

The Economic Appraisal of the Tanzania-Zambia Railway

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The objective of this article is to make an economic appraisal of the Tanzania-Zambia transport links with special reference to the Tanzania-Zambia Railway, through comparing the advantages and disadvantages of the £169 million interest-free Chinese loan with a hypothetical Western loan of equal magnitude, against the background of Zambian trade re-orientation and the various feasibility studies of the railway link.

The Net Present Value variant of the discounted cash flow methods of investment analysis is applied in Tables 8-11 in the economic comparison of the possible routes TZR could have taken and in Table 13 in the comparison of the hypothetical Western loan and the Chinese offer. The basic assumption of the methods of discounted cash flow is that money has a time value. A given sum of money today is normally worth more than the equal sum of money at some future date because the ownership of the sum of money today enables the owner to invest or consume it. The given sum of money P today has the same value as the sum $P(1+r)$ one period from today, i.e., the exchange rate between money now and money one period in the future is 1 to $P(1+r)$. Because money today is more desired than in the future, the money owner can normally lend only if he receives an interest rate r on the sum lent; the borrower can profitably borrow if his expected return from the given project is at least equal to the rate of interest he pays for borrowing.¹

Under the discounted cash flow method all expected expenditures on goods and services for the project, including capital expenditure and all the expected receipts from the project's output sales are recorded. These future cash flows in terms of expenditures and receipts are discounted to the present through the use of an appropriate discount rate which represents the expected rate of return from the project or the rate of interest charged on borrowed capital. The discounting process is simply the compound interest worked backwards. By discounting expenditures and receipts occurring at different times, these cash flows are revalued to make them comparable to present expenditures and receipts. After discounting to find the present value of receipts and expenditures and after subtracting expenditures from receipts we obtain the Net Present Value (NPV) of the project.²

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1 A. J. Merret and Allen Sykes, *The Finance and Analysis of Capital Projects* (Longmans, 1963), pp. 3-8.

2 I. M. D. Little and J. A. Mirrlees, *Manual of Industrial Project Analysis in Developing Countries*, Volume 1, "Social Cost Benefit Analysis," (OECD, Paris, 1968), pp. 15-22.

Assuming the present value of receipts is represented by PR and the present value of expenditures by PE and given that R represents receipts per time period while E represents expenditures in the project per time period, we get the formulae

$$1. \quad PR = \frac{R}{(1+r)} + \frac{R}{(1+r)^2} + \frac{R}{(1+r)^3} \dots + \frac{R}{(1+r)^n}$$

$$2. \quad PR = \sum_{t=1}^{t=n} \frac{R}{(1+r)^n}$$

$$3. \quad PE = \frac{E}{(1+r)} + \frac{E}{(1+r)^2} + \frac{E}{(1+r)^3} \dots + \frac{E}{(1+r)^n}$$

$$4. \quad PE = \sum_{t=1}^{t=n} \frac{E}{(1+r)^n}$$

$$5. \quad NPV = \sum_{t=1}^{t=n} \frac{R}{(1+r)^n} - \sum_{t=1}^{t=n} \frac{E}{(1+r)^n}$$

$$\text{If } \sum_{t=1}^{t=n} \frac{R}{(1+r)^n} - \sum_{t=1}^{t=n} \frac{E}{(1+r)^n} > 0, \text{ NPV is positive. The}$$

project is profitable.

In the formulae above

r = rate of discount

n = life period of the project

The Net Present Value discounted cash flow method is used in comparing the profitability of different projects or the profitability of the same project given either differences in productive techniques or the scale of the project or both. It is also used in ranking projects according to profitability. Wherever NPV is positive for any given discount rate, it is profitable to invest.

The Zambian and Tanzanian purpose of investing in inter-country transport links of railway, road and pipeline is to provide Zambia with reliable alternative outlets to those passing through Southern Africa, to raise their individual and joint gross domestic product, increase national self-sufficiency, promote national cohesion and security, etc. The various transport links

between Tanzania³ are seen more as complementary than competitive. Indeed this complementarity may compel competition especially between road and rail and thus impel the transport modes to operate more efficiently. We have, in this type of situation, a sort of built-in mechanism to ensure the best effort from the transport modes. The links, though the emphasis is on the railway, are seen as economically and politically justifiable.

SHORT RUN EVENTS LEADING TO THE INTENSIFICATION OF TRANSPORT LINKS BETWEEN TANZAMA AND POSSIBLE LONG RUN CONSIDERATIONS

It was the shock of the Unilateral Declaration of Independence (UDI) by Rhodesian settlers in 1965 that provided the immediate impulse for initiating the far-reaching reorientation of Zambian transport trade links from Rhodesia, Portuguese Southern Africa colonies and South Africa to Tanzania and free Africa. What could have been a gradual process became an emergency operation.

UDI has made Rhodesia an insecure transit country. Chances of Rhodesia Railways being subject to African guerrilla attacks are not remote; such guerrilla attacks on the Lobito route have disrupted Zambian traffic in the past. Zambia's leaders are resolved to assist in the liberation of Southern Africa. Indeed TZR is vulnerable to settler sabotage but such vulnerability is much less compared to having routes through enemy territory. Given these politico-economic considerations and the unfriendliness of the "White" south and its allies, it becomes clear that any financial analysis of Zambia's outlets via Rhodesia is virtually a pointless exercise. In concerned Africa, the immediately important issues are the preservation of independence of free Africa and the liberation of occupied Africa. To the White colonists, the immediate and future issue is the maintenance of the racist systems at any cost. By facing this reality at least with respect to the near future, routes through Southern Africa cannot be seriously regarded as the only outlets for Zambian traffic, though currently, more than two-thirds of her trade passes via this area.

