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Oil and Gas Policies in Tunisia

A Macroeconomic Analysis

Hinh T. Dinh

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Hinh T. Dinh is an economist in the Country Programs Department II of the World Bank's Europe, Middle East, and North Africa Regional Office.

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ABSTRACT

The sustained economic growth that Tunisia enjoyed in the last decade is likely to be restrained in the 1980s by several factors related to its oil and gas resources. First, with no new major hydrocarbon discovery in sight and with rapidly increasing domestic consumption, the country will cease to be a net oil exporter by the end of the decade. Second, prospects for further substantial gains in the terms of trade due to oil price increase cannot be anticipated.

This paper quantifies the impact of these two factors on the Tunisian economy and examines the macroeconomic implications of various policies in the oil and gas sector. The economywide impact is studied by the use of a macroeconomic model constructed on the basis of the specific structure of the Tunisian hydrocarbon sector and its linkages to the balance of payments and the budget. Based on a scenario of anticipated policy and development, it was found that a continuation of past trends in energy consumption would lead to large Government budget and balance of payments deficits. The paper examines other oil and gas policies to reverse this trend, including pricing, energy conservation, acceleration of exploration and development, as well as the development of large projects.

The analysis, based on mid-1983 data, and on assumptions which are tentative in character, shows that to limit the balance of payments deficit to a sustainable level in the long term, energy conservation measures must be taken. To help offset the declining revenues of the Government and to reduce domestic energy demand, these measures need to be taken jointly with prompt adjustments in prices. Development of the existing small oil and gas fields should be accelerated before large investment projects are undertaken. In financing large projects, methods must be chosen so as not to jeopardize the country's medium and long-term creditworthiness.

CONDENSE

L'expansion économique soutenue qu'a connue la Tunisie pendant la décennie écoulée va probablement être freinée dans le courant des années 80 par plusieurs facteurs liés à ses ressources en pétrole et en gaz. Premièrement, étant donné qu'aucune nouvelle découverte importante d'hydrocarbures n'est en vue, et que la consommation intérieure augmente rapidement, la Tunisie aura cessé d'être exportatrice nette d'ici à la fin de la décennie. Deuxièmement, on ne saurait s'attendre à ce que de nouvelles hausses des prix pétroliers fassent encore progresser sensiblement les termes de l'échange.

Ce rapport mesure l'impact sur l'économie tunisienne de ces deux facteurs et examine les implications macroéconomiques de différentes mesures que pourraient arrêter les pouvoirs publics dans le secteur du pétrole et du gaz. Pour étudier les répercussions sur l'ensemble de l'économie, l'auteur s'est servi d'un modèle macroéconomique élaboré compte tenu de la structure spécifique du secteur des hydrocarbures tunisien et de ses liens avec la balance des paiements et le budget. Il a établi un scénario basé sur certaines hypothèses relatives à l'action du Gouvernement et à l'évolution du secteur. Selon ce scénario, il a constaté que si les tendances passées de la consommation d'énergie se maintenaient, on obtiendrait un large déficit du budget de l'état et de la balance des paiements. Le document envisage des mesures propres à inverser cette tendance, notamment dans les domaines de la politique des prix, des économies d'énergie, de l'accélération de l'exploration et du développement, ainsi que la mise au point de grands projets.

Il ressort de l'analyse, qui repose sur des données datant du milieu de 1983, et des hypothèses de travail retenues, de caractère conjecturel, que pour contenir le déficit de la balance des paiements à un niveau tolérable à long terme, il importe de prendre des mesures en vue d'économiser l'énergie. Pour compenser une partie de la baisse des recettes de l'Etat, et pour réduire la demande intérieure d'énergie, il faudrait simultanément remanier les prix. Il faudrait accélérer le développement des petits gisements de pétrole et de gaz existants avant d'entreprendre de vastes projets d'investissement. Pour le financement des grands projets, on devra choisir des méthodes qui ne compromettent pas la solvabilité à moyen et long termes de la Tunisie.

EXTRACTO

Es probable que el crecimiento económico sostenido que ha disfrutado Túnez durante los diez últimos años se vea restringido en el decenio de 1980 por diversos factores relacionados con sus recursos de petróleo y gas. En primer lugar, sin perspectivas de nuevos descubrimientos importantes de hidrocarburos y con el rápido crecimiento del consumo interno de estos productos, el país dejará de ser exportador neto de petróleo a fines del decenio. En segundo lugar, no se prevén nuevas ganancias cuantiosas en la relación de intercambio debidas a un aumento del precio del petróleo.

En este informe se miden los efectos de estos dos factores en la economía tunecina y se examinan las repercusiones macroeconómicas de diversas políticas en el sector de petróleo y gas. Para estudiar los efectos en todo el ámbito de la economía se ha utilizado un modelo macroeconómico elaborado de acuerdo con la estructura específica del sector de hidrocarburos de Túnez y sus vinculaciones con la balanza de pagos y el presupuesto. Conforme a hipótesis de las políticas y el nivel de desarrollo, se halló que una continuación de las tendencias pasadas de consumo de energía tendría como resultado cuantiosos déficit presupuestarios y de balanza de pagos. Se examinan en el informe otras políticas relacionadas con el petróleo y el gas que podrían invertir esta tendencia, como son las de fijación de precios, conservación de energía y aceleración de las actividades de exploración y explotación, así como la cuestión de los proyectos de gran escala.

El análisis, basado en datos de mediados de 1983 y en supuestos que son de índole tentativa, demuestra que para limitar el déficit de balanza de pagos a un nivel sostenible a largo plazo deben tomarse medidas de conservación de energía. Para que ayuden a compensar la disminución de los ingresos del Gobierno y para reducir la demanda interna de energía, estas medidas deben adoptarse conjuntamente con ajustes expeditos de los precios. Antes de emprender proyectos que requieran grandes inversiones debe acelerarse la explotación de los pequeños yacimientos de petróleo y gas existentes. En la financiación de proyectos de gran escala deberán elegirse métodos que no pongan en peligro la capacidad crediticia del país a mediano y largo plazo.

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OIL AND GAS POLICIES IN TUNISIA:

A MACROECONOMIC ANALYSIS

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CURRENCY EQUIVALENTS

			1980	1982	1983
1 Tunisian Dinar (TD = US)			$ 2.47	1.69	1.58
1 US Dollar	=	TD	.405	.592	.633

WEIGHTS AND MEASURES

1 ton of oil equivalent (TOE)	=	39.7 million Btu
1 barrel of oil	=	42 US gallons
1 ton of Zarzaitine crude	=	7.75 barrels
1 ton of Ashtart crude	=	7.2 barrels
1 ton of Arabian light crude	=	7.3 barrels
1 ton of gasoline	=	1.35×10^3 litres
1 ton of gas oil	=	1.16×10^3 litres
1 ton kerosene	=	1.23×10^3 litres

PRINCIPAL ABBREVIATIONS

ETAP	-	Entreprise Tunisienne d'Activités Pétrolières
GOT	-	Government of Tunisia
LOGP	-	Large Offshore Gas Project
LPG	-	Liquified Petroleum Gas
STEG	-	Société Tunisienne de l'Electricité et du Gaz
STIR	-	Société Tunisienne des Industries de Raffinage
SEGMA	-	Société d'Etude du Gaz Marin

Summary and Conclusions

The Setting

During the 1970s, the Tunisian economy experienced rapid growth accompanied by substantial structural transformation. This performance was achieved partly due to the increase in oil income made possible by successive increases in oil production and oil prices. The continuation of this growth into the 1980s, however, is likely to be checked by two factors. First, existing reserves are running out and, without major new discoveries in oil and gas, and with the rapid growth of energy consumption, Tunisia will cease to be a net exporter of energy by the end of the decade. Second, prospects for further substantial gains in the terms of trade due to oil price increase cannot be anticipated. The transition to a post-hydrocarbon era, as previous World Bank reports have pointed out, requires careful management of scarce resources so as to maximize growth within the financial constraints. The important influence of the oil and gas sector on economic activities and on financial resources implies that this sector should receive particular consideration.

This report seeks to contribute to the formulation of an oil and gas strategy which is consistent with the country's development objectives and constraints by quantifying the impact of these two factors on the economy and by examining the macroeconomic impact of various policies in this sector. Since oil and gas permeate all aspects of the economy, a decision taken in this sector would have a major impact on trade, capital flows, inflation and employment. The report focusses on two particular aspects that are deemed important for Tunisia, balance of payments and public finance. Unlike other exports, developments in the oil and gas sector affect the economy not only via the expansion of income and market, but also via the Government budget. They also have an impact on other economic variables such as the real exchange rate, domestic price level and employment. Exports of oil and gas allow the country to increase its foreign exchange earnings and, therefore, its capacity to import while oil-related domestic expenditures serve to increase domestic income. The tentative conclusions reached herein are based on data which existed at the time the report was written (mid 1983) and on assumptions which are tentative in character.

Tunisia's indigenous energy resources consist of oil, natural gas and a small hydropower potential. Proven reserves are currently estimated at 70 million tons for oil and 27.5 million tons of oil equivalent (TOE) for natural gas. While exploration drilling activities have been slow, domestic consumption of oil and gas has grown rapidly since 1970, averaging about 11 percent p.a. during 1970s and amounted to 2.9 million TOE's in 1982. The income elasticity of demand for petroleum products is estimated at 1.27 and there is indication that it has risen in the last Five Year Plan period (1976-1981). The rapid growth in consumption has probably been stimulated by the domestic pricing policy which until 1979, had kept oil and gas prices low compared to international prices.

The price setting mechanism for oil and gas is complex, reflecting the institutional structure of this sector which involves various ministries and a number of state enterprises. The Ministry of National Economy (MNE) set oil and gas prices, while ETAP, a state enterprise, is responsible for coordinating exploration and production activities, including the imports of crude oil and refinery products. STIR, another state enterprise, is

responsible for operating the refinery plant. While both domestic and imported crude oil are sold by ETAP to STIR at a subsidized price set by MNE, the MNE also sets the price at which STIR could sell petroleum products to distributors. Various indirect taxes are then levied on these products so that their retail prices are substantially above the ex-refinery prices (although still below international prices, with the exception of gasoline). This system has evolved from the ad hoc measures adopted during the oil crisis of 1974/1975 to insulate the domestic market from price disruptions in the international market.

On the average, about 27 percent of the Government current revenues originate from oil and gas, the largest component of which is the transfer of the accounts held by ETAP on behalf of the Government concerning operations in crude oil and in refinery products. These operations include both domestic and international trade, as well as an exchange in kind, involving sending domestic crude to foreign refineries in exchange for refinery products. Because they appear in the budget as a net item, these accounts conceal the economic subsidy (on domestic crude sold to STIR) and the budgetary subsidy (on imports of crude and petroleum products). Indirect taxes levied at the distribution stage of petroleum products also constituted an important revenue source.

Although oil exports accounted on the average for about 50 percent of total merchandise exports in the last five years, net oil exports accounted for only 22 percent because prior to 1982, Tunisia both exported and imported crude oil to take advantage of its higher quality crude. Net oil exports remain the single largest category of merchandise exports today, amounting to $440 million in 1982. The rapid growth of net oil export earnings, averaging 23 percent p.a. in the last five years, arose mainly from successive price increases of oil in the international market.

The Base Scenario and Implications of Pricing Policy

The economy-wide impact of various policies in the use and development of oil and gas is studied by the use of a macroeconomic model of the Tunisian economy. The model was constructed with the specific structures of the oil and gas sector and its linkages to the balance of payments and the Government budget. The detailed equations and assumptions are presented in a separate Annex. The special features of this model include, *inter alia*, the detailed production and profit sharing between Tunisia and its foreign partners for major oil fields, the financial transactions between the Government, ETAP, STIR, and the linkages between oil (and gas) and the major economic variables.

A scenario based on anticipated policy and developments in the sector was constructed to serve as a benchmark against which the impact of other policies is measured. It retains basic assumptions underlying the Five Year Plan (1982-1986) including the phasing out of petroleum subsidies by 1986 and assumes that policies in non-oil sectors are implemented in a timely and successful manner. For oil and gas, production is projected according to the latest Government information while demand for oil and gas is determined by the economy's overall and sectoral

growth. The base case assumes significant additional production from new fields, i.e., that current Government efforts in oil and gas exploration and development will be sustained.

It is found that a continuation of past trends in energy consumption would lead to increasing Government budget and balance of payments deficits. By the end of this decade, the oil and gas net exports turn to net imports, which by 1991 would amount to 28 percent of the current account deficit, exceeding net food imports. At the same time, even assuming that domestic prices will be raised to international level by 1986, the contribution of petroleum revenues to the budget will slow down considerably from over 36 percent p.a. between 1978-1981 to below 13 percent between 1983-1991.

To examine the consequences of postponing price adjustment beyond 1986, we simulated a scenario in which the existing domestic price structure (as of mid 1983) relative to international level remains unchanged throughout 1983-1991. It is found that petroleum contribution to the budget would then decline quickly and total revenues would decrease by over TD 100 million p.a. between 1983-1986 and by over TD 380 million p.a. between 1987-1991. The share of oil and gas in total current revenues would decline continuously from 32 percent to 22 percent between 1982 and 1991. To the extent that postponing price adjustment will further induce consumption, the case for a prompt pricing policy can be made even stronger.

Other Policies in Oil and Gas

Drawing on the results of previous technical studies, the report examines the macroeconomic impact of other policies in oil and gas. The first policy, based on a study by the U.S. Agency for International Development (USAID), involves the activation of an intensive energy conservation program in industry leading to a saving of 12 percent in energy consumption by 1986, and involves an investment program of about $30-40 million in current prices. The 12 percent used here merely serves to illustrate the magnitude of potential saving. Actual saving could vary dependent upon the intensity of the conservation program. The second policy, costing about $66 million, deals with the acceleration of oil exploration and development; the third combines the first two, and the fourth policy concerns the development of a large gas project, the cost of which is estimated at $820 million in current prices. The analysis of the last policy involves a modification of the model to allow for various indirect effects to be observed.

Policy 1 - Energy Conservation

The analysis of this policy brings out three main distinct points. First, the impact of better energy demand management policies can be significant on the balance of payments. The debt service ratio could be reduced by three percentage points and the current account deficit by 7 percent in the short to medium term, and by 22 percent over the long-term. Second, the immpact of these policies on the Government budget would be slightly negative in the short to medium term, (which perhaps explains the insufficient attention paid to these policies by the Government in the past)

but will, in the long run, become beneficial by reducing the expenditures in terms of savings in interest payments; total Government revenues would not be affected between 1987-1991. Third, the same policies would have uneven impact on the balance of payments and the budget. The impact on the former is immediate and much more substantial than the latter.

Policy 2 - Exploration and Development

Policy 2 involves the acceleration of various oil fields within the constraint of technical feasibility and has about the same effect on the energy balance as Policy 1 for the period 1987-1991, but its impact is more immediate and less significant on the balance of payments. The current account deficit would be reduced by about 16 percent over this period. In contrast, its impact on the budget is much more substantial: total annual revenues would increase by TD 100 million ($158 million) and the budget deficit would be reduced by TD 142 million ($224 million) between 1987-1991.

Policy 3 - Combined Policy

Policy 3 combines the conservation measures of Policy 1 with exploration and development efforts of Policy 2. As can be expected, the impact on both the balance of payments and the budget is substantial. Debt service ratio would decline continuously compared to the base scenario and would reach 15 percent by 1991, about the level in 1982. Because of the negative impact on indirect taxes on petroleum products, this policy does not yield much revenues compared to Policy 2 during the first few years. However, over the medium and long terms, the combined positive impact of demand and supply would reduce the current budget deficit more than Policy 2 alone.

Policy 4 - Development of a Large Gas Project

The analysis in Policy 4 is slightly different from that used in previous policies where the required additional investment is not significant. In the case where the investment size of a project is large, it is important to examine not only the direct effects of the project on the economy, but also the induced effects that these direct effects may generate so that the final impact of the project on income, expenditures and balance of payments (and the creditworthiness of the country) can be assessed. The model is modified to allow for these induced effects and a large gas project is selected to illustrate the approach and the considerations that must be taken into account.

The analysis of Policy 4 shows that although the large project generates substantial income and government revenues as well as reduces the balance of payments deficit, the timing of the project is of great importance. First, if the project had been started several years ago, the peak impact on the balance of payments would have taken place in the mid-1980s and the effect would be minimal. As things stand now, the construction of the project during the current Plan would delay the peak impact on output and net exports toward the end of 1980s but creates in the meanwhile more pressure on a strained balance of payments. Second, unless other financing methods are found, the

project should be implemented only after pricing measures, and measures in Policies 1, 2 or preferably 3 are taken so as to dampen demand and to alleviate pressure on both the current account and the budget deficits arising from the project's construction period. Third, if the sequence of policy measures is respected, the project may bring substantial benefits to the Government budget and to the balance of payments.

Issues and Recommendations

Priority of Various Policies. The analysis in this report shows that limiting the balance of payments deficit to a level that is sustainable in the long term can only be achieved if conservation measures are taken. To help offset the declining Government revenues and to reinforce the demand dampening effect, these measures need to be taken jointly with prompt adjustments in pricing policy. The acceleration of the development of the small existing oil and gas fields should also be undertaken before the large investment projects, unless other financing methods (such as non-recourse financing) are found for the latter.

Pricing Issue. The current distortion in petroleum prices particularly of fuel oil not only encourages consumption but also provides the wrong signals to investment. Relatively low prices of energy products also make investment in energy conservation less profitable. The Government has undertaken the necessary steps to increase domestic prices to international level by 1986. This commitment should be maintained. Furthermore, the pricing system could be simplified to improve efficiency. The Government could relieve ETAP from having to sell domestic crude oil to STIR at a fixed price. Instead, STIR should be free to buy the crude it needs, whether from the foreign oil companies, ETAP, or imports at the prevailing world price. In turn, STIR should be free to set the price of its petroleum products to cover the refinery and input cost. Indirect taxes levied at the distribution stage then could be reduced so that the rise in retail price of products would not be excessive.

