, starting at yearly intervals during the first four years of the project with 3,790 ha. in the first year, an additional 4,820 ha. in the second, 4,900 ha. in the third, and 5,320 ha. in the fourth. The original project appraisal justified the project on the grounds of substantial foreign exchange earnings and increases in incomes of participating farmers. The economic

1/ The annual benefit may then be defined as: $B = S(1-t) - S(1-s)(\beta-D/v)$ where s is the private marginal propensity to save. Note that this formulation assumes that private savings is as valuable as public income.

rate of return, without shadow pricing of labor or foreign exchange, was estimated at 20% for the new plantation component.[1/]

94. The project thus involves private and public costs and benefits: The private farmer's costs consist of on-farm cash costs including hired labor, plus the opportunity cost of foregone income through the employment of family labor in the project. The farmer's benefits consist of the sale of his products at the government controlled price. Public costs consist of the government's initial project costs and its subsequent administrative costs; public benefits result from the difference between the price which the government pays the farmers for their product and the price at which the government can sell the product on the world market.[2/] Further complications are that the government provides the farmers with subsidies during the year of planting and extends credits to them to cover on-farm costs during the initial years of the proejct, to be repaid later.

95. In order to evaluate the sectoral costs and benefits, one should assess the resource costs and benefits to the country resulting from the project, as well as the costs and benefits arising from the induced consumption change. The resource cost consists of the sum of private and public expenditure on project inputs (including imputed family labor costs), modified by the appropriate conversion factor to express them in terms of foreign exchange. The consumption cost (or benefit) consists of the change in

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1/ For further details, cf. IBRD Report No. PA-41a; the project appraisal is also reviewed and partially reprinted in Gittinger, Economic Analysis of Agricultural Projects, John Hopkins Press for IBRD, Baltimore 1972.

2/ The Government benefits may actually be further split into the receipts from the export tax, which go to the central government directly, and the receipts of the CSSPPA (a price stabilisation fund), a public agency.

consumption of the private sector (here set equal to the net project incomes to the farmers, assuming that marginal propensity to save to be zero), multiplied by the appropriate weight, i.e., (β - d/v). The resource gains to the country consist of the increase in sales at border prices. Subsidies and credit payments and repayments need not be further specified in this particular formulation of the problem: The resource cost computation takes them implicitly into account by valuing the entire private on-farm costs as a cost (even though partially paid for by a government transfer); credit payments and repayments are accounted for in the effective change in income to the private sector and hence in the ensuing (net) consumption cost to the government in terms of government income.[1/]

96. Following this approach one can convert the cost and benefit accounts of the original appraisal into the terms required by the new methodology. On the benefit side, the sale of cocoa produced by the project is already evaluated at border prices and needs no adjustment. On the cost side, however, the original input data have to be transformed into border prices; as previously, the adjustment is made by taking the foreign exchange component at full cost since all import tariffs have been subtracted from imported inputs.[2/] Imputed family labor cost is converted into foreign terms by simple

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1/ Note that here as in the previous cases, strictly speaking only the tariff component has been netted out, while the distortions of domestic from border prices due to quantitative restrictions have not been allowed for. The implicit assumption is therefore that none of the inputs are subject to quantitative restrictions.

2/ The proportionality factor of domestic cost in total cost used for this purpose is 56% for public, and 44% for private costs (derived from the table on p. 15 of Report No. PA-41a); it is purely accidental that these two figures add up to 100%.

application of the SCF (cf. para. above). Total resource cost consists of the value of all project inputs regardless of whether they are paid for by the public or the private sector. The original project appraisal includes government credits under private on-farm costs, and presents private on-farm costs as including credit element, but not of first year subsidies; these therefore have to be added here to private on-farm costs, in order to obtain total resource cost.

97. Computation of the consumption cost (and benefit) associated with the project is complicated by the fact that the original appraisal does not specify the expected number of participating families, the number of beneficiaries. Nor does it set up an overall income account for the family unit which may be used to compute the changes in income per head. Instead all computations are set up on the basis of per hectare unit cost and benefits. Consequently, a number of intermediate steps must be taken to derive the consumption cost of the project. But first, to facilitate this derivation, assume that the government keeps the farm family's income (with the project) from falling below the income which the family could have earned without the project, by applying an appropriate subsidy and credit policy during the initial years of the project.[1/] In other words, the family has a constant income up to the point where the cash returns from the project begin to exceed the sum of on-farm costs and the opportunity cost of family

1/ For greater detail converning the implications of this assumption, see Linn, p. 127. Note that in a full appraisal a careful specification of the farm family budget in line with actual government subsidy and credit policy would be necessary; it could show that during the first years of the projects the farmers actually experience a drop in their total income with the project, as compared to a situation without the project.

labor working on the project; after this point, there are no credits and subsidies given and family income and consumption rises with the increase in net cash revenue. This increase in family income can then be derived from the per hectare data provided in the appraisal report by going through the following steps.