Short-term Considerations

The immediate cause of Zambia Trade disengagement was the oil sanctions applied against Rhodesia and which Rhodesia applied on Zambia soon after UDI. The Beira-Umtali Oil Pipeline serving Rhodesia and Zambia was blockaded by the British Navy. By Christmas of 1965, Zambia had resorted to petrol rationing. The use of the Great North Road (Zam-Tan Highway) to transport oil and other goods was inaugurated. Of the estimated £50 million cost of UDI to Zambia, £36 million was spent on subsidizing oil.⁴ Oil and copper were air freighted to Dar es Salaam for a time because the British Prime Minister had promised to end the rebellion in a few weeks. The con-

³ Short for Tanzania and Zambia.

struction of the Zambia-Tanzania Petroleum Pipe line to overcome the oil shortage became the first step in disengagement from dependence on Rhodesia. Trade diversion from the south was announced in 1965 as Tables 1 and 2 show. Other causes that accelerated trade reorientation in 1966 were the announced United Nations trade sanction against Rhodesia and the Rhodesian demand that all charges for Zambia's mineral cargo be paid in advance and in foreign exchange.⁴ Despite disengagement policy, much of Zambian traffic,

Table 1—ZAMBIAN IMPORTS FROM RHODESIA IN PRE-DEVALUATION BRITISH £'s

Imports from Rhodesia		Total Zambia Imports	Rhodesian Share %
1964	£31.0 million	£78.0 million	40
1965	£35.5 million	£105.5 million	34
1966	£23.0 million	£123.0 million	19
1967	£16.0 million	£153.0 million	10½
1968	£11.5 million	£177.5 million	7
1969	£11.0 million	£156.0 million	7

Source: *African Economic Development* (October 1970), p. z. 16, Tables 1 and 2.

Table 2—CHANGING SHARES OF THE ZAMBIA IMPORT MARKET (%)

	S. Africa	U.K.	U.S.A.	E.E.C.	East Africa	Japan	Others
1964	21	17	5	5	½	2	9½
1969	22	23	10	10	3½	7	17

Table 3—1969 APPROXIMATE COPPER EXPORTS BY ROUTE

Via Rhodesia	—	720,000–780,000 tons
Via Dar es Salaam	—	180,000–300,000 tons
Via Lobito	—	Up to 180,000 tons

Source: *African Development* (October 1970), p. 13.

An adaptation from John Leech's article: "Why Zambia Turned North".

especially copper, passes through Rhodesia (see Table 3). Circumstances compelled her to import power from Kariba Dam and Wankie coal to the value of £8.7 million and £3.0 million respectively in 1968.

According to Leech, each month, Zambia must import 80,000 to 90,000 tons of cargo and export 65,000 to 70,000 tons of copper for economic survival. Exports through Lobito are difficult, because of congestion—so are copper exports through Zam-Tan Highway. Rhodesia remains the predominant outlet.

⁴ *African Development* (October, 1970), p. 16.

Long-term Considerations

The long term pressures for Zambian trade reorganization stemmed from the unequal pre-independence transport agreements especially with Rhodesia Railways. In 1949, the Beira Convention was signed by Britain, Southern Rhodesia and the Portuguese governments. The convention guaranteed that RR would use the port of Beira in Mozambique to maximum capacity. Rhodesia Railways would not divert its traffic from Beira nor alter traffic charges. Other agreements were made between 1949 and 1960, the year in which the 1957 Tripartite Agreements signed by RR, Banguela Railway and Compagnie defer du Bas-Congo au Katanga (BCK), were renewed.

Rhodesia Railways, at the 1960 agreement renewal, offered a new discount rate of £9 10s. 6d. per ton of discount copper. The cost of copper per ton was then £14 17s. 0d. on all routes. Lobito copper was fixed at 36,000 tons a year. Discount rate copper flow through Lobito ceased.⁵ In 1963, the Zambian Government (then called the Northern Rhodesia Government) made an agreement with the Southern Rhodesia Government to the effect that any traffic diversion by either signatory was to be compensated. The offending government was to pay the full amount of revenue lost by the partner as a

Table 4—RHODESIA RAILWAYS ESTIMATED PROFIT OR LOSS FOR PRINCIPAL COMMODITIES YEAR ENDING 30 JUNE 1963

	Profit or Loss (for 200 mile equal point)	Estimated Product Valuation per ton	Product Origin
	£	£	
Tobacco	+0.48	347	Mostly Rhodesia
Maize and Maize meal	-0.79	15	Mostly Rhodesia
Asbestos	-0.24	42	Rhodesia
Chrome Ore	-1.29	5	Rhodesia
Zambian Copper (full rate):			
To Beira	+7.49	210	Zambia
To Laurence Marques	+6.60		Zambia
Zambian Copper (discount rate):			
To Beira	+2.72		Zambia
To Laurence Marques	+2.36		Zambia
Copper to S. Africa	+9.04		Zambia
Lead and Zinc	+0.62	57-58	Zambia
Coal and Coke	-1.52	1.0	Rhodesia
Livestock	-0.09	13.5	Mostly Rhodesia

Source: *Journal of Transport Economics and Policy*, Vol. 1, No. 1 (January 1967), p. 50.