Issue in Public Enterprises. Pricing policy may be a necessary, but not sufficient condition to promote energy conservation in Tunisia because of the preponderance of public enterprises in energy intensive subsectors, such as cement, chemicals and transport. While the potential for energy saving is largest in these enterprises, the weakness of profit motivation coupled with the control of final output prices make additional investment in energy saving equipment unattractive to them. It is recommended that (a) output prices of these public enterprises be added to the list of "auto-homologation" products, the prices of which are allowed to rise with input costs, provided that these prices are determined at levels of efficient operation; (b) the Government exert its control on these enterprises to adopt the conservation measures and standards by setting energy consumption targets related to output levels, by providing bonuses to plant management and labor for achieving these targets, and by requiring monitoring and periodic reporting on progress in agreed conservation programs.

Issues in Conservation Program. The institutional set up for energy conservation is not adequate. The responsible unit currently has limited

manpower and does not have the authority nor the expertise to formulate and implement a national energy conservation program. It is recommended that a permanent body be set up and given the mandate to (a) collect auditing results and coordinate various studies on energy conservation in order to assess the potential for energy saving; (b) organize and map out a strategy to launch a nationwide energy conservation program with initial focus on energy-intensive public enterprises. The program should include measures to increase awareness through education and promotional efforts, intensive training and technical assistance, regulations concerning energy efficient standards for industrial and transport equipment, and investment and operational incentives such as low cost financing for energy efficiency investments in small and medium-sized companies.

Timing Issue. While the urgency of needed reforms in pricing and conservation policies may not be felt as strongly due to the weakening price of oil in the international market in the recent past, the cost of this postponement is nevertheless quite high. It is recommended that the Government entrust the Energy Conservation body with the preparation of a conservation plan in 1984 for subsequent review and implementation. Although the Government has decided to increase domestic prices to international level by 1986, it may be desirable to accelerate the adjustment of fuel oil and gas oil prices to earlier, during the current Plan (1982-1986).

Inflation and Poverty Impact Issue. The concern is often voiced that increasing petroleum prices may fuel inflation and adversely affect poverty groups. Studies in other countries have shown that despite the immediate impact on the level of prices, this concern may be exaggerated. Preliminary results obtained by previous studies in Tunisia have also shown that for a variety of products important to the poor, energy cost constitutes a small proportion of final output prices. It is recommended that the current study being carried out by the Bank and Tunisia on the impact of fuel taxes in transport sector be extended to assess the impact of energy pricing on inflation and on the distribution of income.

Pricing and conservation policies need to be supplemented by intensified exploration and development efforts. Such efforts are currently hampered to some extent by a less than fully adequate contractual framework. The Government is preparing new legislation to remedy this situation, and it is recommended that emphasis be placed on providing (i) flexible fiscal terms; (ii) clear criteria on pricing and other delivery and purchase guarantees for natural gas; and (iii) flexible exchange control provisions. ETAP should also improve its capability to monitor on-going exploration and appraisal activity and ensure that it has the information required to make sound judgements on the value and size of its potential participation in development investments. Non-conventional financing schemes for major projects could also help spur development of larger fields at least cost to the economy.

CHAPTER I - THE SETTING

During the 1970s, the Tunisian economy experienced rapid growth accompanied by substantial structural transformation. Average GDP growth was about 7 percent per annum, but actual improvement in income was even higher because of substantial gains in the terms of trade caused by the relative price increase of oil. As a result, consumption has increased (over 8% per annum), investment reached a high level (30% of GDP), and the current account recorded only a small deficit. The share of industry, including construction, in GDP has also increased from 21 percent to over 32 percent.

This excellent economic performance was achieved partly due to the increase in oil production and oil prices. Although the contribution of the oil and gas sector to employment was limited, its impact on the balance of payments, on the Government budget and, therefore, on the level of a broad spectrum of economic activities was significant. The increase in foreign exchange earnings allowed the Government to import and to step up foreign borrowing for investment financing, while the stimulating effect of the increase in public revenues enabled the administration and public investment to be financed on a growing scale, thereby further expanding income.

The continuation of this growth into the 1980s is likely to be checked by several factors. First, existing oil reserves are running out and, without major new discoveries, with the rapid growth of energy consumption, Tunisia will cease to be a net exporter of energy by the end of the decade. Second, prospects for further substantial gains in the terms of trade due to oil price increase cannot be anticipated. 1/ The transition from an oil exporting to an oil importing economy requires fundamental adjustments in the structure of the economy so that growth is not greatly curtailed while the balance of payments deficit is kept to a manageable level.

The Government is fully aware of these needed adjustments and is considering the necessary steps to ensure a smooth transition through slowing down private consumption growth (by reducing subsidies and reforming the tax system) and through stimulating non-oil exports. However, sectoral policies, particularly for oil and gas, have not yet been formulated to best utilize resources in a manner consistent with the country's development objectives and constraints.

This report seeks to contribute to the formulation of such policy in the oil and gas sector, by quantifying these constraints and by examining the macro-economic impact of various policies in the sector. Since oil and gas permeate all aspects of the economy, a decision taken in this sector would have a major impact on resource development, trade, capital flows, inflation and employment. A sensible oil and gas strategy must be based on thorough analyses of various policies and the impact of these policies on other aspects of the economy. The report, however, does not pretend to cover all areas of interest. It focuses on two aspects deemed important for Tunisia: balance of payments and public finance. The tentative conclusions reached herein are based on data which exist at the time the report is written (mid 1983) and assumptions which are tentative in character. In a field as uncertain as oil

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1/ The World Development Report 1983 assumes an oil price increase of 1.6 percent in real terms between 1982-1995. See World Development Report 1983, p. 28.

and gas, it is possible that new information on oil and gas prospects as well as Government new actions could change the emphasis on the recommendations of this report. Nevertheless, this must be accepted since policy decisions are based on data existing at any point in time. Moreover, the model and method of analysis used in this report should remain valid and allow data adjustments at any time.

Framework of Analysis

Although the scope of this report is limited to the oil impact on the Government budget and on the balance of payment, it is important to recognize the various linkages between the oil sector and the economy. The oil and gas sector is a complex set of markets that link primary sources and processing technologies to a variety of end uses and user types. Unlike other export industries, developments in this sector affect the economy not only via the expansion of income and market, but also via the Government budget. They also have impacts on other economic variables such as the real exchange rate, domestic price level, and employment. Furthermore, exports of oil and gas allow the country to increase its foreign exchange earnings and, therefore, its capacity to import while oil-related domestic expenditures serve to increase domestic income. The oil income accrued to Government revenues can stimulate growth either directly through Government investment or indirectly through current expenditures used to maintain and facilitate the productive capacity of the country.

Recent studies have shown that an increase in oil production and price could reduce the competitiveness of non-oil exports because it tends to trigger an appreciation of the real exchange rate (defined as the relative cost of the domestic manufacturing sector to the international price corrected for the movement in the nominal exchange rate). This is caused through an increase in the monetary base (unless the inflow of foreign exchange is sterilized) and therefore the money supply and domestic prices when the nominal exchange rate is fixed, or through the change in nominal exchange rate when the money supply is fixed and domestic prices stable. Furthermore, the competitiveness of non-oil exports is likely to be eroded because the terms of trade have shifted in favor of the non-tradable sector, either because a substantial portion of oil revenues accrued to the Government is spent on this sector, or because the import regime is relaxed.

Rising oil revenues also bring about inflationary pressures on the economy in the way they are spent. Since a great proportion of government revenues are in the form of foreign exchange while a major proportion of their expenditures are in local currency, the domestic part of the budget tends to show growing deficit which would lead to credit expansion and inflationary pressure. 1/ On employment, however, the oil effect is limited. Exploration and development activities in the hydrocarbon sector involve capital-intensive investments and the impact on training skilled workers, creating employment, etc. is small. 2/ Some authors have even gone further to show that the rate

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1/ See David R. Morgan and his domestic budget balance concept in "Fiscal Policy in Oil Exporting Countries, 1972-78," IMF Staff Papers, Vol. 26 No. 1, March 1979.

2/ See Charles Rollins, "Mineral Development and Economic Growth" Social Research, Vol. 23, No. 3, 1956, p. 253-280.

of oil exports (or depletion) bears a direct relationship to the unemployment rate. 1/

The Oil and Gas Sector in Tunisia

Tunisia's indigenous energy resources consist of oil, natural gas and small hydropower potential. Proven reserves of oil are estimated at about 70 million tons and those of gas at about 27.5 million tons of oil equivalent (TOE). Oil reserves/production ratio is about 14 to 1 in 1982 and gas reserves/production is about 55 to 1. Despite the involvement of a large number of foreign oil companies in the country, exploration drilling has been slow, mainly because of the relatively small size of new finds, the complexity of the geological structure and an inadequate contractual framework. Although oil and gas currently constitute the most important energy resources in Tunisia, it should be noted that a comprehensive energy sector review should also consider other resources such as coal as a possible energy substitute.

Domestic consumption of oil and gas has grown rapidly since 1970, averaging about 11 percent per annum during the 1970s and amounts to 2.9 million TOE's in 1982 2/. Detailed breakdown of historical consumption by fuel categories for selected years is given below.

Table 1.1
DOMESTIC CONSUMPTION OF OIL AND GAS (in '000 TOE)

	1970	1976	1980	1981	1982
LPG	16.8	54.4	95.9	106.8	118.9
Gasoline	89.1	136.4	151.9	159.4	168.4
Kerosene	61.3	99.8	109.0	112.4	122.1
Gas Oil	283.8	590.7	924.2	939.0	925.5
Fuel Oil	445.0	502.5	979.3	999.3	902.5
Jet Fuel	61.3	114.4	177.7	159.4	147.6
Total Products	958.2	1498.2	2438.0	2476.5	2396.0
Gas	-	245.0	409.0	449.0	486.0
Total	958.2	1743.2	2847.0	2925.5	2882.0

Source: Ministère de l'Economie Nationale

11. Regression estimate of income elasticity of demand (or rather GNP per capita elasticity) for petroleum products yields a value of 1.27 (see Annex I). Although this falls within the range of long-run income elasticity of

1/ Dudley Seers, "The Mechanism of an Open Petroleum Economy" Journal of Social and Economic Studies (1964), 233-242.

2/ The figure for 1982 underestimates the consumption trend because several cement plants were closed and the growth of the economy slowed down. As a result, consumption of petroleum products declined relative to 1981.

developing countries, 1/ a careful review of historical data reveals that consumption has accelerated during the second half of the last decade (see Statistical Annex). The income elasticity of demand for the pre 1976 period is 1.0, and that for post 1976 is 2.0. Besides pricing policy, factors responsible for this rapid growth of energy demand may have been distorted relative to factor costs and an incentive system which favored capital intensive technology.

The rapid growth of energy demand was to an important degree due to the energy pricing system in the country. Except for gasoline, prices of petroleum products rose very little between 1964 and 1979 (Table 1.2). Beginning in 1981, the Government has made substantial progress in introducing successive price increases and petroleum product prices are now close to the international price, except for fuel oil and kerosene. The (weighted) average domestic price is about 86 percent of cif import price. Table 1.2 gives the evolution of retail prices.

Table 1.2
EVOLUTION OF RETAIL PRICES OF PRODUCTS (TD/Ton)

	1964	1971	1979	1983a/	1983b/	1983c/	Ratio d/ %
LPG	119.2	119.2	143.0	208.0	147.1	233.6	63.0
Gasoline e/	117.4	148.5	276.8	405.0	377.0	213.6	176.5
Kerosene	46.7	44.3	55.4	123.0	101.2	192.0	52.7
Gas Oil	46.4	52.2	87.0	168.2	146.0	166.9	87.6
Fuel Oil	8.0	8.0	24.0	80.0	75.1	108.1	69.5
Weighted Average f/					126.4	147.3	85.8

Source: Ministère de l'Economie Nationale

Note: a/ Domestic retail price, including taxes
b/ Domestic retail price adjusted for domestic transport and distribution costs, comparable to cif imports
c/ cif price given by ETAP using 1.5 exchange rate
d/ Ratio of b to cif price
e/ Regular
f/ Weighted by quantity consumed

1/ See B. J. Choe, "Energy Demand in Developing Countries", Chapter 18 in International Energy Strategies, edited by J. Dunkerley, or Charles Wolf et al; "Oil and Energy Demand is Developing Countries in 1990", The Energy Journal Vol. 2, No. 4, October 1981.

Institutional Structure

The institutional structure of the Tunisian oil and gas sector is fairly complex, involving various ministries and a number of state enterprises. There is no Ministry of Energy. The Ministry of National Economy is responsible for setting prices at both wholesale and retail levels. The Ministry of Planning is responsible for the sectorial Five-Year Plan while the Ministry of Finance oversees the state enterprises. Of these, the most important is ETAP (Enterprise Tunisienne d'Activités Pétrolières) which is responsible for coordinating exploration and production activities, including the control of crude and refinery product imports. STIR (Société Tunisienne des Industries de Raffinage) is responsible for the domestic refinery. STEG is responsible for production, transmission and distribution of electricity and gas. SEGMA (Société d'Etude du Gas Marin) is responsible for gas development in the Gulf of Gabès. Each of the state enterprise has a board of directors which includes representatives from various Ministries.

The complex institutional structure is reflected in the price setting mechanism for petroleum products. The Ministry of National Economy sets the price at which STIR purchases crude oil from ETAP for the refinery. This price, which stood at $7.2 barrel in 1982, is far below the international price. In the case where ETAP imports crude oil (to maximize Tunisian earnings by exporting high quality crude and importing a low quality type) it also sells to STIR at the same price as domestic crude. STIR purchases crude oil at such a subsidized price, but sells its refinery products at a low price 1/ to the distribution companies. The Government then levies excise taxes on these products. Imported refinery products are sold by ETAP to the distribution companies at the same price as the STIR products. For its complex transactions, ETAP maintains three accounts on behalf of the Central Government, plus several accounts of its own. These three accounts concern a) operation by which Tunisia exports its crude, and the surplus from domestic transactions in crude oil; 2/ b) operation by which Tunisia imports crude oil; and c) operation by which it imports petroleum products, including both direct imports and imports by processing (this is an exchange in kind, involving sending Tunisian crude to the Italian companies for processing at a small fee per ton).

This cumbersome system in which the Government subsidizes crude oil and heavily taxes refinery products was the result of measures taken during the oil crisis of 1974/1975. At that time, the Government attempted to insulate the domestic market from price disruptions in the international market by fixing the domestic crude price sold to STIR. As the oil price began to stabilize, instead of lifting the subsidy on crude, the Government raised excise taxes gradually on petroleum products. It is often claimed that the subsidy on crude is more than being offset by the excise taxes. However, except for gasoline, this is not true. Besides being administratively cumbersome, this system also creates misleading information on petroleum excise taxes in Tunisia.

1/ For example, gas oil is currently sold at TD 88.7 per ton to distributors compared to TD 168.2 at the consumer level and TD 197 at international level.

2/ Budget des Opérations pour le Compte de l'Etat Concernant la Commercialization de Pétrole Brut.

Oil and Gas Contribution to the Budget and the Balance of Payments

All oil and gas revenues, including taxes, enter the Central Government Budget (Titre I). Separate accounts for the oil and gas sector in the Budget had not been made prior to 1982. Estimates of petroleum revenues for selected years are given in Table 1.3. On the average, oil and gas revenues contributed about 27 percent of Government current revenues. The largest component in oil revenues is the ETAP transfer, which is the surplus of the three accounts that ETAP maintains on behalf of the Government, explained above. The second largest is excise taxes, levied at the distribution stage of petroleum products. The above classification of oil and gas revenues does not match the categories in the Budget. Annex 2 E shows an attempt to reclassify oil and gas revenues.

Table 1.3
OIL AND GAS REVENUES 1/ (Million current dinars)

	1978	1980	1981	1982
Total Budget Contribution	145.1	272.1	368.6	486.2
Excise Taxes	59.2	74.0	117.2	121.4
ETAP Transfer	60.4	149.1	180.2	282.8
Royalties	10.5	19.6	21.9	18.7
Profit Taxes	15.0	29.4	49.3	63.3
Percentage of Current Revenues	21.0	27.0	30.0	32.0

Source: Ministère des Finances

Note: 1/ Excluding import taxes on gas oil, ETAP profits and dividends.

Although oil exports accounted for about 50 percent of total merchandise exports, net oil exports accounted for only 27 percent. Nevertheless, they still constitute the single largest category of these exports. Discussion of oil and gas contribution to the balance of payments should focus on net oil exports rather than oil exports because prior to 1982, due to its higher quality crude, Tunisia exported a large proportion of its domestic output and imported the cheaper, Arabian light crude for its use at the refinery plant. Since then, the price differential has narrowed down and Tunisia has virtually stopped this practice. 1/ Net oil exports amount to about $440 million in 1982, equivalent to about 61 percent of current account deficit (Table 1.4). During the Five Year Plan, non-oil merchandise exports have grown quite rapidly in nominal terms, averaging 23 percent p.a., the impetus came mainly from the manufacturing industries. Net oil exports grew at about the same rate, mainly due to price increases.

1/ In 1980, c.i.f. price of Arabian-light import was $34.5/barrel and f.o.b. price of Zarzaitine crude export was $37.75. In 1982, these prices were $34.2 and $34.5 respectively.