98. Step 1 computes the number of family workers associated with a hectare of project land. Assuming that the entire family labor force is employed in the project in the peak labor demand year (the second year of each of the four production cycles), the total number of family workers per hectare is derived by dividing the per hectare family labor cost for that year by CFAF 62,500, i.e., the annual per worker labor cost.[1/] Thus one finds that in year 2 0.529 family workers are associated with the project per hectare. Step 2 derives the number of family members per hectare involved with the project, assuming that the ratio of family workers to family members is 2.5/6=0.417.[2/] Hence the number of family members per hectare of project land is 0.529/0.417 = 1.269. Step 3 computes the per capita value of net private profits for each year, by dividing the per hectare net private profit figure by 1.269. All this assumes implicitly that the size of the family varies in proportion with the size of the farm, which appears justified in the case of the Ivory Coast, where "land within community boundaries is allocated to farmers by the Chiefs according to each family's labor potential." (IBRD Report No. Pa-41a). Step 4 computes the value of the distribution parameter for the increases in income each year using the national average consumption level (CFAF 68,141) and the without-project per capita income (CFAF 26,042) as benchmarks for comparison.

1/ Derived as CFAF 250 per day for 250 days per year.
2/ This ratio is based on information provided in the Employment Report, p. 29, for the average rural family.

Step 5 then computes (β - d/v) for each of the four planting cycles, where β equals 0.84, and v is set equal to 2.5 in Case 1 and equal to 1.7 in Case 2. Step 6 derives the annual consumption cost for each production cycle by multiplying total annual net private profits by the appropriate weight (β - d/v) Step 7 obtains total consumption cost for each year by summing across all four cycles.

99. The economic rate of return can then be computed in terms of efficiency prices; and the social rate of return on the basis of social prices, including consumption costs. Two cases are here considered: Case 1 (n=0.5 and CRI=5.0%) and Case 2 (n=1.0 and CRI=7.5%). Since for these two cases the value of (β - d/v) differs, different consumption cost streams are obtained. Note that the consumption cost stream for Case 1 is positive, i.e., the change in consumption results in a cost to society expressed in terms of uncommitted foreign exchange in the hands of the government, while for Case 2, consumption costs are negative, i.e., the increase in consumption is valued as a benefit to society. The reason the changes of the value of (β -d/v) is positive in the former, but negative in the latter. In other words, for the low value of n and the high value of v (Case 1) the beneficiaries of the project lie above the critical consumption level, while they lie below this level in Case 2, when n takes on the higher value and v the lower value, respectively.

100. Table 34 summarizes the rate of return results for the two cases of social pricing, for efficiency pricing, and for the original project appraisal.

Table 34: Cocoa Project: Rates of Return
(%)

	Internal Rate of Return	Discount Rate
Case 1	21.3	7.4
Case 2	25.1	8.5
Efficiency	23.8	10.0
Bank Appraisal	19.9	10-12

The rate of return in the original appraisal is lower than the R/R with efficiency pricing since the original project appraisal did not shadow price foreign exchange, as is effectively done in the case of the efficiency (and social) pricing. Comparing for the social returns with the efficiency returns, one finds that Case 1 yields a lower return, due to the positive consumption cost; while Case 1 yields a higher return, due to the consumption benefits (i.e., negative consumption costs). Relative to the ARI, however, both social returns are more favorable than the efficiency return, since the benefits which are not retained by the government accrue to a relatively poor segment of the population.

101. The impact of social pricing on the project returns is not very large, given the assumptions made here concerning the (net) consumption costs. Two factors in particular contribute to reduce the impact of the consumption cost element: First, the assumption that consumption does not change during the initial project years, but is effectively maintained by the government at its pre-project level, reduces the weight of changed consumption, beginning only with the sixth year, more detailed knowledge of the actual time path of

of gains ad losses in consumption might give a different otucome. Second, and more generally, the consumption cost is quite sensitive to changes in the value of d, which depends on assumptions made with respect to the consumption levels of the beneficiaries. Given our particular assumptions, the weighted consumption costs (benefits) are relatively small, because the value of d/v is fairly close to the value of β. In other words, the beneficiaries happen to be close to the critical consumption level at which government values public and private income and consumption equally. In that case social pricing does not produce significant differences as compared with efficiency pricing, where a priori all benefits and costs are valued equally. However, a more detailed project appraisal might conclude that the beneficiaries are actually better (or worse) off than here assumed, in which case social pricing would produce quite different results from those of efficiency pricing.

102. The calculations presented in this exercise can only be taken as an indication of the kind of information required by the project economist for his social pricing computations. They should not be taken as a model with sufficient degree of accuracy for actual project appraisal, where it may not be too difficult to determine the income and consumption levels and expected changes therein resulting from the project in greater detail than was here possible.[1/] More detailed work than presented here would be required of the project economist also in the derivation of the border price equivalent

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1/ In fact it may be argued that it would be good practice to make such computations in any case. It may be important for the success or failure of a project to what degree the private farmer incurs losses initially which he may find difficult to sustain; or to what degree he is faced with risks, due to initial losses, which he may not want to shoulder, thus resulting in unwillingness to participate in the project. In the absence of calculations of private cost and benefit streams on a per capita basis and relative to non-project related income, Bank project appraisals in the past have had no factual basis for judgement in this respect.

of project costs. The method used here throughout is acceptable only as a first approximation for a desk study. Since the project economist disposes of more detailed cost data and can ascertain border prices directly in the field during the appraisal mission or have them ascertained by the consultants) this should not cause particular problems.

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