⁵ R. S. Doganis, "Zambia's Outlet to the Sea," *Journal of Transport Economics and Policy*, Volume 1, No. 1 (January, 1967), London School of Economics, p. 48.

result of the diversion. Rhodesia Railways at the same time ran a discriminatory freight system. Although copper accounted for only 8 per cent RR freight by weight, it provided 28 per cent of its revenue. The average profit on copper products was £4 16s. 0d. per ton of 200 mile equal point.⁶ Rhodesian minerals, viz., coke and coal, asbestos, chrome, ore, maize and maize meal and livestock were carried at a loss except for tobacco as indicated in Table 4.

THE TRANSPORT LINKS BETWEEN ZAMBIA AND TANZANIA AND THE ALTERNATIVES FACING ZAMBIA

The transport links⁷ between Tanzania and Zambia constitute the £169 million Tanzania Zambia Railway (TZR) now under construction to join Dar es Salaam to Kapiri Mposhi, the £16 million Zambia-Tanzania Petroleum

Table 5—BY 1980 THE PROJECTED CARGO CAPACITIES OF THE DIFFERENT TRANSPORT MODES IN TONS PER YEAR ARE:—

Zam-Tan Petroleum Pipeline	Improved Zam-Tan Highway		TZR	
	Tonnage	Cost per ton	Tonnage	Cost per ton
Throughput	500,000 ¹			
Increased Throughput	750,000 ²	700,000 ³	3.4 million ⁷	.83d ⁸ cf
With Increased Pressure		350,000 ⁴		£16 ⁶ (1.14d via RR)

Source: Summary Report, p. 69.

- 1. Summary Report, p. 69.
- 2. Ibid.,
- 3. Ibid., Fig. 4.
- 4. African Development (December 1970), p. 18.

- 5. Summary Report, Fig. 4.
- 6. The Economist, August 12, 1967.
- 7. The Financial Times, October 27, 1970.
- 8. The Economist, August, 12, 1967.

Table 6—COMPARATIVE COST OF PETROLEUM BY MODES

Period	Mode	Cost/Ton-Mile (Pence)
Late 1960s	Emergency Zam-Tan Road	7-11
Early 1970s	Improved Zam-Tan	4-7
Late 1970s	Improved Zam-Tan	4
Late 1970s	Railway TZR	3
Late 1960s	Pipeline	2

Source: Summary Report, p. 69.

- 6 Ibid., p. 49.
- 7 See Tables 5, 6, 7.

Table 7—THE JOINTLY AND EQUALLY OWNED ZAMBIA-TANZANIA TRANSPORT LINKS BY MODES, THEIR TOTAL COSTS, LENGTH AND SOURCES OF FINANCE INDIVIDUALLY ON COMPLETION

	Zam-Tan Pipeline ⁸	Improved Zam-Tan Highway	TZR
Total Cost	£16 million	£23 million	£169 million ⁹
Length	1060 miles ¹⁰	1095 miles ¹¹	1,200 miles ¹²
Source of Finance	Italy	West esp. USA	China
Interest	6% ¹³	6% ¹⁴	None
Employment	?	2,400 ¹⁵	Up to 30,000 ¹⁶

Pipeline which was completed in 1968 and the £23 million Zambia-Tanzania Highway (Zam-Tan Highway).¹⁷

Zambia, since UDI, has vigorously sought to produce alternative trade outlets starting with the Petroleum Pipeline which now carries enough oil to meet her requirements, which by 1968 were 233,000 tons at a cost of £24.3 per ton, compared to \$56.0 per ton along the Highway. The cost per ton is expected to fall to \$14.70 by 1980 when petroleum demand is projected to be 450,000 short tons.¹⁸

UDI intensified the use of the 1,200-mile Great North Road (Zam-Tan Highway) which is being widened and tarred. Improvements are due for completion by 1972. Summary Report on the feasibility study of Zam-Tan Highway concluded that the project would be financially justified even without developmental investment en route.¹⁹ Development investment would justify a double bituminous surface to meet all the traffic along the route and up to 110,000 tons of copper per year by 1980, though developmental investment would add little to total volume of traffic.²⁰ Any road copper tonnage greater than 110,000 tons would be carried at a loss.²¹ Though the road was not dependent on developmental schemes, the schemes were dependent on the provision and availability of developmental capital.

Zambia was bound to find alternative routes because of the unequal balance of power against her. It is possible that with Zambian independence, the

- 8 Zam-Tan Pipeline ownership is two-thirds Zambian and one-third Tanzanian, "Zambian Fuel," The Economist, June 29, 1968.
- 9 "Zambia Special Report," The Times, June 25, 1971.
- 10 "Zambian Fuel," The Economist, June 29, 1968.
- 11 Summary Report, p. 3.
- 12 "Zambian Special Report," The Times, June 25, 1971.
- 13 "Zambian Fuel," The Economist, June 29, 1968.
- 14 International Bank of Reconstruction and Development (IBRD), Washington, D.C., Bank Release, September 25, 1968.
- 15 African Development (December 1970), p. 18.
- 16 African Development, (November 1970), p. 11.
- 17 "China's gold-tipped wand hovers over Eastern Africa," The Economist, August 19, 1967, p. 565.
- 18 International Bank of Reconstruction and Development (IBRD), Washington, D.C., Bank Release, September 25, 1968.
- 19 Summary Report, p. 3.
- 20 Developmental investment is subsidiary investment made in order to make a main project more profitable.
- 21 Summary Report, p. 9.

unequal treaties and discriminatory charges would eventually have had to be revised, but this would not rule out the need for alternative routes. The certainty of her outlets depended excessively on the goodwill of Rhodesia and her allies.