Table 1.4
OIL AND GAS CONTRIBUTION TO THE BALANCE OF PAYMENTS
(Million Dollars at current prices)

	1978	1980	1981	1982
Exports of Crude	412.7	1307.9	1264.8	834
Exports of Refinery Prod. 1/	20.7	39.3	42.5	32.3
Imports of Crude		403.0	439.7	130.0
Imports of Refinery Prod.		329.6	333.6	296.4
Net Exports of Oil and Gas	207.0	614.6	534.0	439.9
Net Factor Service Income	-9.4	-3.7	148.6	132
Current Account Balance	-583.6	-418.7	-665.4	-719.0
Debt Service Ratio	10.2	10.9	12.8	16.6
Ratio of debt outstanding and disbursed (DOAD) to GDP	40.5	36.6	38.3	42.4

Source: Ministère des Finances
Note: 1/ Consist mostly of Naphta

CHAPTER II - THE BASE SCENARIO AND PRICING POLICY

A Macroeconomic Model of the Tunisian Economy with an Oil and Gas Sector

To facilitate the study of the economy-wide impact of various policies in the use and development of oil and gas, a macroeconomic model of the Tunisian economy with the specific structure of the oil and gas sector and its linkages to the balance of payment and the budget was constructed. The model is a modified version of the Revised Minimum Standard Model (RMSM) used in the Bank and contains five sectors: agriculture, industry (excluding oil and gas), oil and gas, government and services (see Annex 2). In model building, there always exists a trade-off between the choice of a complex model which is capable of yielding rich results but which involves many assumptions that can be questioned, and the choice of a simple model which may be useful for policy decisions, but which may not capture the complexity of the real world. Here we attempt to strike a balance by retaining the simple macroeconomic framework of the RMSM and by incorporating as much as possible the specific details on the structure of the oil and gas sector, including the operation of each major oil field.

Sectoral growth rates are specified exogenously. Imports of goods are distinguished by end-use and consist of food, other consumer goods, crude oil, petroleum products, intermediate goods and capital goods. Imports of crude oil and petroleum products are determined according to the oil and gas block, described in detail below. Imports of other goods are linked to relevant variables through exogenous elasticities. Exports are broken down by product and include crude oil, refinery products, agriculture, olive oil, processed food, phosphates, phosphoric acid, textiles, chemical goods and other manufacturing goods. Their growth rates are exogenous.

In the usual RMSM framework, GDP is determined from the supply side and, given other components of aggregate demand, consumption is determined residually through national income identities. Prices in the model are those projected by the World Bank, except for the oil and gas sector where more specific data are obtained from ETAP. The linkage of the model with the Bank Debt Reporting System (DRS) allows detailed information on the foreign borrowing and debt structure. Such information is necessary in the assessment of alternative investment strategy on the country's debt servicing capacity. The RMSM framework generally is sufficient to allow us to analyze alternative policies when they do not involve major additional investment because the indirect effects are not substantial and can be ignored. When they do, the model is modified so that these indirect effects can be observed, in which case consumption is determined endogenously as a function of income, and industrial value-added serves to close the model. In addition to the modification regarding income determination mentioned above, the model provides detailed operations within the oil and gas sector, with linkages to the Government budget. Main features of these operations are described below, while details are presented in Annex 2.

Within the oil and gas sector, three subsectors are distinguished: crude oil, refinery products and natural gas. For each subsector, the model determines physical balance according to demand/supply and the difference is made up by exports/imports. Supply is given exogenously while demand is determined by the level of economic activities. The model then traces out the

different types of sharing between the Government of Tunisia (GOT), ETAP and the foreign companies for each oil field. Taxes levied on each partner's share are calculated in detail, as are the exports by each partner. Subsidies by the GOT are also considered explicitly through various accounts held by ETAP on behalf of GOT. The final contribution of the hydrocarbon sector to GOT consists of net profits earned on its operations (net of subsidies) and various kinds of taxes levied on both ETAP and foreign companies, as well as excise taxes on refined products. The contribution to the balance of payments consists of the current and capital accounts for oil and gas. Direct contribution to growth is reflected by the value-added generated in the economy. As with other investments, in the case when a large project is considered, the additional investment during the construction period will generate more capital goods imports which then raise the external gap to be financed and hence more external borrowings (net of direct foreign investment).

Crude Oil. Four oil fields which essentially constitute all Tunisian oil production are considered: El Borma, Ashtart, Douleb Tamesmida and Sidi El Itayem. Output of other oil fields is treated in the same way as that of Sidi El Itayem. The information on production and profit-sharing between GOT, ETAP and the foreign companies for each field was obtained from ETAP. The proportion of crude oil produced that is reserved for the local refinery is a parameter that can be changed by policy makers. The proportion of crude oil reserved for foreign refining and reimport is also a parameter. Crude oil imported is assumed to be the light Arabian type. Prices for domestic purchase, sale and exports by GOT are given at the prevailing level in 1982, growing uniformly at an exogenous growth rate projected by the Bank.

Refinery Products. Six petroleum products are distinguished: LPG, gasoline, kerosene, ATK (jet fuel), gas oil and fuel oil. Domestic supply of each of these comes from the local refinery. Demand for each product type is determined by elasticities, econometrically estimated with respect to the economic activities most relevant to its end use. Thus, for example, consumption of LPG comes from households (hence a function of GNP per capita) while demand for fuel oil comes from industry and agriculture (hence a function of value-added in these sectors) (see Annex I). Difference between demand/supply of each product is made up by export/import. Imports of refinery products come from two sources: imports by exchange of crude oil and direct imports. Ex refinery prices of petroleum products are assumed to reach international level by 1986, in accordance with the Government's goal expressed in the Five Year Plan (1982-86).

Natural Gas. Total supply of natural gas comes from royalty gas (from the Algerian pipeline), and domestic production of natural gas. The royalties are assumed to be in cash. Although they can be given in kind, it may be more advantageous to take cash. In the base scenario, this implies that domestic demand for natural gas will be determined by domestic production. In the case of a large gas project, domestic natural gas is used to substitute for fuel oil, the displaced fuel oil then can be used for

exports according to the supply/demand relation for this product. Natural gas thus is not used for export because it is not practical and because the potential for fuel oil substitution is greater than domestic output of fuel oil.

The Base Scenario

The economic model described can be used to examine the impact of various strategies in the oil and gas sector. We first present the scenario based on anticipated policy and developments in the sector, hereafter called the base scenario, before proceeding to various other policies.

This scenario retains the basic assumptions underlying the Five Year Plan 1982-86. 1/ Data are updated to account for recent economic developments. This means, for instance, that growth rates in 1982 and 1983 are lower than what the Plan had expected, that the budget deficit widened in 1982, and that production of hydrocarbons has been increased according to the latest information given by ETAP. We have assumed that the Government policies to promote exports of non-oil products, to curb imports and to mobilize savings are implemented in a timely manner and successfully so that the trend of the target variables after 1984 will be in line with the desired direction expressed in the Plan. Thus, consumption is expected to slow down to about 5.4 percent from 7.7 percent in the last Plan and imports of goods and NFS to 4.4 percent from 12 percent. Main features of the base scenario are presented in Table 2.0 below.

Table 2.0
THE GROWTH FRAMEWORK
(Average Annual Growth Rates in 1980 Prices)

	1976-1981	1982-1986		1986-1991
	Actual	Plan	Base Scenario	Base Scenario
Consumption	7.7	6.9	5.4	4.7
Private	7.6	6.5	4.8	4.3
Public	7.8	8.4	7.7	6.1
Gross Investment	8.0	2.7	1.5	2.0
Imports GNFS	12.3	5.9	4.4	3.9
Exports GNFS	8.7	6.3	4.5	6.2
GDP	6.3	6.0	4.3	5.1

Source: Actual 1976-1981 and planned 1982-1986 from Tunisia. Review of the VI Development Plan, World Bank.

1/ See Tunisia: Review of the VI Development Plan. World Bank Report No. 4137-TUN. (This is an internal document with restricted circulation.)

In the base case, however, demand for oil and gas is projected using income elasticities estimated from the most recent period (1976-1982) presented in the Annex. Schedule of output by each oil field is as of March 1983 and is presented below. It should be noted that the base case assumes significant additional production from new fields and implies that current Government efforts in oil and gas exploration and development will be sustained.

TABLE 2.1
PROJECTED CRUDE BALANCE
(in million ton)

	1983	1984	1985	1986	1990	1991
Production	5.5	5.5	5.3	5.1	5.6	5.2
El Borma	3.2	3.1	2.8	2.6	1.8	1.8
Ashtart	1.5	1.5	1.7	2.0	1.2	1.2
Other oil fields 1/	.74	.52	.767	.482	2.51	2.11
Douleb Tamesmida	.06	.38	.033	.018	.09	.09
Refinery Consumption	1.6	1.6	5.3	5.3	5.3	5.3
Domestic Crude Used in Refinery	1.55	1.55	1.55	2.1	2.1	2.1
Imports	.05	.05	0.5	3.2	3.2	3.2

1/ Since the sharing agreement between Government and foreign companies in the small oil fields to be developed is not known, output of these oil fields are treated in the same way as that of Sidi El Itayem which, because of its size and profit sharing, is more comparable than the big oil fields.

For refinery products, the model keeps consistency between refinery consumption of crude, refinery output and domestic final demand. Production of refinery output takes into account a new plant at Bizerte beginning in 1986. It is assumed that the surplus of refinery products can be exported. The balance of refinery products consistent with the overall economy is given below.

TABLE 2.2
PROJECTED BALANCE OF PETROLEUM PRODUCTS
('000 TOE)

	1983	1986	1991
Demand			
LPG	123	156	222
Gasoline	173	190	221
Kerosene	123	132	147
Gas Oil	1160	1471	2026
Fuel Oil	1280	1738	2782
Jet Fuel	155	191	260
Domestic Supply 1/			
LPG	30	110	110
Gasoline	180	190	190
Kerosene	125	140	140
Gas Oil	430	2100	2100
Fuel Oil	570	1410	1410
Jet Fuel	-	250	250
Imports (exports)			
LPG	93	46	112
Gasoline	-	-	31
Kerosene	-	-	7
Gas Oil	730	(629)	(74)
Fuel Oil	710	328	1372
Jet Fuel	155	(59)	10

1/ For model classification purposes, naphtha, which is not domestically consumed, is not included here.

The Government is currently exploring the possibilities of substituting gas for higher value petroleum products; the displaced fuels then can be used for exports. Such a strategy, if materialized, could reduce somewhat the pressure on energy balance.

Given the demand/supply in the oil and gas sector, the corresponding balance of payments is given in Table 2.3. It is clear that a continuation of past trends in energy consumption leads to an increasing balance of payments deficit (current account balance). The debt service ratio rises beyond 21 percent by 1991. Indeed, the critical nature of the situation can be gauged by the ratio of debt outstanding and disbursed to GDP, a more accurate indicator than the debt service ratio because no lag in service payments is involved. This ratio increases from about 44 percent in 1982 to 57 percent in 1991. By the end of 1980's, the net oil and gas exports turn to net imports, which by 1991 amount to 28 percent of the current account deficit, exceeding net food imports.

TABLE 2.3
PROJECTED BALANCE OF PAYMENTS
(Million dollars at current prices)

	1983	1986	1991	1983-86	1987-91
Exports of Crude	852	784	1358	3489	6330
Refinery 1/	3	227	36	234	632
Total Exports GNFS	3026	4557	8402	15083	34220
Imports of Crude	11	887	1365	922	5788
Refinery	420	100	611	1692	1871
Total Imports GNFS	3894	5999	10205	19512	41984
Net Factor Service Income	51	-9	-330	117	-997
Current Account Balance	-790	-1426	-2108	-4194	-8639
Debt Service Ratio	16.9	15.7	21.5		
Ratio of Debt Outstanding and Disbursed (DOAD) to GDP	46.2	51.2	56.7		

1/ For model classification purposes, Naphtha, which is not domestically consumed, is included in other non-oil exports.

With respect to the contribution of oil and gas to the budget, the base scenario assumes that the Government's intention to eliminate subsidies will be carried out promptly and successfully so that ex refinery prices of petroleum products will be raised to international level (cif prices of imports) by 1986. In this case, it would be sensible to assume that, in order to make STIR efficient, price of crude oil sold to STIR should also be raised to world level. Furthermore, we assume that excise taxes levied on petroleum products, currently used to partially recover the subsidy given to crude and to products, would be phased out starting in 1986 (except for gasoline, the unit taxes on which still remain at the 1985 level because retail price of gasoline is already much higher than international price). The projected petroleum revenues for selected years are presented in table 2.4 below.

TABLE 2.4
PROJECTED PETROLEUM REVENUES
(Million TD at current prices)

	1983	1986	1991
Total Contribution (excluding transit royalties)	435	701	1124
Excise Taxes	139	45	52
ETAP transfer *	223	394	817
- Domestic Crude Operation	325	405	835
- Imported Crude Operation	-3	-11	-17
- Imported Product Operation	-99	0	-1
Royalties	19	41	39
Profit Taxes 1/	110	125	128
Other indirect taxes 2/	12	2	6
ETAP profit 3/	29	90	80
Dividends 4/	5	4	2
Transit royalties 5/	10	66	121

* Accounts operated by ETAP on behalf of Government
1/ Not including profit taxes that ETAP paid to Central Government, which is included in the line for ETAP contribution
2/ TFD taxes, taxes on gas oil imports.
3/ Net of royalties paid on Ashtart, which have been included under royalties item.
4/ Mostly from El Borma
5/ On transit pipeline, the flow will start in 1983

Excluding the transit royalties (from the pipeline between Algeria and Italy) petroleum revenues growth rate would decline from 36.4 percent p.a. between 1978-1981 (Table 1.3) to below 13 percent between 1983-1991. The decline would be caused by a stagnant crude production and a slow growth in oil export price. It should be noted that the above projection assumes an upward adjustment of domestic prices (ex refinery prices) to international level by 1986. If the adjustment does not take place by then, the role of petroleum revenues would be even further eroded.

The model has detailed transactions and operations for each oil field. For those oil fields that will be developed in the future and, therefore, the profit sharing scheme is not known now, we assume that the scheme will be similar to that of the Sidi El Itayem (small oil field) type, mainly because there is no prospect of a large oil field discovery, such as El Borma or Ashtart. Space limits do not allow the detailed presentation by each oil field. For illustration, we chose the year 1986 (the last year of the current plan) to show the breakdown.

TABLE 2.5
DETAILED CONTRIBUTION OF CRUDE AND PETROLEUM PRODUCTS
TO GOVERNMENT BUDGET IN 1986
(Million TD)

Crude Production	Transaction Surplus	TFD 1/	Profits Tax	Royalties	Dividends	Total
El Borma	336	4	31	-	4	375
Ashtart	8	-	86	41	-	135
Other Fields	61	1	8	-	-	70
Douleb Tamesmida	1	-	1	-	-	2
Crude Imports	-11	-	-	-	-	-11
Refinery Operations	-	-	-	-	-	-
ETAP Surplus	-	-	90	-	-	90
Total	394	5	216 2/	41	4	660

1/ Taxes sur les formalités douanières (Custom Service Taxes).
2/ In Table 2.4, this is 125 TD because profit tax on ETAP is shown separately.

Implication of Pricing Policy

In the base scenario, we have assumed that the Government policy of adjusting domestic price level of petroleum products to their international level by 1986 will be implemented promptly and successfully. Given the concern for inflation and the weakening price prospects of oil in the international market in recent years, the tendency to postpone this adjustment may arise. In this section, we examine the impact of postponing the adjustment during the period 1983-1991

In principle, a distorted pricing system such as the existing one not only caused a drain on the Government budget but only could promote consumption, discourage interfuel substitution and curb incentives to the development of oil and gas resources. Here, however, we focus only on the budgetary impact. Due to the past extensive price control in oil and gas, the effect on consumption of price changes cannot be estimated with any degree of confidence. To the extent that the price elasticity indeed is significant, the case for prompt adjustment of pricing policy can even be made stronger.

Budgetary Impact of Existing Policy

To examine the budgetary impact of postponing price adjustment, we compare the base scenario with the scenario in which the existing domestic price structure (as of mid 1983) relative to international level remains unchanged. That means, for instance, that although in absolute terms, all domestic selling prices of crude and petroleum products would increase at the same rate as world prices, the existing gap between ex refinery prices and cif import prices would continue. We also assume that the (per unit) excise taxes are maintained so that final retail prices would increase at the same rate as international prices. The net impact of this scenario (met with respect to the base scenario) on petroleum revenues is presented in table 2.6 below.

Table 2.6
NET IMPACT OF EXISTING PRICING POLICY ON PETROLEUM REVENUES 1/
(million current TD)

	1983	1986	1991	1983-1986	1987-1991
Total Contribution		-229	-512	-440	-1915
Excise Taxes	-	188	274	188	1196
ETAP Transfer		-363	-734	-540	-2859
- Domestic crude oper.	-	-78	-163	-123	-644
- Imported crude oper.	-	-254	-390	-257	-1655
- Imported prod. oper.	-	-31	-181	-160	-560
Royalties	-	-10	-9	-15	-45
Profit Taxes	-	-	-	-	-
Other Indirect Taxes	-	-	-	-4	-
ETAP Profit	-	-45	-42	-69	-208
Dividends	-	-	-	-	-
Transit Royalties	-	-	-	-	-

Note: See Table 2.4 for an explanation of different categories.

1/ The figures in this table refer to the difference between the scenario based on existing policy as of mid 1983 and the base scenario.

It can be seen that postponing the price adjustment beyond 1986 will impose a high cost on the Government budget. Indeed, if the present price structure is maintained, the surplus transfer by ETAP would become insignificant by 1986 because of subsidy on imported crude oil. Until now, the Government policy of selling crude to STIR at prices below international level has not resulted in a drain on the budget because the quantity of imported crude has not been large and thus because domestic crude is utilized, the economic subsidy is only implicit in the budget. But when the new refinery plant at Birzerte comes on stream in 1986, domestic production of crude will no longer be adequate, and has to be supplemented by imported crude. The subsidy then becomes explicit.

Each component of petroleum revenues enters the Budget through a different account. To facilitate the presentation, these components are classified into direct taxes, indirect taxes and non-tax revenues (the last one includes transfer from ETAP, royalties, etc.). The impact of postponing pricing policy on the budget is presented in Table 2.7.

Table 2.7
NET IMPACT OF EXISTING PRICING POLICY ON GOVERNMENT BUDGET 1/
(Million current TD)

	1983	1986	1991	1983-1986	1987-1991
Total Revenues	-	-229	-511	-440	-1915
Direct Taxes	-	-45	-42	-69	-208
of which petroleum	-	-45	-42	-69	-208
Indirect Taxes	-	188	274	184	1196
of which petroleum	-	188	274	184	1196
Non-Tax Revenues	-	-373	-743	-556	-2902
of which petroleum	-	-373	-743	-556	-2902
Total Expenditures	-	-	-	-	-

1/ For the model classification of petroleum revenues in the Government budget, please see Annex 2E.

The above analysis serves to illustrate the magnitude of the pricing policy on the budget. The determination of an appropriate pricing framework for Tunisia, taking into account end-use substitutions and priorities for the development of indigenous resources should be carried out in a separate study.

CHAPTER III - OTHER POLICIES IN OIL AND GAS

Drawing on the results of previous technical studies on oil and gas policies, this chapter examines the macroeconomic impact of these policies by the use of the model described earlier. The first policy involves the activation of an intensive energy conservation program in industry, leading to a saving of 12 percent in energy consumption by 1986. 1/ The 12 percent used here merely serves to illustrate the possible magnitude of potential savings. It is estimated that a rigorous conservaton in industry alone could result in at least about 10 percent reduction in energy consumption. On the other hand, studies on other sectors are underway and are likely to indicate further, substantial saving for the economy. The second policy deals with the acceleration of oil exploration and development according to the recommendations outlined by the Bank consultants. The third policy combines the first two, and the fourth policy concerns the development of a large gas project. Investment decisions in the last scenario have significant macroeconomic implications which need to be considered.

To assess the impact of the above policies on the economy separately from the impact of price policy, since they are designed by technical experts without regard to the pricing issue, prices in these policies are assumed to be the same as in the base case. This serves also to isolate the cause-effect of different scenarios. The case of increasing domestic selling prices to STIR to international level and its impact was already examined in Chapter II.

Policy 1: Energy Conservation

World Bank experience in the energy sector indicates that there is considerable scope for energy and cost savings in developing countries through policies aimed at raising energy efficiency and replacing high cost sources of energy with cheaper ones. 2/ In addition, the rapid growth of oil and gas consumption in Tunisia (Chapter I) under existing pricing policy and the absence of a well-defined policy on energy consumption indicate that the scope for energy saving may be substantial.

Some of the factors which led to the current situation are not uncommon among developing nations, e.g., relatively low prices, subsidies, lack of awareness of the potential and technical feasibility of energy saving programs, lack of energy management experience. But the existence of a large number of state enterprises, 3/ particularly among the energy intensive

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1/ The Bank's Plan Review also estimated that conservation efforts in industrial plants could yield as much as 10-30 percent saving.

2/ See, for instance, The Energy Transition in Developing Countries. World Bank, 1983.

3/ Tunisia's share of state-owned enterprises in GDP is among the highest in its income group. See World Development Report, 1983. pp. 51.

industries such as construction materials, transport, steel and chemicals, may also have weakened the efforts to conserve energy. The World Bank, through the energy component of a technical assistance project, is helping Tunisia in the auditing of 10 major energy consuming industries with a view to assess the potential for energy saving in these industries. The U.S. Agency for International Development (USAID) is currently conducting a study to determine the extent of energy conservation in several sectors outside industry.

Preliminary results of these studies indicate that the potential for energy savings through conservation measures in Tunisia is substantial, between 10 to 20 percent of consumption. Although the VIth Plan did not allocate any investment to the conservation effort, studies by the Bank show that small scale investment involving for instance combustion efficiency,insulation and other housekeeping measures would cost about $30-40 million in current prices. Moreover, unlike measures to increase supply, energy conservation policy can have faster effects on the energy balance. This policy would involve investing in equipment to conserve energy, coupled with the necessary measures to increase energy efficiency, particularly for industry. These measures include, but are not restricted to, promotion, training and technical assistance. The success of this policy furthermore requires a well integrated program and institutional structure for the energy sector.

In this section, the macroeconomic consequences of such a policy will be analyzed. It is assumed that it will result in a gradual reduction in fuel oil and gas oil consumption, so that, by 1986, total consumption of petroleum products will be about 12 percent less than the level in the base scenario. Gas oil and fuel oil are selected because the likelihood of success is higher and because the potential for energy saving is greater than other petroleum products. The difference between consumption in this policy and that in the base scenario for selected years are listed below.

OIL CONSUMPTION (Million TOE)

	1986	1987	1991
Base Scenario			
Total Consumption	3.879	4.213	5.658
Gas Oil	1.471	1.579	2.026
Fuel Oil	1.738	1.928	2.782
Others	.670	.706	.850
Policy 1			
Total Consumption	3.397	3.648	4.705
Gas Oil	1.250	1.328	1.643
Fuel Oil	1.477	1.614	2.209
Others	.670	.706	.850

Impact on the Balance of Payments. Under this policy, the current account deficit would be reduced by about 7 percent during the current Plan and about 22 percent during the 1987-1991 plan. Debt service ratio declines by more than 3 percentage points, to about 18 percent by 1991. Total foreign

exchange savings would amount to over $100 million per annum between 1984-86 and over $375 million during 1987-1991. Table 3.1 below shows the total net impact.

TABLE 3.1
POLICY 1: NET IMPACT ON BALANCE OF PAYMENTS 1/
(Million current $)

	1983	1986	1991	1983-1986	1987-1991
Crude Exports	-	-	-	-	-
Refinery Exports	-	71	189	71	672
Goods NFS Exports	-	71	189	71	672
Crude Imports	-	-	-	-	-
Petroleum Imports	-	-61	-202	-185	-681
Goods NFS Imports	-	-77	-242	-220	-828
Net Factor Service Income	-	13	143	17	392
Current Account Balance	-	162	573	308	1892
Debt Service Ratio	-	-1	-3	-	-
Ratio of Debt OAD to GDP 2/	-	-2.4	-9.1	-	-

Note: - Component may not add up to totals due to rounding
- (-) indicate zero or insignificant

1/ This table, and subsequent tables in this chapter, refer to the difference between the respective policy and the base case.
2/ Ratio of Debt, outstanding and disbursed, to Gross Domestic Product (percentage).

Impact on the Budget. The reduction in energy consumption will slightly reduce petroleum revenues accruing to the Government. Given the anticipated tax policy, this would involve a reduction of about TD 6 million p. a. during 1984-91. However, the reduction in consumption lowers imports and, therefore, could lower current expenditures by the savings in interest payments resulting from reduced borrowing from abroad as compared with the base case. 1/ Due to these reduced interest payments, the current budget deficit would be reduced during the 1987-91 period by about 50 million TD p.a. Table 3.2 below shows the impact on the Government current budget. The budget deficit would worsen slightly by this policy in the first few years but would improve thereafter.

1/ Government consumption of petroleum products is small and therefore the reduction in current expenditures associated with this policy is not significant.

TABLE 3.2
POLICY 1: NET IMPACT ON THE BUDGET
(Million current TD)

	1983	1986	1991	1983-1986	1987-1991
Total Revenues	-	-4	-9	-17	-32
Direct Taxes	-	-	-	-	-
of which Hydrocarbon	-	-	-	-	-
Indirect taxes	-	-4	-10	-33	-35
of which Hydrocarbon	-	-	-	-24	-
Non tax revenues	-	-	1	16	4
of which Hydrocarbon	-	-	1	16	4
Total Expenditures	-	-8	-91	-11	-247
Net Impact on Budget Deficit	-	-4	-82	6	-215

Note: - Component may not add up to totals due to rounding
- (-) indicate zero or insignificant

The above analysis brings out the following points. First, the impact of better energy demand management policies can be significant on the balance of payments. The debt service ratio could be reduced by three percentage points and the current account deficit by 10 percent in the short to medium term, and by 22 percent over the long term. Second, the impact of these policies on the Government budget would be slightly negative in the short to medium term, (which perhaps explains the insufficient attention paid to these policies by the Government in the past), but will, in the long term, become beneficial, not so much through increasing revenues, but by reducing the expenditures in terms of savings in interest payments. Third, the same policies would have uneven impact on the balance of payments and the budget. The impact on the former is immediate and much more substantial than the latter.

Policy 2: Exploration and Development

The policy to be considered 1/ in this section, estimated to cost about $66 million in current prices, consists of accelerating the development of various oil fields within the constraint of technical feasibility. Specifically it involves:

- Increase oil production from El Franig area in 1989

1/ This policy was designed by a Bank consultant.

- Bring in "other fields" 3 years earlier (1986 rather than 1989) and increase their production in later years.

- In addition, continue Sfax area production for 3 years after the expected 1985 shut-down

This policy would not involve large investments costs and simply entail an acceleration of Government expenditures already allocated under the current Plan. The effect of this policy on oil production would be as follows:

PRODUCTION OF OIL
(million tons)

	1983	1986	1988	1990	1991
Current ETAP Projection	5.5	5.1	5.3	5.6	5.2
Proposed Policy	5.5	5.7	6.3	6.1	5.7
Increase	-	.6	1.0	.5	.5

Impact on the Balance of Payments. This policy would generate an additional $221 million per annum in exports of crude oil, over the period 1987-91. This would partly be offset by a slight increase in imports of petroleum products (due to the increase in income associated with the higher level of crude production) and by rising factor service payments (from oil companies). The current account deficit will be reduced by about 16 percent p.a. on average over the respective period, and the debt service ratio will decline by more than 3 percentage points to about 18 percent by 1991. Table 3.4 shows the impact on the balance of payments.

Compared to Policy 1, the impact of this policy is more immediate, but smaller, on the balance of payments.

TABLE 3.4
POLICY 2: NET IMPACT ON BALANCE OF PAYMENTS
(Million in current $)

	1983	1986	1991	1983-1986	1987-1991
Crude Exports	-	189	234	189	1104
Refinery Exports	-	-	-	-	-
Goods to NFS Exports	-	189	240	189	1104
Crude Imports	-	-	-	-	-
Petroleum Imports	-	9	18	10	70
Goods NFS Imports	-	5	10	5	40
Net Factor Service In.	-	-	108	-	330
Current Acct. Bal.	-	184	337	184	1392
Debt Service Ratio	-	-1	-3		
Ratio of Debt OAD to GDP	-	-1.9	-6.8		

Note: - Component may not add up to totals due to rounding
- (-) indicate zero or insignificant

Impact on Public Finance. Policy 2 will bring about 100 million TD to Government revenues (taking into account partners' share of profits) between 1987-1991, over four-fifths of which in the form of non-tax revenues. Direct taxes on profit would account for about 10 percent; indirect taxes for the remaining 10 percent. This slight increase in indirect taxes would come from the increase in consumption, which would be offset by the small decline in import tax receipts. It should be noted that current expenditures would also decline due to the reduction in interest payments. Table 3.5 shows the net impact.

TABLE 3.5
POLICY 2: NET IMPACT ON PUBLIC FINANCE
(Million Current Dinars)

	1983	1986	1991	1983-1986	1987-1991
Total Revenues	0	88	114	88	521
Direct Taxes	0	12	10	12	55
of which Hydrocarbon	0	10	6	10	41
Indirect Taxes	0	0	0	0	2
of which Hydrocarbon	0	0	2	0	9
Non-tax revenues	0	76	104	76	464
of which Hydrocarbon	0	76	104	76	464
Total Expenditures	0	0	-69	-	-208
Net Impact on Bud. Def.	0	-88	183	88	729

Note: - Component may not add up to totals due to rounding
- (-) indicate zero or insignificant

Compared to Policy 1, the impact of this policy on Government revenues is much more substantial.

This policy would have a significant impact on both the balance of payments and public finance. Perhaps this could explain why exploration and development activities have received more attention from policy makers than demand management measures (Policy 1). However, if we consider the fact that both policies have about the same effect on the energy balance, it becomes apparent that Policy 1 would have a longer lasting and more potent effect on the balance of payment, whereas Policy 2 could particularly affect Government revenues.

Policy 3: Combined Policy

Given the small magnitude of investment involved in Policies 1 and 2, the possibility of combining both Policies is examined further. From the demand side, this involves an acceleration in the energy conservation effort and investment in energy saving equipments which would lead to 12 percent savings in petroleum consumption, and from the supply side, a well integrated program to promote and accelerate the development of the small oil fields mentioned earlier.

Impact on the Balance of Payments. The effect of the combined policy on the balance of payments could be substantial. The current account deficit could decline continuously during the 1984-91 period, on average by about 32 percent. The debt service ratio would decline to 15 percent, about the level in 1982. Table 3.6 shows the total net impact.

TABLE 3.6
POLICY 3: NET IMPACT ON THE BALANCE OF PAYMENTS
(Million $ current)

	1983	1986	1991	1983-1986	1987-1991
Crude Exports	-	189	239	189	1104
Refinery Exports	-	71	189	70	671
Goods NFS Exports	-	260	429	260	1776
Crude Imports	-	-	-	-	-
Refinery Imports	-	-58	-199	182	666
Goods NFS Imports	-	-80	-247	222	849
Net Factor Serv. Income	-	13	254	17	730
Current Account Balance	-	353	929	499	3355
Debt Service Ratio	-	-1	-6		
Ratio of Debt OAD to GDP	-	-4.3	-15.7		

Impact on the budget. Whereas the prospects on external balance could greatly improve with the combined policy, and total revenues would increase, the budget situation would still remain critical. For the period 1983-1986, the combined policy does not yield much in terms of revenue compared to Policy 2. This should be expected because, as mentioned earlier, the energy conservation effort would slightly decrease budget revenues in the first few years. The petroleum contribution to current revenues would still decline from about 32 percent in 1982 to 23 percent in 1991. Table 3.7 shows the net impact on the Government budget.

TABLE 3.7
POLICY 3: NET IMPACT ON GOVERNMENT BUDGET
(Million current TD)

	1983	1986	1991	1983-1986	1987-1991
Total Revenues	-	84	105	71	486
Direct Taxes	-	12	9	12	54
of which Hydrocarbon	-	9	6	10	40
Indirect Taxes	-	-4	-10	-33	-35
of which Hydrocarbon	-	-	-	-23	9
Non Tax revenues	-	76	105	92	467
of which Hydrocarbon	-	76	105	92	467
Total Expenditures	-	-8	-156	-11	-450
Net Impact on Budget Deficit	-	92	-261	-82	-936

Note: - Component may not add up to totals due to rounding
- (-) indicate zero or insignificant

Other Policies. So far we have focussed on the impact of various policies on the balance of payments and the budget. But these policies could have repercussions on other macroeconomic variables as well. For instance, the first policy would increase gross domestic savings by 13 percent by 1991, the second policy by 7 percent and the third by 20 percent. The second and third policies would also bring about an increase in GDP due to the increase in crude production.

55. How important is the timing of the policies discussed? For Policy 1, if the results in energy savings were to be obtained two years earlier (i.e. in 1984 instead of 1986), our calculations show that the current account deficit would be reduced by a further $400 million over the period 1984-1991. On the other hand, the budget would slightly improve towards the end of the period (as mentioned earlier, the favorable impact on the budget would only be felt after a long lag, in this case, it would be felt by 1988 rather than 1990).

Given the increasingly difficult budget situation, as Tunisia enters the post-hydrocarbon era, we also consider the possibility of increasing taxes on petroleum products. Excise taxes on petroleum products are chosen for this purpose and are assumed to increase at par with international prices. 1/ This should serve to restrain the growth of energy consumption on the one hand and to facilitate tax collection on the other. It is found that this policy would bring in about an additional 150 million TD per annum to the budget. Of course, like other indirect taxes, this increase in excise taxes could worsen

1/ We thus make these taxes ad valorem, rather than unit taxes as they are.

the income distribution. The incidence of such taxes therefore should be investigated.

Policy 4: Development of a Large Gas Project 1/

In this section, the model is extended to measure the impact of a large gas project on the economy. In the case where the size of the project is large, the microeconomic decision based on project analysis is a necessary, but not sufficient, condition to undertake the project because of the project's possible consequences on the balance of payments, and subsequently on the creditworthiness of the country (which in turn may affect the terms of its borrowing). A macroeconomic analysis of the project impact would be useful as a supplement to project analysis although taken alone it could not insure that any particular project should be chosen over others. The particular project is used as an example here simply because it has been identified, its costs and expected stream of output are known, and it is a large undertaking suitable for our analysis. The analysis in this section serves merely to illustrate the approach and the kind of considerations that should be taken into account when exploring such a policy. To save space, the simulation results are presented in the appendix, only the framework of analysis and conclusions are presented here.

Framework of Analysis. Since the impact of a large project on the economy is not commonly analyzed, a brief review of the framework may be useful. Development of the large gas field (hereafter called LOGP, for Large Offshore Gas Project) will affect the Tunisian economy in several ways. First, the project has a direct effect on income and expenditures. Second, these direct effects will cause repercussions throughout the economy, the so-called "induced effects". Third, because the project requires large imports and capital inflows and at the same time increases exports, the debt service ratio of the country could be affected. The impact on the economy would vary according to two distinct phases. During the construction period, the project will lead to increased expenditure on domestic goods and services. In an economy operating at less than full capacity such as Tunisia, this would lead to an addition to aggregate output. Furthermore, the increase in income caused by spending will in turn generate other rounds of income. 2/ On the external side, imports of capital goods (machinery and equipments) would increase. To the extent that these imports have no direct effect on income, they do not induce further expenditures in Tunisia. The effect on the overall balance of payments depends on the magnitude of direct foreign financing compared to the direct import content of the project. If they are equal, the effect is not noticeable during the construction period, although the future outflow of interest, dividends and debt repayments will show up late in the operating period. Government expenditures will increase in the

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1/ Such as Miskar.