The Various Feasibility Studies of TZR

Of the four non-Chinese feasibility studies of TZR route now under construction, the Gibb and World Bank Reports assumed that no Zambian copper would be exported via Dar es Salaam because of Zambia's colonial transport agreement arrangements. The Gibb Report unreservedly supported the railway as a political strategy; it supported the railway conditionally as an economic strategy.²² The economic justification of the railway rested upon agricultural and general development of north-eastern Zambia and south-western Tanzania. The question was one of timing. It thus recommended agricultural modernization, commercialization and population economic education. To promote development, the Gibb Report supported the construction of a road network in this area of the two countries.

The World Bank went on to assume that in spite of agricultural development, the rail link was not economically justifiable; if built it would be more expensive to run than the outlets through Rhodesia. It rejected the railway project, and instead recommended the building of Zam-Tan Highway and the provision of a road network in this area of the two countries, especially in Zambia.²³ This recommendation was much in line with the Gibb Report proposals for development. Perhaps because the East African Railways and Harbours Administration had shown that the railway link was economically viable, the World Bank also recommended that EARHA should not invest in transport renewal. It required that EARHA took no part in investing in any new railway line. The World Bank recommendations in so far as they were completely inspired by economic considerations only, indicate that it was out of touch with realities of Africa. By assuming free outlets for Zambia through occupied Africa, the World Bank involved itself in questionable investment appraisal assumptions. The relevant routes for consideration as Zambian route alternatives must surely be those through free Africa.

The EARHA recommended the project as financially profitable if after five years of completion about 250,000 tons of copper cargo per year would use the route.²⁴ This target has already been surpassed by Zam-Tan Highway copper freight of 252,000 tons in 1969.²⁵ But the Highway will be inadequate to transport all of Zambia's exports. The Maxwell Stamp economic appraisal of TZR indicated the commercial viability of the link. The Chinese com-

22 Sir Alexander Gibb and Partners Ltd. and Overseas Consultants, Inc.: *Report on Central African Rail Link Development Survey*, Volumes 1 and 2 (U.K. Government Colonial Office, London, 1952), p. 33.
 23 R. S. Doganis, "Zambia's Outlet to the Sea," *Journal of Transport Economics and Policy*, Volume 1, No. 1 (January, 1967), L.S.E., p. 51.
 24 Doganis, *ibid.*, p. 50.
 25 *African Development* (November, 1970), p. 9.

mended the link after making their own survey. They proceeded to finance and to build it.

The Economics of the Choice of Routes

The universal question about TZR²⁶ is whether it will provide enough economic and social returns, and if so, whether the returns would be higher than all the other alternative railway routes, or would Zam-Tan Highway, in fact, produce the highest returns for all Zambian traffic? The *Summary Report* indicates Zam-Tan would be incapable of absorbing more than 25 per cent of Zambia's copper traffic. R. S. Doganis regards Zam-Tan as supplementary to TZR rather than an alternative,²⁷ a view I share. Having decided that the only routes worth any detailed economic analysis are those through independent Africa, use has been made of the estimated costs and possible revenue from each of these routes so as to determine whether the route under construction is the best given Zambia's overall economic and political strategy.

Table 8—THE PROJECTED COSTS AND REVENUES WHICH ARE EARNED YEARLY BY THE DIFFERENT ROUTES OVER A PROJECTED LIFE PERIOD OF ABOUT 40 YEARS

Routes	Capital Investment Required	Revenue per Year
Route 1 (ZEARL) ²⁸	\$597 million ²⁹	\$19.1 million
Route 2 (Mupulungu)	\$598 million	\$ 9.5 million
Route 3 (Kalemie)	\$515 million	\$12.0 million
Route 4 (Matadi)	\$512 million	\$10.3 million

26 The noticeable thing about TZR is the big differences in the cost estimates of the various reports. Some differences can be explained in terms of different techniques applied, the precision required and because of the different bodies involved in the appraisal. Other differences are a function of time and inflation. Perhaps the differences in the intensities of the profit motive among the appraisers significantly explains the major disparities.
 EARHA estimates of 1963=£51 million.
 World Bank of 1964=£51-62 million.
 Maxwell Stamp, 1966=£126.3 million.
 Chinese loan, 1970=£169 million (£145 million prior to devaluation).
 The World Bank raised the costs by about £11 million in one year.
 Maxwell Stamp raised the costs by about £75 million in two years.
 The Chinese raised the costs by about £45 million in four years.
 By the time agreements were to have been reached on the Maxwell Stamp report estimates, whether the Chinese loan would have risen by £19 million before devaluation cannot be certified.
 All the Western oriented reports made little to no use of cost benefit analysis techniques of investment assessment despite its appropriateness to transport capital formation. Maybe this is the best approach from the eyes of financiers who will strictly not finance any project that would not be able to pay for itself. It appears cost benefit analysis would be more appropriate for internally financed public investment. Foreign capitalist financiers are reluctant to use cost benefit analysis for fear that governments to whom they lend money could always produce evidence of social need and thus justify economically any project even if such a project could not break even.
 27 Doganis, *ibid.*, p. 51.
 28 TZR is same as Route 1, i.e. (ZEARL).
 29 The Chinese estimate of the cost of Route 1 (TZR) is £169 million which is approximately \$405.6 million as compared to the \$597 million of the MATS estimate.

Table 9—THE PRESENT VALUE OF THE DIFFERENT ROUTES AND DIFFERENT RATES OF DISCOUNT OVER 40 YEARS IN MILLION DOLLARS

Revenue per year		Discounted value of Routes revenues at different discount rates			
		6%	7%	8%	10%
19.1	Route 1 PV	286.5	254	218.3	187.2
9.5	Route 2 PV	142.5	126.4	113.1	93.1
12.0	Route 3 PV	180.6	159.6	142.8	117.6
-10.3	Route 4 PV	Ignored	Ignored	Ignored	Ignored

Table 10 below shows the capital expenditure per route, the present value of the revenue per route at different discount rates and the Net Present Value of outstanding capital after 40 years, all in Million Dollars.

Table 10—CAPITAL EXPENDITURE, REVENUE PV, OUSTANDING NPV AND DISCOUNTED VALUES

Routes	Capital Expenditure Revenue PV Outstanding NPV	Discounted Value of Routes at Different Discount Rates			
		6%	7%	8%	10%
1	Capital Expenditure	597.0	597.0	597.0	597.0
	Revenue PV	286.5	254.0	218.3	187.2
	Outstanding Capital NPV	310.5	343.0	378.7	409.8
2	Capital Expenditure	598.0	598.0	598.0	598.0
	Revenue PV	142.5	126.4	113.1	93.1
	Outstanding Capital NPV	455.5	471.6	484.9	505.9
3	Capital Expenditure	515.0	515.0	515.0	515.0
	Revenue PV	180.6	159.6	142.8	117.6
	Outstanding Capital NPV	334.4	355.4	372.2	397.4

Table 11—OUTSTANDING CAPITAL AT VARYING RATES OF DISCOUNT

Outstanding Capital at Different Rates of Discount	Route 1	Route 2	Route 3
Outstanding Capital at 6%	310.5	455.5	334.4
" " " 7%	343.0	471.6	355.4
" " " 8%	378.7	484.9	372.2
" " " 10%	409.8	505.9	397.4

Because Route 4 (Matadi) would, over a period of 40 years, not even cover running costs, but require a yearly subsidy of \$10.3 million just to cover costs, it is ignored in the analysis. Of the remaining three routes, Route 2 shows higher outstanding capital liability than Routes 1 and 2 at any discount rate. For any discount rate below 8 per cent, Route 1 (TZR) indicates the least amount of capital outstanding among the three, but for rates of 8 per cent and above, Route 3 shows the least amount of capital outstanding after the 40-year period.

Were Zambia to have secured a loan at an interest rate of 8 per cent or over, she would find Route 3 the least burdensome financially. However, it would have been unlikely that she would agree to finance the Kalemie route. It was also likely that the Congo would not agree to meet the 50 per cent of the cost. Tanzania would have been most reluctant to contribute 50 per cent to the cost of the renewal of the Kigoma-Dar es Salaam section. It is hard to envisage the three governments agreeing to the sharing of the costs. If the West would not finance the enterprise, it is doubtful the Chinese would agree to back such a project. From such a project, the Congo and Tanzania would gain only in terms of transit revenue charges. Zambia would only benefit from the expansion of an old outlet. No new areas in either of the three countries would be developed. A cost benefit analysis of the route variants would come out in favour of TZR. TZR provides a completely new outlet for Zambia and opens to transport new Tanzania territories.

To Tanzania and quite likely to the Chinese, the most viable route is TZR or Route 5 because Route 2, though it would still help to open north-eastern Zambia to development, would only provide transit revenue to Tanzania. Such revenue would be inadequate to finance transport provisions in vast areas of Tanzania in need of transport facilities. However, Route 5 was found to be too long, too expensive and too vulnerable to Portuguese war adventures near the Tanzanian border. As it turns out, TZR route was chosen and is now under construction. *The Middle Africa Transport Survey* projections of costs and returns from the various possible routes shows that TZR route under construction is the best.³⁰ The capital costs of TZR as estimated at \$597 million by MATS is higher than the \$405.6 million Chinese loan to finance the same route.

The Chinese Loan Offer

When Tanzania's President visited Peking in February 1965, China promised to provide an interest free loan worth £100 million³¹ to finance the Tanzania-Zambia rail link after the West had declined to do so. The offer was greeted with widespread scepticism in Europe and North America.

30 Stanford Research Institute, *Middle Africa Transport Survey (MATS)*, Draft Final Report Contract No. AID Afr-503, SRI Project No. 6594 (Menlo Park, California, August, 1968), p. 169.
31 *African Development* (November, 1970), p. 3.