2/ On the other hand, in an economy operating at full capacity, the effect would be to raise the price level as resources are bidden from other sectors.

construction period, to the extent that the Government finances part of the capital costs.

During the operating period, the value-added of gas will boost output, investment is expected to fall back to normal level, employment on the project tends to decrease as construction work tapers off. Imports would be back to normal trend but capital outflows in terms of debt repayments would increase. Rising outflow of dividends and interests would also be expected. Exports and Government revenue would increase.

Adding to the induced effects are changes in exchange rates and prices. During the construction period, the current account deficit is likely to worsen because imports increase (both the import content of the project and the import content of the induced increase in consumer expenditure work together) and exports decline (perhaps by resources being bidden away from other sectors). At the same time, on the capital account, there will be net additional capital inflows. The net effect on the exchange rate will depend on the magnitude of the deficit/surplus of these two accounts. If the current account deficit is larger than the surplus on the capital account (e.g., if the import content of the project is larger than its foreign financing), the exchange rate will depreciate (or reserves will be drawn down) and there will be additional effects on the volume and price of exports as well as of imports.

In the case of the Tunisian economy, the induced effects on prices and exchange rates are likely to be diffused because of the existence of a comprehensive, complex system of price controls and subsidies. Furthermore, the availability of a large surplus of unemployed labor implies that if a sensible wage policy is followed, an increase in exports can be accompanied by an increase in aggregate supply without affecting the price level.

Within the framework of the model described earlier, the induced effects cannot be observed because consumption is residual. To allow for the induced effects on income, expenditures and imports, it is necessary that income be made endogenous so as to allow for the multiplier effect. The model thus has to be modified by specifying an annual marginal propensity to consume that corresponds with our base run. The impact of the large gas project, hereafter called LOGP, will work through the economy in the following way. First, the direct expenditure on domestic output will generate income which is then spent on domestic goods and generate the second round income. The leakage in income from imports will also take place. This process goes on until the last dinar is spent. To the extent that domestic supply cannot satisfy this demand, the increase in expenditures will be reflected in imports which then serve to check this growth in demand. In other words, our model is now demand-driven.

To obtain the LOGP scenario, we first reorganize data to reconstruct the same base scenario (discussed in Chapter 2) using the demand-driven model. Given this base scenario, we then proceed to incorporate the project keeping the same behavioral assumptions as in the base scenario. The two scenarios are then compared to each other (Annex 2F).

Project Costs and Financing. Following an estimate by Société d'Etude du Gas Marin (SEGMA), the cost of the project is about $556 million

(constant 1982 prices), consisting of four components: drilling, platforms, gasoduct and a plant. Besides equity participation, three sources of foreign financing are envisaged by SEGMA: i) export credits with 10 percent interest, 8 year maturity and 5 year grace; ii) soft loans at 12 percent interest, 14 year maturity and 4 year grace; and iii) financial credits at 16 percent interest, 7 year maturity and 2 year grace.

Detailed simulation results on income, expenditures, balance of payments and the budget during both the construction and operation periods for both direct effects and induced effects are presented in the appendix. Only a brief summary of the results are discussed in this section. It should be emphasized that these results reflect the particular financing assumptions used by SEGMA. Other financing methods (such as non-resource financing) could change the conclusions reached herein.

Effects on Income and Expenditures. During the construction period (first five years) LOGP generates relatively small value added through the direct effect on the construction sector and through the induced effect on other sectors via the multiplier of the initial spending. The induced effects on income and output are much greater than the direct effects during the operating period. On average the project generates about 35 million TD p.a. (in 1980 prices) in domestic income during the construction period and about 200 million TD p.a. (1980 prices) during the operating period.

Effects on the Balance of Payments. During the construction period, because the project requires imports, the resource gap will be widened by $92 million p.a. However, the increase in factor service payments will raise the current account deficit by an additional $20 million. Consequently, the ratio of debt outstanding and disbursed to GDP will be raised by over 1 percent p.a. between 1982-85 and by 4 percent in 1986. This ratio will only begin to decline in 1988, 6 years after the project started, which implies that if the Government undertakes the project in 1984, the ratio would peak sometime in 1990. The analysis in chapter 2 has shown that this is precisely the period where, if nothing is being done on the consumption side, the balance of payments will be under considerable stress.

Effects on Public Finance. During the construction period, the total effect on Government revenues is minimal, arising mainly from the increase in import taxes and income taxes. During the operating period, however, the effect is substantial, amounting to about $135 million p.a. Government current expenditures also rose by TD 23 million p.a. during the first eight years because of rising interest payments.

The above analysis has shown that although the project generates substantial income and Government revenues as well as reduces the balance of payments deficit, the timing of the project should be a matter of concern. First, if the project had been started several years ago, the peak impact on the balance of payments would have taken place in the mid 1980's and the effect would have been minimized. As things stand now, the construction of the project during the current Plan with the financing method above, would delay the peak impact toward the end of 1980's, therefore creating more pressure on a strained balance of payments. Second, unless another non-conventional financial scheme is found, the project should not be implemented by the Government alone unless measures in policy 1, 2, or preferably 3 (combination) have been taken to dampen the demand and to

alleviate the pressure on both the current account and the budget deficits. Third, there is evidence that once the prospects on the balance of payments and on the budget become better, the project may bring substantial benefits to the Government budget and to the balance of payments.

Summary of Various Policies

Scenario	Policy	Cost (in current prices)	Result during 1983-1991 on energy balance
Base	No policy change	0.0	0.0
Policy 1	Conservation	$30-40 million	13% reduction in consumption
Policy 2	Development of small oil fields	$66 million	12% increase in production 1987-91
Policy 3	Both 1 and 2	$96-106 million	Sum of 1 and 2 above
Policy 4	Development of large gas project such as LOGP	$820 million	36 MTOE LPG, 82 MTOE Gasoline 960 MTOE fuel oil per annum

Net Impact on the current account balance (+ indicates an improvement, - a deterioration) in million dollars

	1982-85	1986	1987	1988	1989	1990	1991
Base	-	-	-	-	-	-	-
Policy 1	147.	162.	215.	282.	363.	459.	573.
Policy 2	-	184.	347.	299.	116.	294.	337.
Policy 3	147.	353.	573.	592.	490.	770.	929.
Policy 4	-392.	-174.	109.	155.	264.	324.	391.

Net Impact on the Ratio of Debts (outstanding and disbursed) to GDP (in percentage)

	1982-85	1986	1987	1988	1989	1990	1991
Base	-	-	-	-	-	-	-
Policy 1	-1.8	-2.4	-3.5	-4.8	-6.2	-7.5	-9.1
Policy 2	-	-1.9	-4.3	-5.5	-5.0	-6.0	-6.8
Policy 3	-1.8	-4.3	-7.7	-10.1	-11.1	-13.3	-15.7
Policy 4	4.5	3.9	.9	- .4	-1.8	-3.1	-4.6

Net Impact on Government current revenues (in million TD) (+ indicates an improvement, - a deterioration)

	1982-85	1986	1987	1988	1989	1990	1991
Base Case	-	-	-	-	-	-	-
Policy 1	-13.5	-4	-5	-5	-6	-7	-9
Policy 2	-	88	161	123	19	104	114
Policy 3	-13.5	84	156	117	12	96	105
Policy 4	54	18	88	112	133	153	192

Net Impact on Government current expenditures (in million TD) (+ indicates an increase, - a decrease)

	1982-85	1986	1987	1988	1989	1990	1991
Base Case	-	-	-	-	-	-	-
Policy 1	-3	-8	-17	-29	-45	-65	-91
Policy 2	-	-	-10	-30	-47	-52	-69
Policy 3	-3	-8	-28	-58	-91	-117	-156
Policy 4	31	38	46	36	24	7	-16

CHAPTER IV - ISSUES AND RECOMMENDATIONS

The foregoing analysis indicates that a continuation of past trends in energy consumption will inevitably lead to balance of payments and Government budget deficits which will be difficult to sustain. Thus, policy actions in this sector are needed to reverse this direction. In light of recent economic events which include a stagnation in output and emerging financial constraints since 1981, the need for these policies has become more urgent. Previous chapters have made clear that any of the policies considered in this report is superior to the no-policy option. However, although demand and supply policies both affect the energy balance, their impact on other macroeconomic variables, in particular the Government budget and the balance of payments may be different. The choice of a particular policy therefore should be made in accordance with the country's overall development objectives, which are to maintain a viable growth with a sustainable balance of payment.

Priority of Various Policies. The analysis of various policies has shown that a long lasting, sustainable balance of payments deficit can only be achieved if conservation measures are taken, but that these measures need to be supplemented by other policies to offset the declining Government revenues. Pricing policy taken jointly with Policy 1 seems to be appropriate because it reinforces the reduction in consumption on the one hand and substantially raises Government revenues on the other. The pricing and conservation policies should also be taken together with policy to accelerate the exploration and development of the small oil and gas fields, given its relatively small investment. The most appropriate timing for the large investment projects, which yield substantial benefits in terms of foreign exchange earnings and Government revenues, appears to be either after the other policies have taken place, or until other financing schemes can be found which will not affect the country's external debt. Given the long gestation period for projects in oil and gas, actions also need to be taken now to formulate a national strategy aimed at stimulating supply in the long run.

Pricing Issue. Central to an effective energy policy is an appropriate pricing framework. The distortions in petroleum retail prices, particularly of fuel oil, not only encourage consumption but also provide the wrong signals to investment, which probably partly explains the high energy and capital intensity of the investments in the last Plan in contrast with labor intensive investments. 1/ Relatively low prices of energy products also make investment in energy conservation less profitable. The Government is well aware of this problem and is committed to increase domestic fuel and gas price to the international level by the end of 1986.

The oil and gas price system in Tunisia furthermore has suffered from a cumbersome and inefficient aspect, namely the subsidies on crude oil and heavy taxes on petroleum products at the distribution stage. This system currently not only affects domestically produced crude oil and refinery products, but also imports. It causes a drain on the budget, which will

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1/ See Tunisia: Review of the VIth Development Plan. Ibid. p.7.

increase when the new refinery plant comes on-stream at Bizerte. Moreover, because the system was a result of ad hoc measures adopted during the oil crisis of the 1970s, it is never clear why the relative prices of different petroleum products should be the way they are.

Recommendation. The Government's commitment on pricing will not be difficult to be carried out given the relative weakening of oil price in the international market and should be maintained even when short-term concerns on inflation may dictate otherwise. It is further recommended that a study on pricing of energy products be undertaken to determine the appropriate absolute and relative prices, taking into account the possibilities of end-use substitutions (including coal), the priorities for the development of indigenous resources, and the impact on energy conservation. In the meantime, the Government could relieve ETAP from having to sell domestic crude oil to STIR at a fixed price. Instead, STIR should be free to buy the crude it needs, whether from the foreign oil companies, ETAP, or imports at the prevailing world price. In turn, STIR should be free to set the price of its petroleum products to cover the refinery and input cost. Indirect taxes levied at the distribution stage then could be reduced so that the rise in retail price of products would not be excessive. Even in the case where factors other than economic are involved and prevent the implementation of the above action, 1/ the Government could at least offset the budgetary subsidy by asking STIR to import directly the additional crude and refinery products it needs and by allowing STIR to charge the distributors prices that cover its costs.

Issue in Public Enterprises. In Tunisia, pricing policy based on international prices may not be sufficient to promote energy conservation because of the preponderance of public enterprises, particularly among the energy intensive subsectors, such as cement, chemicals and transport, which have the largest potential for energy saving. Two possible interrelated reasons for this come to mind: the weakness of a profit motivation by state enterprises and/or the unattractiveness of additional investment in energy saving equipment when final output prices are controlled.

Recommendation. It is recommended that the Government allows the energy-intensive public enterprises (some of these have been identified by other studies, e.g., USAID) to charge output prices sufficient to cover their input costs. One possible way to do this is to add output prices of these enterprises to the list of "auto-homologation" products, the price of which are allowed to rise with input costs provided that these output prices are determined at levels of efficient operation (including appropriate energy efficiency). Moreover, since the Government can exert more control on the operations of these enterprises than in the private sector, it could enforce the adoption of the conservation measures and standards more effectively through setting energy consumption targets related to output levels as well as providing bonuses to plant management and labor for achieving these targets; and through requiring monitoring and periodic reporting on progress in agreed conservation programs at the plant level.

1/ For example, it may be difficult for the Government to negotiate with the foreign oil companies on the price of domestic crude reserved for local market, if the Government is selling this portion at international price.

Issue in Conservation Program. The Government has recently set up a unit in charge of collecting data on energy consumption (attached to the Ministry of National Economy) but this unit so far has only limited manpower and does not have the authority nor the expertise to formulate and implement a national energy conservation program.

Recommendation. It is recommended that a permanent body consisting of high-level representatives from the Ministry of Finance, Planning and National Economy be set up and given the mandate to (a) gather data, collect auditing results and coordinate the various studies on energy conservation by various local and international organizations, the objective is to assess the potential for energy saving; (b) organize and map out a strategy to launch a nationwide energy conservation program with initial focus on energy intensive public enterprises; (c) prepare pre-investment studies on energy saving equipment; and (d) report annually to the Council of Ministers on progress of the program. The staff of such a permanent body should consist of both technical (engineers) and policy oriented managers. The energy conservation program should include measures to increase awareness through educational and promotional efforts, intensive training and technical assistance. Regulations concerning energy efficient standards for industrial and transport equipment should also be included in the program. Conservation progress in the private sector could be accelerated by providing investment and operational incentives such as making training and technical assistance available upon request at low costs, low-cost financing for energy efficiency investments in small and medium size companies.

Timing Issue. While the urgency of needed reforms in pricing and in conservation policies may not be felt as strongly due to the weakening price prospects of oil in the international market in the recent past, as pointed out in Chapter 3 (para. 56), the longer the delay, the higher is the economic cost, and perhaps the more difficult for the economy to readjust to an era where energy is no longer cheap.

Recommendation. Immediate actions could start on two fronts. The Government could start first strengthening the institutional capability of the Energy Conservation body (para. 78) and entrust it with the preparation of a preliminary plan to carry out the energy conservation program to be dicussed in the course of the mid Five Year Plan Review in early 1984. The Plan should draw on previous studies, including the preliminary results of the audit program to assess the potential of energy savings, and to propose a timetable to implement the program. Second, although the Government has decided to increase domestic prices of petroleum products to international level by 1986, it may be desirable to accelerate the adjustment of fuel oil and gas oil prices earlier, i.e., during the current Plan (1982-1986).

Inflation and Poverty Impact Issue. The proposed changes in energy pricing policy may have an impact on inflation and poverty, the priority concerns of the Government. Due to recent wage rate increase and the liberalization of some products (milk, etc.) in 1982, the inflation rate has accelerated to 13.7 percent (compared to 7.5 percent in the V Plan) although it is expected to slow down to below 10 percent this year. The concern often voiced that increasing petroleum prices may fuel inflation and adversely affect poverty groups, may deter the Government effort to take corrective measures.

Recommendation. Studies on the impact of fuel prices increase in other developing countries in the transport sector do not reveal major impact on the inflation. The study on industrial energy by USAID on Tunisia also shows that for a variety of products, especially staple food products, the ratio of energy cost to selling price is below 10 percent. It is recommended that the current study conducted jointly by the Bank and the Government 1/ be expanded to assess the impact of energy price increase on the general price level and on the distribution of income. The poverty groups affected could then be compensated possibly by direct income transfers.

Issues in Exploration and Development Policies

The analysis in Chapter 3 has highlighted the priority of demand management policies in the oil and gas sectors. The pricing and conservation issues can substantially affect the prospects of a manageable deficit for the balance of payments and the budget in the medium term. In the long term, however, pricing and conservation policies need to be supplemented by intensified exploration and development efforts.

Tunisia has always elicited a high level of interest from petroleum companies and has been successful in promoting acreage to foreign investors. About thirty companies are now active in areas which cover over two-thirds of the prospective Tunisian on-shore and off-shore. Nevertheless, inspite of a reasonably persistent and continuing exploration effort by the industry, the companies are not proceeding at a satisfactory rate in appraising and developing the many discoveries made over the past decade. The relatively small size of new finds, the complexity of the geological structure and the relatively frequent occurrence of gas, have probably had major influence in holding back foreign companies from moving swiftly. However, there is also evidence that relatively harsh fiscal terms, and insufficiently well defined policies on natural gas, have contributed to this problem. The Government has recognized these deficiencies in the present contractual framework and is preparing new legislation aimed at providing appropriate incentives for the development of marginal finds and production of domestic gas resources.

Recommendations. It is important that the Government finalize the appropriate adjustments to the contractual framework as soon as possible, and it is recommended that major emphasis in developing this modified framework be placed on:

(i) providing flexible fiscal terms aimed at, on the one hand, giving economic incentives on fields that are in fact small or marginal producers and, on the other hand, achieving a higher Government take on medium or higher levels of annual cost flows. These terms should apply for both oil and gas;

(ii) providing clear principles for future natural gas production agreements covering gas pricing, take or pay provisions, and gas delivery; and

(iii) relaxing the foreign exchange control system to foreign companies. This may have a key impact in helping to encourage companies to invest in

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1/ Study on the impact of fuel taxes on price level and income distribution.

appraisal and development of domestic oil and gas. In addition it is important that ETAP develop its capability to monitor the exploration and appraisal activity more closely, and that the modified framework ensure that both ETAP and the Government receive from the companies all the information required to make a sound judgement on the value and size of a possible future ETAP participation at the development stage.

Issue in the Development of Large Oil and Gas Projects

The analysis of policy 4 in Chapter 3 has shown that the benefits accrued to Tunisia in terms of budget revenues and foreign exchange earnings are substantial when a large project is developed in this sector. The issue thus is what the optimal timing for these large projects would be.

Recommendations. Although the optimal timing would appear to have been 1981 or 1982, such a project should not be undertaken alone by the Government during the current Plan without first adopting a rigorous program aimed at curbing domestic energy consumption (Policy 1) and at increasing the production of some oil fields discussed in Policy 2. It is possible that with other method of financing (e.g., limited recourse financing), the risk of the project and the debt burden may shift from the Government to partners (in which case the benefits to Tunisia would also decline) and this remains a possibility to be explored. Given the long gestation period for oil and gas projects, it is recommended that an analysis of all major projects should also be undertaken to assess the potential and cost of increasing hydrocarbon output and revenues so as to provide a long-term growth impetus to the economy.

Annex I

Estimate of Oil Demand

Data for oil and gas consumption by fuel categories are available for the period 1970-1982. This is the most up-to-date, complete information given by the Ministry of National Economy.

I. Methodology: The functional form of the demand equation is

$$Q = CY^{B}e$$

where Q is the quantity consumed per capita, Y is per capita income and e is the error term, assumed to be white noise. C and B are parameters.

Taking logarithm from both sides

$$\ln Q = A + B \ln Y + E$$

where A is the constant term, B represents income elasticity of demand and E is a log normal, identically and independently distributed random variable.

There are various functional forms in the literature. The above is the simplest and usually yields sensible results. The possibility of using transcendental logarithmic functions to estimate the elasticity of substitution between various fuel categories is excluded because the data base is too limited. Almon distributed lag and geometric models have been used by Choe in his estimate of energy demand in developing countries 1/ but the lagging of time series by four, five periods will cause our sample size to become too small. Furthermore, our aggregate estimate of income elasticity, presented below, is not much different from his.

Empirical estimates of income elasticity in developed countries vary between .79 to 1.23. 1/ In a sample of nine developed countries for the period 1953-1974, Joy Dunkerley found their values to range from .70 to 1.87. 2/ She also found that income elasticity became much higher with time. Choe studied energy demand in 40 developing countries and found that their income elasticity is much higher than that of developed countries, averaging 1.3. 3/

1/ See Joy Dunkerley, Trends in Energy Use in Industrial Societies - An Overview. Washington, D.C. Resources for the Future, 1980. Chapter 5, p. 79

2/ ibid

3/ B. J. Choe, "Energy Demand in Developing Country", chapter 18 in International Energy Strategies, Joy Dunkerley, Editor, OGH Publishers, 1980.

The estimation method used in this report is Ordinary Least Squares. There is a temptation to use Zellner's seemingly unrelated regression because consumption data on various fuel categories are available. However, the existence of serial correlation in some of the equations renders this method unsuitable because recent studies have shown that for finite samples, serial correlation will make OLS a better choice than Zellner's method. 1/

II. Estimation Results

The estimated equations, obtained by Time Series Processor, are presented below where numbers in parentheses denote standard errors, D.W. denotes Durbin Watson statistics and R^2 is coefficient of determination. For each equation, the estimated coefficients are presented first for full sample, then for the first period (1970-1976) and finally the latest period (1976-1982).

1. Total Petroleum Product Demand: Ln (total per capita consumption) = A + B ln (GNP per capita)

Full sample (1970-1982)

$$A = -8.17 \quad (.65)$$

$$B = 1.269 \quad (.12)$$

$$R^2 = .91$$

$$D.W. = .706$$

Early Period (1970-1976)

$$A = -5.04 \quad (.43)$$

$$B = .67 \quad (.08)$$

$$R^2 = .95$$

$$D.W. = 2.41$$

1/ See Asatoshi Maeshiro and Dinh Hinh, "A Total Reappraisal of the Econometrics of Autocorrelation", paper presented at the 1978 European Econometrics Meeting, Geneva 1978. This paper was also discussed in Edmond Malinvaud's Statistical Methods of Econometrics (Amsterdam, N. Holland Co., 1980) p. 553.

Late Period (1976-1982)

A = -12.27
(1.42)

B = 2.006
(.256)

R^2 = .925

D.W. = 2.22

2. Demand for LPG: Ln (LPG consumption per capita) = A + B ln (GNP per capita)

Full Sample

A = -22
(.87)

B = 3.174
(.160)

R^2 = .97

D.W. = 1.58

First Period

A = 19.03
(2.21)

B = 2.61
(.418)

R^2 = .91

D.W. = 1.68

Late Period

A = -22.593
(1.819)

B = 3.283
(.327)

R^2 = .95

D.W. = 1.30

3. Demand for Gasoline: Ln (Gasoline Consumption) = A + B ln (GDP at factor costs)

Full Sample

A = -7.14
(.24)

B = .72
(.034)

R^2 = .98

D.W. = 1.06

First Period

A = -8.08
(.58)

B = .86
(.085)

R^2 = .96

D.W. = 2.48

Late Period

A = -6.196
(.604)

B = .591
(.083)

R^2 = .91

D.W. = 1.20

4. Demand for Kerosene: Ln (kerosene consumption) = A + B ln (GNP per capita)

Full Sample

A = -8.57
(.33)

B = 1.14
(.061)

R^2 = .97

D.W. = 2.48

First Period

A = -8.49

B = 1.12
(.14)

R^2 = .94

D.W. = 3.28

Second Period

A = -7.597
(1.268)

B = .964
(.228)

R^2 = .782

D.W. = 1.60

5. Demand for Gas Oil: Ln (Gas oil consumption) = A + B ln (Value Added in Industry)

Full Sample

A = -6.79
(.22)

B = 1.13
(.040)

R^2 = .99

D.W. = 1.51

First Period

A = -6.41
(.496)

B = 1.056
(.096)

R^2 = .97

D.W. = 2.33

Second Period

A = -6.859
(.93)

B = 1.143
(.160)

R^2 = .91

D.W. = .93

6. Demand for Fuel Oil: Ln (Fuel oil consumption) = A + B ln (GDP at factor costs)

Full Sample

A = -7.21
(1.17)

B = .954
(.165)

R^2 = .75

D.W. = .65

First Period

A = -1.493
(1.39)

B = .115
(.204)

R^2 = .07

D.W. = 1.5

Last Period

A = -14.39
(2.43)

B = 1.944
(.335)

R^2 = .87

D.W. = 2.09

7. Demand for Jet Fuel: Ln (jet fuel consumption) = A + B ln (services other than administration)

Full Sample

A = -9.52
(.61)

B = 1.19
(.098)

R^2 = .93

D.W. = 1.81

First Period

A = -10.651
(1.293)

B = 1.38
(.218)

R^2 = .91

D.W. = 2.92

Last Period

A = -9.99
(2.149)

B = 1.26
(.338)

R^2 = .735

D.W. = 1.52

III. Statistical Tests

The above coefficient estimates are all significant at 1 percent level. Under the null hypothesis that income elasticity did not increase over time, we also test the estimate of B in the two periods (1970-1976 and 1976-1982), using the Chow's test. 1/ At 1 percent level of significance, we reject the null hypothesis. The statistical evidence here shows that there is a significant difference between the elasticity during the two periods.

1/ G. Chow, "Test for Equality between Sets of Coefficients in Two Linear Regressions", Econometrica 28, 1960, 591-605.

Annex II

Model Description

This annex describes the model used in the report. As mentioned in Chapter 2, the model is a modified version of the Revised Minimum Standard Model used in the World Bank for economic analysis. The modifications involved: a) the specific structure of the oil and gas sector, described below in Section B; b) the specific structure of the Government current budget, described in Section C; c) the linkages between the oil and gas sector and national income accounts, public finance and balance of payments, described below. Values for the exogenous variables and parameters are provided in section D. The standard equations of the RMSM, particularly the external debt module are described elsewhere 1/ and are not repeated here.

2 A. Macroequations

A.1 Sectoral Valued Added and GDP

Industry	YIND	=	$YIND_{t-1}$	(1. + YINDGR)
Agriculture	YAGR	=	$YAGR_{t-1}$	(1. + YAGRGR)
Services	YOTH	=	$YOTH_{t-1}$	(1. + YOTHGR)
Government	YGOV	=	$YGOV_{t-1}$	(1. + YGOVGR)

Oil and Gas (VAHYD) is determined according to equation in section 2.B7 below:

GDF Factor Costs: GDPFC = YIND + YAGR + YOTH + YGOV + VAHYD

GDP: GDP = GDPFC + INDTAX where INDTAX is net indirect taxes

A.2 GDP Expenditures Side

Investment: I = IFIXED + CHGSTK

Resource Gap: RGXTT = MGNFS + XGNFS

Gross Domestic Income: GDY = GDP + TTADJ where TTADJ is terms of trade adjustment.

Government Consumption: $GC = GC_{t-1}\ (1 + EGC\ (YGOV/YGOV_{t-1} - 1)$ where EGC is elasticity of consumption to government value added.

Private Consumption: PC = C - GC

A.3 Balance of Payments

A.31 Exports of Goods: (constant and current prices, in dinars and dollars respectively)

Exports of Crude: constant prices (XCRUDE) and current prices (EXCRUD) are determined from the oil and gas block in Section B.

1/ See World Bank, The Revised Minimum Standard Model, July 1979 Mimeo

Exports of Refinery Products: constant prices (XRFFIN) and current prices (EXREF) are determined from the oil and gas block in Section B.

Exports of Agricultural Products:

constant prices: $XAGPRO = XAGPRO_{t-1} (1 + GXA)$ where GXA is exogenous growth rate, consistent with YAGRGR above.

current prices: EXGAPE = XAGPRO * XPIAGP/100 * EXCHR where XPIAGP is price index and EXCHR is exchange rate.

The following exports have the same functional form as agricultural products.

Exports of Olive Oil
Processed Food
Phosphate Rocks
Phosphoric Acid
Other Goods
Textiles
Chemical Products
Other Manufacturing Goods

Total Exports of Goods (constant dinars)

XGOODS = sum of product exports in constant prices.

EXPG = sum of product exports in current prices.

Exports of Non-Factor Services: (constant and current prices, in dinars and dollars respectively) are determined the same way as exports of agricultural products (above).

A.32 Imports of Crude: constant prices (MCRUDE) and current prices (IMCRUD) are determined according to the oil and gas block in Section B

Imports of Petroleum Products: constant prices (MPET) and current prices (IMPPET) are determined from the oil and gas block in Section B.

Imports of Food:

constant prices: $MFOOD = MFOOD_{t-1} * (1 + ELMF (PC/PC_{t-1} - 1))$ where ELMF is import elasticity with respect to private consumption

current prices: IMPFOD = MFOOD * MPIFOD/100 * EXCHR where MPIFOD is international index of food price.

Imports of Other Consumer Goods:

constant prices: $MOCGP = MOCGP_{t-1} * (1 + ELMC (PC/PC_{t-1} - 1))$

current prices: IMPOGC = MOCGP * MPIOCG/100 * EXCHR where MPIOCG is international index of food price.

The following imports are of the same functional form as the above.

Imports of	Elasticity with respect to	Index of International price
Intermediate Goods	Value added in industry	MPIINT
Capital Goods	Fixed investment	MPICAP
Non-factor Services	GDP	IPI

Total imports of goods and non-factor services, constant prices:

MGOODS = MFOOD + MOCGP + MPET + MCRUDE + MINT + MCAP
MGNFS = MGOODS + MNFS

Total imports of goods and non-factor services, current prices:

IMPG = IMPFOD + IMPOCG + IMPPET + IMPINT + IMPCAP + IMCRUD
IMPGNF = IMPG + IMPNFS

A.33 Resource Balance: RESBAL = EXPGNFS - IMPGNF

A.34 Current Account Balance: CURBAL = RESBAL + NETFSY + NETTRN where NETFSY, net factor service income, takes into account the outflow of oil income payments to foreign companies.

Change in Reserves: CHGRES = .125 (IMPGS - $IMPGS_{t-1}$)

GAP: GAPFIL = IMPGS - (EXPGS + NETTRN + NETDFI + NETOFF + NETPRI + SHTERM + CAPNEI + NETIMF + CHGRES)

2 B. Oil and Gas Sector

2.B1 Overview
2.B2 Crude Oil
  a. Production and Profit Sharing
  b. Consumption
  c. Trade
2.B3 Petroleum Products
  a. Consumption
  b. Production
  c. Trade
2.B4 Other Government Accounts
2.B5 ETAP Account
2.B6 Natural Gas
2.B7 Oil and Gas Contribution
2.B8 Contribution to the Budget

2.B1 An Overview: The transactions and institutional arrangements in the oil and gas sector are complex and require lengthy explanations. An overview is therefore needed to provide a bird's eye view on how the various sections can fit together in the macroeconomic model described in Section A.

Given the production level of each oil well, the model determines the Government of Tunisia's share of output; calculates various taxes on the partners' share; and proceeds to allocate the Government share into portions which go to exports, domestic refinery and foreign processing. The refinery plant, assumed to operate at full capacity, determines the level of crude domestic consumption. When this level exceeds the part of domestic crude reserved for local markets, imports make up the difference.

Consumption of petroleum products is determined endogenously via the estimated elasticities presented in Annex I. Domestic production of these products is given according to the refinery plant capacity. Again, exports/imports make up for the difference between domestic consumption and production.

Domestic demand of natural gas per se is assumed to be furnished by domestic supply which consists of domestic production of natural gas plus royalty gas.

In the balance of payments, exports of crude oil are calculated according to the Tunisian method. That is, exports include both the GOT's share and partners' share, with the exception of El Borma and Sidi El Itayem where partners' shares are evaluated by domestic selling price, rather than international price.

As mentioned in the report, the contribution of oil and gas to the budget is through taxes and through the accounts held by ETAP on behalf of the GOT. These accounts consist of (a) the surplus in crude transactions of Tunisian shares; (b) operations or crude imports; and (c) products imports.

Thus for the oil and gas sector, the model is a very simple accounting framework capable of generating in detail the contribution of this sector to the budget and balance of payments. The exogenous variables are the quantity produced by each oil field, domestic and international prices for crude oil and for petroleum products.

2.B2 Crude Oil

A. Production and Profit Sharing

El Borma Oil Field

Let Q1 be output of El Borma (in MTOE's), Q1 ACT be that part of the Government's share that actually goes to the refinery plant (see flow-chart below), and recall that there are 7.75 barrels in each ton for El Borma, we have:

Sale revenue accrued to the Government energy budget

Q1RGS = (Q1 ACT * PC1D * 7.75 + (.85 * Q1-Q1ACT) * PC1X * 7.75) * EXCHR

Where PCID is selling price ($ per barrel) to STIR and PC1X is selling price for exports

Purchasing expenditures by the Government

Q1CGB = (.2Q1 * 7.75 * PC1B + .5Q1 * 7.75 * PC1B2) * EXCHR

Where PC1B is purchasing price from SITEPT for local market portion
PC1B2 is purchasing price from SITEPT for the rest of Government portion

Quantity (in tons) of El Borma crude exported

Q1EX = Q1-Q1ACT

Sale revenue (from exports) accrued to the Government

Q1RGX = (.85 * (Q1-Q1ACT) * PC1X * 7.75) * EXCHR

TFD taxes

Q1RGTF = .015 (Q1RGX * .985)

Revenue accrued to ETAP as commission on sale

Q1REC = Q1RGS * .005

The operating cost for SITEPT is the product of a fixed unit cost and quantity produced, adjusted for inflation: Q1OC = Q1 * IPD/100 * 6.8044 where IPD is domestic inflation rate

Taxes on profit of SITEPT

Q1RGTP = ((.15 * Q1 * PC1B2 * EXCHR) + Q1CGB - Q1OC) * .75

Dividends paid to Government

$$Q1DIV = \frac{\text{Surplus of SITEPT}}{4} = \frac{(\text{Net sale} - Q1RGTP)}{4}$$

but

Net sale = Q1RGTP/.75

$$\text{Therefore } Q1DIV = \frac{Q1RGTP\ (1-.75)}{4 * .75}$$

$$= Q1RGTP * .08334$$

Net revenue (excluding taxes and dividends) accrued to Government

SC1 = Q1RGS - Q1CGB - Q1RGTF - Q1REC

Total gross revenue (including taxes and dividends) accrued to Government from El Borma

Q1RG = SC1 + Q1RGTF + Q1RGTP + (Q1DIV * 1.5) because Government also taxes .5 dividends accrued to foreigners

Contribution to trade account, capital account

SC1BT = QIEX * PCIX * 7.75 * EXCHR

SC1CA = (.15 * Q1 * (PCIX - PCIB2) * 7.75) + Q1DIV * EXCHR/2

Note that foreigners only have .5 of dividends paid.

Ashtart Oil Field

Sale revenue accrued to Government from Ashtart on the part of El Equitaine.