Zambia, though interested in the link, was reluctant to accept the Chinese aid, hoping that the West would favourably reconsider the financing of TZR.³²

The Chinese promise materialized when in October 1970, the construction of the controversial Tanzania-Zambia Railway, nicknamed "Uhuru Railway" in Africa, started in earnest. The loan now quoted as £169 million³³ (Sterling) is regarded as the largest loan China has made anywhere in the world. In Africa, this is the third largest foreign loan after the Aswan High Dam and the Volta River Project. TZR, which is represented by Route 1 on Map 1 and is the third overland transport mode in Tanzania, will run from Dar es Salaam to Kapiri Mposhi on the Zambian Railways 3 ft. 6 ins. gauge instead of the one metre East African Railways gauge.

The construction expertise will be provided by China. Initially it was estimated that over 3,000 Chinese experts would be involved plus up to 30,000 Tanzanians and Zambians.³⁴ However, it is believed there are perhaps more than 10,000 Chinese and about 50,000 host countries people working on TZR.³⁵ At the latest, TZR is scheduled to finish in 1977. It was, however, expected that by December 1971, 300 miles of the route would be completed. On completion, the railway will be capable of carrying four million tons of cargo between Dar es Salaam and the Zambian copper belt,³⁶ provide a new profitable outlet for landlocked Zambia, help ensure more complete Zambian disengagement from trading with colonial Africa and promote Afro-Chinese solidarity.

The route TZR will take differs on details from that of Zam-Tan Highway thus helping to open up new areas. TZR will help to provide employment, encourage the growth of towns and villages near it, enhance prospects of industrial development, provide markets for agricultural and industrial goods while strengthening Zambian ties with the East African community.

The Tripartite Agreement

About the time the Maxwell Stamp study was in progress, the Chinese made their own feasibility study which supported the project, proposed to use labour intensive techniques and to finish building in five years.³⁷ The construction of TZR began in earnest by October 1970.³⁸ The Chinese offered to Tanzania and Zambia a loan of about £169 million interest-free, to be divided equally between the two. The first repayment is due in 1983.³⁹ Payments will be spread over a period of 30 years. At the latest the construction is expected to finish by 1977. It will carry a cargo of about three to four million tons yearly either way.

32 "China's gold-tipped wand hovers over Eastern Africa," *The Economist*, August 12, 1967, p. 565.

33 Bridget Bloom, "Tanzam Railway," *Financial Times*, October 27, 1970.

34 *African Development* (November, 1970).

35 *The Times*, June 25, 1971, "Zambia Special Report".

36 *Financial Times*, October 27, 1970.

37 *The Economist*, August 12, 1967.

38 *African Development* (November, 1970), p. 10.

39 *Ibid.*, p. 10.

In Peking in July 1970, the Tanzanian-Zambian-Chinese Tripartite Agreement finalizing the railway's financing was signed.⁴⁰ It does not indicate whether or not China will finance Dar es Salaam Port expansion. During the 30-year repayment time, Tanzania and Zambia will each annually pay about £2,766,760.⁴¹ Repayment will be in third party currencies, or the proceeds these countries are supposed to earn from exports to China. Fifty-two per cent of the price of the railway will be local costs, including salaries of construction workers. China will meet the local costs of her experts which will be about £32,700. Forty-eight per cent remaining price will be equipment, one-third of which will be rolling stock. It is rumoured that China will buy mainline diesel engines from the West. Under the Commodity Agreement, Tanzania and Zambia will be able to get goods from China on credit up to December 1977 to meet local costs. Up to 1977, they will have to import £6 to £7 million worth of Chinese goods. Tanzania currently imports about £4.66 million worth of Chinese goods.⁴²

According to David Martin, if 52 per cent of the costs are met locally and local requirements evenly distributed during the five to seven years construction period, Tanzama will have to import about £8½ million worth of Chinese goods.⁴³ He argues that the assumption of even requirements during construction is weak because higher costs are inevitable in the first one to two years, for southern Tanzania is mountainous and secondly Tanzania will have to pay for local costs in domestic reserves. Zambia especially will have to do this and so stretch commodity credit beyond the building period to recoup earlier excess; if so Tanzama will about double their China imports immediately; this makes the commodity agreement less favourable to them. This may be a short-term disadvantage of little significance. Martin tries to make this into a long-run problem at least by implication. The possible flaw in his argument against the assumption of evenly distributed local requirements (therefore higher earlier repayment), is that he forgets that whereas local construction costs in Tanzania may be higher than the norm, these may be lower than normal requirements when construction in the even Zambia terrain takes place. Even distribution may, therefore, be achieved over the construction time. This would also be achieved during repayment.

I submit that any increase in Tanzanian imports from China shall not be due to the intrinsic fault of the commodity agreement. So far as any short-run disadvantage exists, it can be counterbalanced by the fact that so far, Tanzania's Chinese imports have been static and thus likely to increase only by the amount of the debt repayment requirement. Any increase beyond this will owe its origin to other factors and not necessarily the commodity agreement. China's interest is long-term trade and would avoid anything that jeopardizes this prospect.

40 *Ibid.*, p. 10.

41 *Ibid.*, p. 10.

42 *African Development* (November, 1970), p. 10.

43 *Ibid.*, p.10.

Considering Zambia's initial reluctance to accept the loan, Martin's fears of significant reduction in the Western market in Tanzania are currently hard to sustain though what the West does over the liberation of the south might possibly cause increased trade reduction with the West. Zambia's satisfaction with the Chinese commodity trade terms was summed up by Andrew Sardanis, the Managing Director of the Zambian Industrial and Mining Corporation, who said some Chinese goods were "eminently" suitable to Zambian needs and that they were reasonably priced.⁴⁴ Martin forgets that Zambia and Tanzania will also pay China in commodities instead of foreign currency although admittedly, commodity agreements are not necessarily the cheapest, but neither are the monetary agreements.⁴⁵ The disadvantage of any better agreement is buying from third parties and the cheapest markets are ruled out. More than 70 per cent of Western lenders tie the borrower to buy goods from their specific country. It is argued that Tanzania are likely, under the barter agreement to buy consumer goods like textiles, bicycles, fertilizer, hardware, etc., the sort of goods that will compete with their similar domestic goods. It is possible, however, for Tanzania to import Chinese vehicles, medical equipment, building materials, chemicals, certain types of machinery, arms and other intermediate goods.

The value added by the Zambian half of the TZR finance of £84.5 million to the GDP and the possible transport savings effected to gross domestic income will depend upon the Zambian "income multiplier" which is 1.2.⁴⁶ This would lead to an income rise of more than £100 million. The expansion of the money economy is likely to raise the size of the income multiplier, after all the marginal propensity to consume tends to be higher in developing countries. With increased monetization of the economy the final value added by the investment would even be higher. Once TZR is completed, the bulk of Zambia's export cargo will be mainly copper and other minerals. Most of the imports through Dar es Salaam will be industrial equipment, manufactured goods, agricultural machinery, fertilizer, motor vehicles and petrochemicals.

The Zambian concentration on transport investment has meant the diversion of resources from agriculture, education, housing and other sectors of the economy. This diversion was unavoidable with UDI; even without UDI a similar sacrifice would have been called for, but it would have been more evenly spread. However, the impact of concentration on transportation has been considerably absorbed, especially with respect to TZR loan conditions. If we judge the extent to which transport investment has deprived other sectors of capital, we can examine the results of the Zambian First National Development Plan (1966-70). Satisfaction of the Plan targets was as follows:⁴⁷

Manufacturing	...	...	...	...	...	120%
GDP	...	...	...	...	...	113%
Education	...	...	...	...	...	80%
Employment	...	...	...	...	...	55%
Health	...	...	...	...	...	50%
Housing	...	...	...	...	...	100,000 backlog

It was agriculture and housing that fared worst. Agricultural failure is due to many causes other than finance. It can be fairly inferred that it was housing that was hardest hit by UDI contingencies. However, economic plans fail for other reasons than capital shortage.

THE COMPARATIVE ECONOMICS OF LOANS

Specifications

Let us suppose that Zambia (and Tanzania) had been faced with choosing between the Chinese loan and the Western loan as projected by Maxwell Stamp Report (£126 million)⁴⁸ which of the loans would be more advantageous? The Western loan value is raised by 14 per cent to take account of devaluation in Britain. This amounts to about £145 million, the Zambian portion of which is taken as £72.3 million. By using capital intensive techniques the construction period is taken as three years.

During the first operational year the railway earning of £11.4 million⁴⁹ above costs is adjusted to £13 million (because of devaluation). Half of the £13 million goes to Zambia, it is assumed. In the second operational year the railway is again assumed to earn £13 million, £6.5 million of which is Zambian. It is assumed the Chinese-built railway would prove as profitable in revenue terms as the Western-built rail!

The conditions of the Western loan are based on the World Bank afforestation loan to Zambia, i.e., a 6 per cent rate of interest assumed to be compound;⁵⁰ a grace period of ten years⁵¹ is taken. The repayment period is taken to be 25 years. It is assumed earned profit in the first two years of completion is reinvested within Zambia at a 6 per cent rate of compound interest.

Construction is taken as starting in August 1970 and ending in August 1973, and repayment beginning in August 1983 to end in August 2008. The number of Zambians employed during the construction time is assumed to be 7,500 while those employed under the labour intensive techniques is taken to be 15,000 taken from the fact that a maximum of 30,000 could be employed on TZR as a whole. The wages per worker per year are assumed to be £120 under either contractor. The Chinese building starts in August 1970 to end in August 1975. Repayment at the rate of £2.8 million per year over 30 years starts in 1983 to end in 2013.

Detailed appraisal will compare the Chinese and Western loans under two

44 *African Development* (October, 1970), p. 2.

45 At the worst, the terms of the commodity agreement are unlikely to be any worse than the monetary arrangements Tanzania would have had to accept on an equivalent Western loan.

46 *Summary Report*, p. 140.

47 *African Development* (October, 1970), pp. 10-11.

48 *The Economist*, August 12, 1967, p. 565.

49 *Ibid.*, p. 565.

50 World Bank Release, September 25, 1968.

51 If the grace period included the construction period, this would bring the construction time to 13 years as for the Chinese.

assumptions as to what happens to interest rate during the grace period—interest waiving and interest accumulation. The Zambian multiplier given as 1.2 shall be applied to give full impact of either of the loans from every angle. The decision on which loan is better is for convenience based upon Zambian liabilities in 1983.