Q2RGS = ((Q2ACT * PC2D * 7.2) + (.1Q2-Q2ACT) * PC2X * 7.2) * EXCHR

where PC2D is domestic selling price to STiR and PC2X is export price

Purchasing expenditures by Government on the above

Q2CGB = (.1 * Q2 * PC2B * 7.2) * EXCHR

where PC2B is purchasing price on quote part d'Aquitaine

TFD taxes on the above

Q2RGTF = ((.1Q2 - Q2ACT) * 7.2 * .985 * PC2X * .015) * EXCHR)

Revenue accrued to ETAP on commission

Q2REC = Q2RGS * .005

Quantity exported
Q2EX = Q2 - Q2ACT

Revenue accrued to ETAP on sale of Ashtart crude
Q2RES = (* .5 * Q2 * PC2D * 7.2 + (1-) * .5 * Q2 * PC2X * 7.2) * EXCHR
Where is the proportion used for exchange with refinery products from abroad

Revenue accrued to Government from redevance part of Ashtart output
Q2RGTR = .125 * Q2RES + .125 * (Q2CGB + (.4 * Q2 * 7.2 * PC2X * EXCHR))

Revenue accrued to Government from TFD taxes on ETAP's operations
Q2RGTE = (1 -) * .5 * Q2 * PC2X * 7.2 * .015 * EXCHR

Total revenue accrued to Government from ETAP
Q2RGTD = .125 * Q2RES + Q2RGTE

Operating cost for Ashtart
Q2OC = Q2 + (IPD/100) * 6.3006

Revenue accrued to Government from profit on Elf
Q2RGTP = ((Q2CGB + .4Q2 * 7.2 * PC2X * EXCHR) - Q2OC) * .65

Net contribution (net of taxes and royalties) of Ashtart to Government revenue (El Aquitaine's part)
SC2 = Q2RGS - Q2CGB - Q2RGTF - Q2REC

Total gross revenue (including taxes but excluding royalties) accrued to Government from Ashtart
Q2RG = SC2 + Q2RGTF + Q2RGTP

Net contribution to trade account, capital account
SC2BT = Q2EX * PC2X * 7.2 * EXCHR
SC2CA = Q2RGTP * .5385/EXCHR

because:
Let B be profit tax on net sale
Thus Q2RGTP = B * net sale
or Net Sale = Q2RGTP/B
But SC2CA = (1-B) net sale
Hence SC2CA = $\frac{(1-B)}{B}$ Q2RGTP
Since B for Ashtart = .65
SC2CA = $\frac{.35}{.65}$ Q2RGTP

Sidi El Itayem

For this field, the arrangement is as follows: CFP (French companie) and GOT set up an operating company which covers the production costs by selling to both CFP and GOT in the following way:

- 15 percent of output accrued to GOT in the form of royalties (redevance)

Sale revenue accrued to the Government
Q3RGS = (.2Q3 * 7.75 * PC1D + .62 Q3 * PCIX * 7.75) * EXCHR

Purchasing expenditures by the Government
Q3CGB = (.2Q3 * 7.75 + PC1B1 + .47 Q3 * 7.75 * PC1B2) * EXCHR

TFD taxes
Q3RGTF = .62 Q3 * 7.75 * PCIX * .985 * EXCHR * .015

Revenue accrued to ETAP on commission
Q3REC = .005 * Q3RGS

Quantity exported
Q3EX = .62 Q3 + .18 Q3
Operating cost
Q3OC = Q3 * (IPD/100.) * 6.3636

Revenue accrued to Government from profit taxes on CFTF (foreign company)
Q3RGTP = ((Q3CGB + .18 * Q3 * PCIB2 * 7.75 * EXCHR) - Q3OC) * .75

Gross contribution
Q3RG = SC3 + Q3RGTF + Q3RGTP

Net contribution to Government budget, B/T and C/A
SC3 = Q3RGS - Q3CGB - Q3RGTF - Q3REC
SC3BT = Q3EX * PCIX * 7.75 * EXCHR
SC3CA = .18 * Q3 * (PCIX - PCIB2) * 7.75

Douleb Tamesmida

Sale revenue accrued to Government
Q4RS = .4 Q4 * 7.75 * PCID * EXCHR

Purchasing expenditures by Government
Q4CGB = (.4 Q4 * 7.75 * 4) * EXCHR

TFD taxes
Q4RGTF = 0
Operating expenditures
Q4OC = Q4 * (IPD/100.) * 6.8182
Taxes on profits of foreign companies
Q4RGTP = ((Q4CGB + .6 * Q4 * PCIX * 7.75 * EXCHR) - Q4OC) * .65
Royalties: Q4RGTR = .125 + (Q4CGB + .6 * Q4 * PCIX * 7.75 * EXCHR)

Revenues accrued to ETAP on sale commission
Q4REC = Q4 RG * .005

Sale revenues, from exports, accrued to Government
Q4RGX = 0

Quantity exported
Q4EX = .6 Q4

Total revenues accrued to Government
Q4RG = Q4RS - Q4CGB + Q4RGTP - Q4REC

Net contribution to budget
SC4 = Q4RS - Q4CGB - Q4RGTF - Q4REC

Net contributions to trade balance
(Q4EX * PCIX * 7.75) * EXCHR

Net contribution to capital account
SC4CA = .5385 * Q4RGTP/EXCHR

Total Production and Uses

Quantity of crude oil produced is the sum of outputs of El Borma, Ashtart, Sidi El Itayem and Douleb Tamesmida:

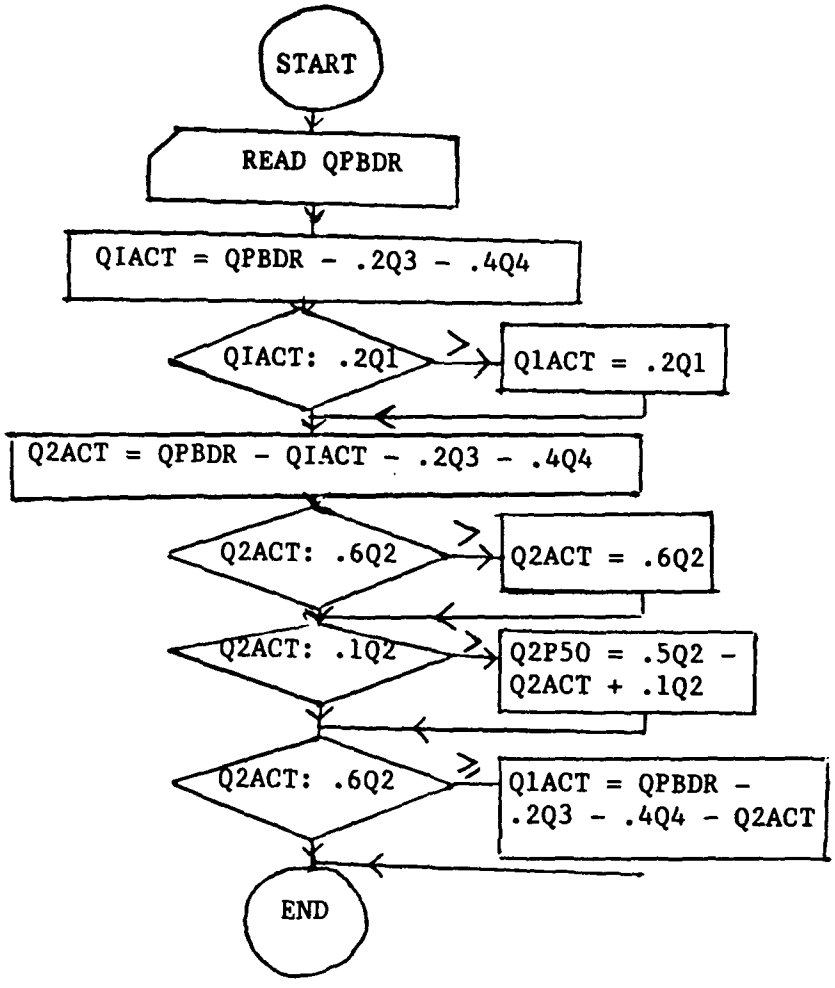
QPBP = Q1 + Q2 + Q3 + Q4

B. Consumption

The consumption of crude oil comes from STIR, which is in charge of the only refinery plant at Bizerte. The capacity of this plant is 1.5 million TOE. By 1986, the refinery capacity will be expanded to 5 million TOE. The refinery operation incurs little loss and crude oil is sold to STIR at a concessional price ($16.5 per barrel).

Quantity of domestic crude oil used in domestic refinery is a policy variable. At first, we attempted to model this quantity according to the difference between import price of crude and the export price. However, historical data does not bear out any such relationship and in particular, does not indicate whether this quantity should come from domestic crude of Zarzaitine mílange (El Borma, Sidi El Itayem, and Douleb Tamesmida) or from Ashtart crude.

In the model, we assume this quantity, QPBDR, comes from the portion reserved for local market, first of Douleb Tamesmida, then Sidi El Itayem, and finally of El Borma and Ashtart. The attached flow chart explains how they are derived.


START
READ QPBDR
QIACT = QPBDR - .2Q3 - .4Q4
QIACT: .2Q1
>
Q1ACT = .2Q1
Q2ACT = QPBDR - QIACT - .2Q3 - .4Q4
Q2ACT: .6Q2
>
Q2ACT = .6Q2
Q2ACT: .1Q2
>
Q2P50 = .5Q2 -
Q2ACT + .1Q2
Q2ACT: .6Q2
≥
Q1ACT = QPBDR -
.2Q3 - .4Q4 - Q2ACT
END

Note for Flow Chart

The complex operations between ETAP and the foreign operating companies are modeled as follows:

The quantity of domestic crude oil used by the refinery plant, QPBDR, is determined by an exogenous portion of the total crude needed by the refinery plant, the latter itself is determined by production level of refinery output. By convention, 40 percent of Douleb Tamesmida well, 20 percent each of Sidi El Itayem, El Borma and Ashtart are reserved for local market and ETAP could purchase them at a special, low price from the operating companies (of which GOT is 50-50 partner).

It is assumed that QPBDR is first filled by total crude reserved for local market at a special price (i.e., .4Q4 + 2(Q1 + Q2 + Q3)). If it is not, the difference will be made up first by the total crude available to Government of Tunisia (GOT) from Ashtart, because Ashtart is of low quality (this quantity is 50 percent of Ashtart output, besides the 10 percent mentioned earlier). If QPBDR is still greater (as is the case in 1988, when output of Ashtart begins to decline), then the difference will be made up from Q1.

It is important to distinguish between quantity reserved for local market and that which is not, because the price difference is substantial.

C. Trade

The trading pattern of Tunisian crude oil is complicated due to the fact that Tunisian crude is of a sufficiently high quality whereas domestic refinery plant could use either high quality produced domestically or low quality crude imported from Saudi Arabia. In addition, part of crude produced is used for direct exchange with refinery products.

In the model, the crude required by the domestic refinery is determined by the output of the refinery plant, which itself is exogenous. The proportion of this required crude that comes from domestic crude is itself exogenous and can be a policy parameter.

Quantity of crude oil imported is the difference between domestic consumption and quantity of crude used in domestic refinery.

$$QCIM = CPB - QPBDR$$

where CPB = a QRPM6 and QRPM6 is the refinery output (a = 1.0667)

Exports of crude is the difference between quantity domestically produced and quantity used in domestic refinery.

$$XPB = QPBP - QPBDR$$

Note that XPB includes partners' shares. It is used for accounting purposes and not to calculate exports proceeds used in the balance of payments.

Refinery Products

A. Production

Petroleum products are distinguished by six categories: LPG, gasoline, kerosene, jet fuel, gas oil and fuel oil. Proportion of each type produced is determined by historical pattern. Total output of petroleum products is determined by the capacity limit of the refinery plant.

Total production of refinery products is determined by the refinery capacity, QRPM6, distributed as follows.

$$QRPPL = a_1\ QRPM6$$
$$QRPPG = a_2\ QRPM6$$
$$QRPPJ = a_3\ QRPM6$$
$$QRPP2 = a_4\ QRPM6$$
$$QRPPF = a_5\ QRPM6$$
$$QRPPA = a_6\ QRPM6 \text{ and the sum of a's is 1}$$

B. Consumption

The consumption of each of the six categories above is determined endogenously in the model. Consumption of LPG is linked to GNP per capita, as the distribution of petroleum products by various sectoral use in Tunisia shows that LPG consumption largely comes from households. Fuel oil and gasoline consumption are determined by GDP, kerosene by GNP per capita, gas oil by value added of the industrial sector, jet fuel consumption by value added of service sector.

LPG: $QRPCL = QRPCL_{t-1} (1 + ECL (GNPPC/GNPPC_{t-1}) - 1)$ where ECG is the elasticity with respect to GNP per capita.

The following categories have the same consumption form as LPG above:

QRPCG : Gasoline
QRPCJ : Kerosene
QRPC2 : Gas Oil
QRPCF : Fuel Oil
QRPCA : Jet Fuel

Total consumption, QRPC is the sum of the six categories.

C. Trade

The difference between production and consumption of each product category is made up by trade. In the case of imports, the GOT imports part of the required products through exchange with the domestic crude oil and the rest by direct imports.

Imports/Exports of petroleum products = difference between consumption and production.

Total: QRPIMT = QRPC - QRPM6
By product: QRPIML = QRPCL - QRPPL
QRPIMG = QRPCG - QRPPG
QRPIMJ = QRPCJ - QRPPJ
QRIM2 = QRPC2 - QRPP2
QRPIMF = QRPCF - QRPPF
QRPIMA = QRPCA - QRPPA

Value of crude exchanged for imports of petroleum products through processing

Q2PXE = β * .5 + Q2 * PC2X * 7.2 * EXCHR * 1.03247
CPIGL = (QRPIML * PRPIML) * EXCHR
CPIG2 = (QRPIM2 * PRPIM2) * EXCHR
CPIGF = (QRPIMF * PRPIMF) * EXCHR
CPIGA = (QRPIMA * PRPIMA) * EXCHR
CPIGG = (QRPIMG * PRPIMG) * EXCHR
CPIGj = (QRPIMj * PRPIMj) * EXCHR

Cost of direct imports by the Government
SQPRM = CPIGL + CPIG2 + CPIGF + CPIGA + CPIGG + CPIGj - Q2PXE
RPIGL = (QRPIML * PSPIML) * EXCHR
RPIG2 = (QRPIM2 * PSPIM2) * EXCHR
RPIGF = (QRPIMF * PSPIMF) * EXCHR
RPIGA = (QRPIMA * PSPIMA) * EXCHR
RPIGG = (QRPIMG * PSPIMG) * EXCHR
RPIGj = (QRPIMj * PSPIMj) * EXCHR

Revenues to Government from sale of refinery products
SRPIM = Σ above

Taxes on sale
TRFSAL = RPIG2 * .06

TFD taxes
TFDD2 = β * .5 * Q2 * 7.2 * PC2X * .985 * .015 * EXCHR

ETAP commission:
RPREC = .005 * SRPIM.
Cost of purchasing Ashtart crude from ETAP for processing:
Q2PCES = β * .5 * Q2 * PC2D * 7.2 * EXCHR

Net contribution (excluding taxes) to Government budget
SC6 = SRPIM - SQPRM - TFDD2 - TRFSAL - Q2PCES - RPREC + Q2PXE

Gross contribution
Q6RG = SC6 + TFDD2 + TRFSAL

Contribution to trade balance (in dollars, current prices)
IMPPET = (SQPRM * EXCH) * 1.116
Contribution to trade balance (in TD, constant prices)
MPET = (QRPIML * PPIXLB + QRPIMG * PPIXGB + QRPIMj * PRIXjB + QRPIM2 * PPIX2B + QRPIMF * PPIXFB + QRPIMA * PPIXAB)
Where PPIXLB, PPIXGB ..... are import price ($ per ton) in the base year

2.B4 OTHER GOVERNMENT ACCOUNT

Cost of importing crude to sell to STIR
Q5CGB = (QCIM * 7.35 * PC5M) * 1.000 * EXCHR

Revenues from sale to STIR
Q5RG = .99 QCIM * 7.35 * PC2D * EXCHR

Net contribution to Government accounts
SC5 = Q5RG - Q5CGB - (Q5RG * .005)

ETAP Account

Total gross revenue
SRETA = Q1REC + Q2REC + Q3REC + Q4REC + Q2RES + RPREC + REVC (other revenue)

Total expenditures
SEETA = TEETA (Operating cost before profit and all taxes)
+ DTEETA (fixed amount related to Ashtart) + Q2RGTD
+ OI TETA (Other taxes; e.g. taxes sur prestation des (of the) services, circulation of vehicles, etc.)

Profit tax
TXPETA = .65 * (SRETA - SEETA)

Contribution of ETAP to Government budget

SCETA = TXPETA + DTEETA + Q2RGTD + OITETA

Contribution to trade

(EXGETA = (* .5 * Q2 * PC2X * 7.2)

Natural Gas. In view of the potential of natural gas as a substitute for fuel oil and gas oil (as well as small quantities of LPG and naphta), the inter fuel substitution between natural gas and petroleum products is determined as follows:

A. Production

Two sources of supply are distinguished: royalties gas from the transcontinental pipeline which can be taken in kind or in cash. The decision to take this gas in either way obviously depends on the negotiated price between Italy and Algeria and the international price of gas and gas oil. The second source of supply is domestic production (currently only a marginal amount from El Borma but potentially LOGP could be brought into production). Recent study has indicated that potential for gas substitution is considerably larger than the incremental production from proven gas reserves in Tunisia. To get around the problem of whether Tunisian gas can be exported and at what price, the model considers natural gas as a perfect substitute for fuel oil (in line with several studies carried out by the GOT, consultants, the Bank and SEGMA) and therefore the import of fuel oil is a residual of demand and total supply. This total supply consists of refined fuel oil and domestically produced natural gas. The Tunisian second gas pipeline project, of which the Bank participates in financing, has been modified so that royalties gas could be substituted for gas oil. Consequently, the import of gas oil also is a residual of demand and total supply consisting of refined gas oil and royalties gas.

B. Consumption

The consumption of natural gas is jointly determined by the consumption of fuel oil.

C. Trade

Imports of natural gas are exogenous and there are no exports.