Table 12—INFORMATION ON LOANS

	Western	Chinese
Value	£72.3 million	£84.5 million
Interest	6% per annum	—
Construction Period	3 years	5 years
Methods of Construction	Capital Intensive	Labour Intensive
Start of Construction	August, 1970	August, 1970
End of Construction	August, 1973	August, 1975
Number of Employees	7,500	15,000
Profit Reinvestment at 6% for 10 years from 1973	£6.5 (1.06) ¹⁰	
Profit Reinvestment at 6% for 9 years from 1974	£6.5 (1.06) ⁹	
Period of grace inclusive of construction	13 years	13 years
Redemption Starts	August, 1983	August, 1983
Yearly Capital Repayment depends on grace period interest waiving		£2.8 million
Yearly Interest Repayment depends on grace period interest accumulation		—

Table 13—ZAMBIAN EARNINGS AND LIABILITIES FROM EITHER LOAN BY 1975

	Western	Chinese
Loan	£72.3 million	£84.5 million
Interest	6%	—
Construction	3 years	5 years
Earning on £6.5 m (1.06) ³ 1973–1975	£7.30 million	—
Earning on £6.5 m (1.06) ⁵ 1974–1975	6.89	—
Earnings by 1975	<u>£14.10 million</u>	
By October 1975 earnings generated from rail profit proceeds	<u>£17.03 million¹¹</u>	—
Employees per year	7,500	15,000
Employees earning per year	£120	£120
Employees earning for 3 years 1970–1973	£2.7 million	£5.76 million
Employees earnings for 2 years 1973–1975	0	3.60 million
Employees earnings by 1975	<u>£2.7 million</u>	<u>£9.36 million</u>
By October 1975 employment generated income	£3.24 million*	£11.232*million
Plus earnings from profit reinvested by 1975	17.03 million*	—
Total Earnings by August 1975	<u>£20.27 million*</u>	<u>£11.232 million*</u>
Total Earnings at 6% in terms of 1983 August	<u>£32.31 million</u>	<u>£17.898 million</u>

Note— *Indicates earnings generated as a result of impact of the multiplier (1.2).

Table 14—THE NET PRESENT VALUE OF EARNINGS AND LIABILITIES IN TERMS OF 1983

	Western	Chinese
(I) <i>The Outcome when Interest is Waived during the Grace Period</i>		
Capital Repayment Liabilities	£72.3 m	£38.530 m
Earnings on all incomes generated	32.31 m	17.898 m
Net Present Value of Outstanding Liabilities	<u>£39.99 m</u>	<u>£20.632 m</u>
(II) <i>The Outcome when Interest Accumulates during the Grace Period</i>		
Capital plus Interest Repayment Liabilities	£129.470 m	£38.530 m
Earnings on all incomes generated	£ 32.310 m	£17.898 m
Net Present Value of Outstanding Liabilities	<u>£ 97.160 m</u>	<u>£20.632 m</u>

Conclusion on the Economics of the Loans

My analysis indicates that if we considered the economics of the construction period alone, in terms of employment and income generation and time, the Western loan wins over the Chinese with regards to income creation and the shorter time period of construction that would enable Zambia to have an outlet more quickly, while the Chinese loan is better only in the volume and the longer period of construction employment. However, when we consider the loans as a whole with respect to size, the rate of interest, the income generated, the period of construction, the level and length of construction employment, the period and terms of repayment, the liabilities Zambia would face and even the political considerations of international investment, my evidence supports the Chinese loan as cheaper regardless of what happens to the rate of interest during the grace period. The favourability of the Chinese loan is enhanced the shorter the construction period, while some reduction in financial and economic attractiveness occurs the longer the construction period goes beyond five years. The Chinese being a people of surprise diplomacy would seem to prefer a shorter period of building than published.

Specifically, if during the grace time interest payment is waived on the Western loan, the Western loan would be about twice more expensive to Zambia than the Chinese. Because the Chinese loan is cheaper by about £19.358 million, this margin is significantly cheaper than the Western loan even if the Western loan meant an earlier use of the railway, regardless of the possibility that under the Tripartite Agreement, the terms of the trade agreement, the foreign exchange requirement, the local currency arrangements, etc., were somewhat unfavourable to Zambia.

With interest accumulating during the grace period, the Western loan becomes about five times as expensive as the Chinese offer which is about

£76.528 million cheaper than that of the West. The Western offer clearly would not stand up to serious consideration as a worthwhile alternative to the Chinese loan which apart from all this analysis of the loans comparatively, has, in fact, been offered while no Western offer existed.

Had the World Bank agreed to finance TZR, foreign exchange in high demand in Zambia as in the majority of developing countries, would have been the sole means of repayment. It is not improbable that the World Bank would have been less likely to finance the Northern Bank of Kariba Dam power generator, considering among other things, the Bank's wish to spread out its investment assistance. Zambia would have had to be more indebted to the World Bank, under such a situation, the governmental decision to acquire 51 per cent of the copper mining shares and to take over certain industries, might have faced frustration, and Zambia's economic policy independence seriously compromised.

The completion of TZR is undoubtedly going to set up the big watershed in the Zambian trade pattern, outlets and political links whose impact will affect Tanzama economics and politics in particular and Africa in general. The rest of Africa except the colonial south are likely to cast more friendly eyes on China. Zambia will be relieved of the UDI crisis of transport. She will end her deep dependence on the colonial powers in Africa. Her hostage status to the white south will come to a relieving close after more than half a century of outlet and economic subordination.