2B.7 CONTRIBUTION OF OIL AND GAS SECTOR

Contribution of energy to trade balance:

- exports of crude (constant 80 TD)

  XCRUDE = Q1ZIEX + .82 * Q3 + Q4EX) * 118.488) + (.18 * Q3 * 25.11) + (Q2EX - .4 * Q2) * 90.39 + (.4 * Q2 * 23.3)

- exports of refined products (constant 80 TD)

  XREFIN = QRPEXL * P PIXLB + QRPEXG * P PIXGB + QRPIMJ * PPIXJB + QRPIM2 * PPIX2B + QRPIMF * PPIXFB + QRPIMA * PPIXAB

- imports of crude (constant 80 dollars)
  MCRUDE = QCIM * 109.77

- imports of petroleum products (constant 80 TD)
  MPET = (MPPL + MPPG + MPPj + MPP2 + MPPF + MPPA) * 1.116

Contribution to capital account
- outflow of foreign companies' profit
  SC1CA + SC2CA + SC3CA + SC4CA

- net inflow of direct foreign investment
  NTODFI

Contribution to government revenue
- contribution to revenues (excluding taxes, royalties, dividends and ETAP per se)
  TGRP = SC1 + SC2 + SC3 + SC4 + SC5 + SC6
- Total contribution (including taxes, royalties, dividends and ETAP per se), excluding excise taxes on petroleum products
  TGRPGO = Q1RG + Q2RG + Q3RG + Q4RG + SC5 + Q6RG + SCETA - (.125 * Q2RES)

  Total contribution: TTNETE = TGRPGO + TXITUP + ROYNG of hydrocarbon (including excise taxes and transit royalties)

National Income Accounts

VA of hydrocarbon sector
- Let VVCRU be value added per unit of crude oil produced
- Let VVRF be value added per unit of refinery produced

Note that VVCRU and VVRF refer to only domestic value added. Part of the total VA belongs to foreigners in the form of profits. Similarly let VVGAZ be v.a. per unit of natural gas produced.

$$VAHYD = VVCRU * QPBP + VVRF * QRPM_6 + VVGAZ * QNGD$$

2 C Fiscal Block

Total government revenues are divided into three categories: direct taxes, indirect taxes and non-tax revenues.

(A) Direct Taxes: consist of progressive surtax (contribution personelle d'Etat), taxes on wages and salaries (Impots sur les traitements et salaires), taxes on industrial and commercial profits (Patente, droit d'exercise, droit proportional).

(1) Progressive Surtax. All family income (except one half of spouse income) irrespective of source, is subject to this tax. Rate ranges from 1.15 percent (on taxable income in excess of TD 100 per year after 10 percent standard deduction on wages and salaries) to 83.5 percent (on taxable income exceeding TD 8200/year).

In the model, the progressive surtax is linked to gross domestic product at factor cost.

(2) Taxes on wages and salaries are withheld at source. Tax rates are progressive and range from 5 percent (on taxable income up to TD 2500 per year) to 8.9 percent (on taxable income exceeding TD 6000). In view of data deficiency on income by source, this tax is linked to GDP at factor cost.

(3) Taxes on industrial and commercial profits. The droit d'exercise is an advance tax payment and is levied at 1 percent of gross receipts (.5 percent for small enterprises). The droit proportionel, based on book profits, is levied at 46.5 percent on corporations engaged in commercial activities and of 40.1 percent on industrial, transport, tourism. In the model, this tax is broken into petroleum tax and non-petroleum tax. The former is derived from detailed operation of each well and the latter on value added on non-hydrocarbon sector.

(4) Other direct taxes consist of taxes on dividends and interest (taxes sur les revenus de valeur mobilières et críances) which are small (11.5 percent on interst, 16.7 percent on dividends paid to individuals and 19.5 percent on dividends paid to companies) and taxes on agricultural income and property (very small amount) and other unidentified taxes. In view of the nature of these taxes, these taxes grow at an exogenous rate in the model.

(B) Indirect Taxes: consist of taxes on goods and services and taxes on international trade.

(1) Taxes on goods and services consist of turnover taxes (taxes sur le chiffre d'affaires), excise taxes on goods (droits sur les produits et les transports) and other monopolies, registration taxes, etc.

The turnover taxes consist of taxes on production with the standard rate of 14.4 percent (gas and electricity only 6 percent), taxes on consumption which varies between 23 percent for luxury goods and 8 percent for necessities (soap, toiletries), taxes on services (for commercial operations) which are 7 percent. The excise taxes on goods are raised on ad valorem basis.

The model again distinguishes those that come from the hydrocarbon sector and those that come from other sectors. The former is a function of the total value of petroleum products and the latter a function of value added in non-hydrocarbon sectos.

(2) Taxes on international trade consist mainly of import duties and turnover taxes on international trade. For petroleum sector, these taxes consist of TED (taxes de formalití douanière) and custom taxes on gas oil. Non petroleum taxes are a function of imports (of non-petroleum goods).

(3) Other indirect taxes are assumed to grow at an exogenous rate.

(C) Non tax revenues: consist of revenues on petroleum of the treasury, and non-petroleum non-tax revenues, assumed to be growing at an exogenous rate.

Expenditures consist of current and capital expenditures.

(1) Current expenditures: composed of government consumption which is a function of government wages and salaries (or government value added), subsidies which are exogenous, interest on domestic debts, interst on foreign debts, and others.

(2) Capital expenditures: are exogenous as this is an instrument of government policy.

Finally, government financing need is determined as government budget deficit net of amortization (which is not included in the current budget) minus net official disbursement (official here is official by source, private creditors presumably do not lend to government for budgetary purposes).

Public Finance Equations:

I. Revenue

a. Direct taxes

- Progressive surtax

$$TXDRST = TXDRST_{t-1} (1 + 1.336 * (GDP\ current/GDP\ Current,_{t-1} - 1)$$

- Taxes on wages and salaries

$$TXDRWS = TXDRWS_{t-1} (1 + 1.195 * (GDP\ current/GDP\ current,_{t-1} - 1))$$

- Taxes on industrial and commercial profits

for petroleum

$$TXDRPP = Q1RGTP + Q2RGTP + Q3RGTP + Q4RGTP + TXPETA + DTETA$$

for non petroleum

$$TXDRNP = TXDRNP_{t-1} (1 + 1.606 * (YNOHY/YNOHY_{t-1} - 1))$$

Total

$$TXDRPA = TXDRPP + TXDRNP$$

- Other taxes

$$TXDROT$$

- Total direct taxes

$$TXDR = TXDRST + TXDRWS + TXDRPA + TXDROT$$

b. Indirect taxes

- On goods and services (turnover and excise)

for petroleum

$$TXITUP = t1 * QRPCL + tg * QRPCG + tj * QRPCj + t_2 * QRPC2 + tf * QRPCF$$

for non petroleum

$$TXITUN = TXITUN_{t-1} (1 + 1.768 + (YNOHY/ZYNOHY - 1)$$

Total

$$TXIRGS = TXITUP + TXITUN$$

- On international trade

for petroleum

$$TXIIMP = Q1RGTF + Q2RGTF + Q3RGTF + Q4RGTF + TFDD2 + TRFSAL + Q2RGTE$$

for non petroleum

$$TXIIMN = .191 * (IMPG/EXCHR - Q5CGB - SQPRM)$$

Total

$$TXIIT = TXIIMP + TXIIMN$$

- Other indirect taxes

$$TXIOT = TXOOT + IOITETA$$

- Total indirect taxes

$$TXIR = TXIRGS + TXIIT + TXIOT$$

c Non-tax revenues

- for petroleum

NTRPE = TGRP + Q2RGTR + Q4RGTR + ROYNG

- for non petroleum

NTRNP

- Total

NTR = NTRPE + NTRNP

d. Total Revenues

TR = TXDR + TXIR + NTR

II. Expenditures

a. Government consumption (defined earlier in 2A2)

$GC = GC_{t-1}\ (1 + 1.208 * (YGOV/YGOV_{t-1} - 1)$

b. Current expenditures

GCE = subsidies + GC * IPD/100 + INTMLD + INTDO + GCROT

c. Total expenditures

GE = GCE + GFI + GNL

III. Government budget deficit

GD = GE - TR

IV. Government financing need

GFNN = GD - NETOFF + AMTOFF

Annex III

Detailed Results of Policy 4

SIMULATION RESULTS

Effect on Income and Expenditures

A. Construction Period: Following SEGMA, we assume the construction period will last for five years between 1982-1986, but investment in equipment will go on until 1988. Between 1982-1986, direct investment expenditures total 176 million TD in 1980 prices (equivalent to $4820 million in current prices) of which imports total 102.4 million TD. Thus, total expenditures on domestic goods and services are 73.6 million TD (1980 prices). The total domestic income that is generated, as shown in Table F.2 below, is about $173 million. Thus, the induced effects on domestic income (99.4 million TD) is larger than the direct expenditures (73.6 million TD).

To compare the direct effect with the total effects on domestic income and expenditures, table F.1 shows the direct effect on major components of domestic expenditures. Table F.2 shows the total effect (= direct effect + induced effect).

Table F.1
NET DIRECT EFFECT OF LOGP 82 ON INCOME
AND EXPENDITURE DURING CONSTRUCTION PERIOD
(1982 - 1986) 1/
(Million 1980 TD)

	1982	1983	1984	1985	1986
GDP (Gross Domestic Product)	1.0	9.0	21.0	28.0	15.0
Consumption	-	-	-	-	-
Investment	2.0	23.0	48.0	65.0	38.0
XGNFS (Exports Goods & Non-Factor Services)	-	-	-	-	-
MGNFS (Imports Goods & Non-Factor Services)	1.0	14.0	27.0	37.0	23.0

1/ Numbers (rounded off) indicating the difference between LOGP 82 scenario and no LOGP scenario.

Table F.2

TOTAL NET EFFECT OF LOGP 82 ON INCOME AND EXPENDITURE DURING CONSTRUCTION PERIOD
(1982-1986)
(Million of constant 1980 TD) 1/

	1982	1983	1984	1985	1986
GDP (Gross Domestic Product	2.0	24.0	47.0	63.0	37.0
Consumption	1.0	15.0	29.0	40.0	24.0
Investment	2.0	23.0	48.0	65.0	38.0
XGMFS (Exports Goods & NFS)	0.0	0.0	0.0	0.0	0.0
MGMFS (Imports Goods & NFS)	1.0	14.0	30.0	42.0	25.0

1/ Numbers (rounded off) indicating the difference between LOGP 82 scenario and no LOGP scenario.

Most of the induced effects of LOGP on income come from consumption. The induced effect from imports is not significant.

B. Operation Phase (1987 onwards)

Effect on Income and Output. The coming-on stream of LOGP output in 1987 will provide an impetus to Tunisian growth. Total increase in GDP amounts to about 1 billion TD during 1987-1991 (constant 1980 prices), although exports increase by only 160 million TD. Thus, during this period, induced effects on income and output are much greater than the direct effects. Table F.3 and F.4 show the direct and total effects on major components of expenditures in the economy.

Table F.3
DIRECT NET EFFECTS ON INCME AND EXPENDITURES
(Million 1980 TD)

	1987	1988	1989	1990	1991	Total
GDP	73	55	19	9	8	164
C	-	-	-	-	-	0
I	12	12	-	-	-	24
XGNFS	71	53	19	9	8	160
MGNFS	10	10	-	-	-	20

Note: The numbers in this table are the difference between the scenario of LOGP in 1982 and the base scenario (no LOGP).

Table F.4
TOTAL NET EFFECTS ON INCOME AND EXPENDITURES
(million 1980 TD)

	1987	1988	1989	1990	1991	Total
GDP	200	200	196	197	198	991
C	128	125	121	120	123	617
I	12	12	-	-	-	24
XGNFS	42	26	8	7	6	89
MGNFS	-7	-37	-67	-69	-70	-260

Note: The numbers in this table are the difference between the scenario of LOGP in 1982 and the base scenario (no LOGP).

Thus, compared to the construction period, the operational period of LOGP witnesses a more rapid increase in both income and expenditures. The induced effect on consumption is more than 600 million TD (constant 1980 prices). During the early years of the operational phase, imports increase but they would be more than offset during latter years. The beneficial effects on the balance of payments will be examined further below.

EFFECT ON THE BALANCE OF PAYMENTS

A. Construction Period. Given our assumptions, exports of goods during the construction phase do not change. It is important to realize that exports do not decrease because we have assumed that the increase in goods and services diverted to the new project comes from an increase in the production. In other words, resources are not redistributed from other sectors to the hydrocarbon.

Because the project requires imports, total imports of goods increase by some 450 million dollars during 1982-1986, compared to the base scenario. Resource gap would be widened by the same amount. However, the increase in factor service payments will widen the goods and services gap (and the current account) to about $565 million. Consequently, the debt service ratio would increase gradually to 16.8 percent in 1986, compared to 15.7 percent in the base scenario. The effect on the balance of payments is summarized below.

Table F.5
TOTAL NET EFFECT OF LOGP ON THE BALANCE OF PAYMENTS
(million dollars in current prices)

	1982	1983	1984	1985	1986	Total
Exports of Goods	-	-	-	-	-	0
of which petroleum prod.	-	-	-	-	-	0
Exports of NFS	-	-	-	-	-	0
Imports of Goods	4	51	114	169	114	452
of which petroleum prod.	-	-	-	-	-	0
Imports of NFS	-	-	-	-	-	0
Resource Gap	4	51	114	169	114	452
(+ indicates increase)						
Goods and Services Gap	4	54	129	205	174	566
Current Account Gap	4	54	129	205	174	566
Net Official Borrowing	-	50	130	230	190	600
Debt Service Ratio	-	-	.3	.7	1.1	

Note: The numbers in this table are the difference between the scenario of LOGP in 1982 and the base scenario (no LOGP).

B. Operation Phase. There are several off-setting factors that operate on the balance of payments during 1987-1991. First, on the trade balance, output of LPG, natural gas (to substitute fuel oil), and condensate (for gasoline) will displace some imports and even allow for exports. On the factor services balance, outflow of interest payments on the project will become more significant. On the capital account, loans repayments will be rising while disbursement on project will cease. The net effect, as Table F.6 below shows, is a substantial decline in the current account deficit, but because of rising debt payments, debt service ratio will increase from 21.5 in 1991 (without LOGP) to 22.2 (with LOGP in 1982).

Table F.6
LOGP NET EFFECTS ON BALANCE OF PAYMENTS 1/
(million current dollars)

	1987	1988	1989	1990	1991	Total
Exports of Goods	137	93	37	36	35	338
of which petroleum prod.	137	93	37	36	35	338
Exports of NFS	-	-	-	-	-	0
Imports of Goods	68	144	-291	-325	-358	-1,186
of which petroleum prod.	154	-231	-324	-360	-396	-1,465
Imports of NFS	24	25	25	26	28	128
Resource Gap	-182	-212	-302	-334	-365	-1,395
Goods and Services Gap 1/	-109	-155	-264	-324	-391	-1,243
Current Account Gap 1/	-109	-155	-264	-324	-391	-1,243
Net Official Borrowings	-10	-110	-130	-130	-130	- 510
Debt Service Ratio	2.67	2.14	2.0	1.3	.7	

1/ The numbers represent the difference between the scenario of LOGP in 1982 and that of no LOGP. For Resource, Goods and Services, and Current Account Gaps, a positive number indicates the widening of gap whereas a negative sign indicates the gap is getting smaller.

It is also clear from the above table that the induced effect of the project on imports is quite strong. Although imports of petroleum products (direct effects of the project) are reduced by over $1.4 billion between 1987-1991, total imports of goods are reduced by $1.2 billion. This is because the increase in income has caused an increase in imports of other goods. Similarly, imports of NFS also increase by over $120 million.

EFFECT ON GOVERNMENT REVENUES

A. Construction Period. During the construction period, the induced effect on Government revenues due to the increase in domestic income is minimal, amounting to some $71 million TD. This increase represents the rise in direct taxes, (TD 14 million) and indirect taxes (TD 57 million) from non-petroleum sectors.

Table F.7
TOTAL EFFECTS ON GOVERNMENT BUDGET
(million TD at current prices)

	1982	1983	1984	1985	1986	Total
Total Revenue	-	8	19	26	18	71
of which direct	-	2	4	5	3	14
of which petroleum	-	-	-	-	-	0
of which indirect	-	7	15	20	15	57
Non Tax Revenues	-	-	-	-	-	0
of which petroleum	-	-	-	-	-	0
Total Expenditures	-	2	8	21	38	69

Note: The numbers in this table are the difference between the scenario of LOGP in 1982 and the base scenario (no LOGP). The revenues here are for Title 1 only.

B. Operation Phase. Given the institutional structure of the hydrocarbon sector in Tunisia, the project will bring about 678 million TD to the Government budget; about 21 percent of this revenue comes from the increase in direct and indirect taxes, 20 percent from the dividends the Government receive from LOGP, and the rest from the subsidies in petroleum imports that would have taken place if no LOGP was to be developed. The interesting question then becomes: should these subsidies be counted as part of the beneficial effect of LOGP? From the country's viewpoint, they cannot. However, from a budgetary viewpoint, the fact that petroleum imports, an operation done entirely by the Government, decline due to the upcoming stream of LOGP output means that the burden of subsidies is shifted from the Central Budget to the consumers. Table F.8 show the impact of the project on the Government revenues, taking into account the reduction in subsidies. 1/

1/ The above paragraph implies that the impact of the project on public finance, as shown here is overstated. To be correct, one should also compare LOGP scenario with a scenario in which no LOGP was developed, but that subsidies for the quantity of petroleum products that LOGP displaces, are eliminated.

Table F.8
IMPACT OF LOGP ON PUBLIC FINANCE
(million current TD)

	1987	1988	1989	1990	1991	Total
Total Revenues	88	112	133	153	192	678
of which direct taxes	18	20	21	23	25	107
of which petroleum	-	-	-	-	-	0
of which indirect taxes	13	12	4	4	4	37
Non-tax Revenues	57	80	108	126	163	534
of which petroleum	57	80	108	126	163	534
Total Expenditures	46	36	24	7	-16	97

Note: The numbers in this table are the difference between the scenario of LOGP in 1982 and the base scenario (no LOGP).

The increase in direct taxes come from the increase in economic activities. As mentioned earlier, the substantial increase in non-tax revenues is due to less imports and therefore, less subsidy of petroleum products.

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