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INTERINDUSTRY AND PROGRAMMING ANALYSIS: THE CASE OF LIBYA

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INTERINDUSTRY AND PROGRAMMING ANALYSIS: THE CASE OF LIBYA

by

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INTRODUCTION

Libya and Its Economic Development Problems

Libya has an area of 1,780,000 square kilometers (687,258 square miles) and a Mediterranean coastline of nearly 2,000 kilometers (1242.8 miles). This makes Libya the fourth in size among the countries of Africa and the fifteenth among the countries of the world.[1] At the time of independence (1951), Libya was an extremely poor desert state whose only important physical asset appeared to be its strategic location at the midpoint of Africa's northern rim. The last twenty years, however, have brought it immense petroleum wealth. Libya is considered to be exceptional among many developing countries in having a capital surplus rather than a capital-deficit economy. This means that it possesses more capital than its home-grown administrative-management apparatus, technical expertise, and skilled labor force.

A relatively narrow coastal strip and highland steppes immediately south of it are the most productive agricultural regions. Still farther southward a pastoral zone of sparse grassland gives way to the vast Sahara Desert, a barren wasteland of rocky plateaus and sand. It supports minimal human habitation, and agriculture is possible only in a few scattered oases.

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[1]Libya: a country study. Foreign Area Studies, The American University, Edited by Harold D. Nelson, January 1979. Washington D.C., 1979. Third Edition.

Along the shore of Western Libya for more than 300 kilometers, coastal oases alternate with sandy areas and lagoons. Inland from these lies the Jifara Plain, a triangular area of some 15,000 square kilometers. About 120 kilometers inland the plain ends with Jabal Nafusah, a plateau with elevations of up to 1,000 meters.

In Eastern Libya, there are fewer coastal oases, and the Marj Plain covers a much smaller area. Behind the Marj Plain comes Jabal al Akhdar (Green Mountain), so called because of its leafy cover of pine, juniper, cypress, and wild olive. It is a limestone plateau with maximum altitudes of about 900 meters. Eastern Libya, unlike Western Libya, extends southward across a barren grazing belt that gives way to the Sahara Desert. Southern Libya constitutes the southwestern desert. It comprises 33%, while Western Libya 16%, and Eastern Libya 51% of the country's area.

In the most of the coastal lowland the climate is Mediterranean, with hot summers and mild winters. The weather is cooler in the highlands. In the desert interior the climate is continental, with very hot summers and extreme diurnal temperature ranges.

Less than 2% of the national territory receives enough rainfall for settled agriculture. The deficiency in rainfall is reflected in an absence of permanent rivers or streams. These circumstances severely limit the country's

agricultural development. The government has constructed a network of dams in wadis, dry watercourses that become torrents after heavy rains. These dams serve both as water reservoirs and for flood and erosion control. The wadis are heavily settled because soil in their bottoms is often suitable for agriculture, and often a high water table in their vicinity makes them logical locations for well digging.

Other sources of water include numerous springs along the scarp faces of the Jabal Nafusah and the Jabal al Akhdar. These are best suited for future development. The most talked-about of the water resources, however, are the great subterranean aquifers of the desert. In the late 1970's, for example, wells were being drilled at Al Kufrah as part of a major agricultural development project. It was estimated that there was enough water available at a depth of as little as 35 meters to irrigate 100,000 hectares for 350 years.

Al Kufrah and Sabha were the largest of five major projects where between 1970 and 1978 more than 600,000 hectares of desert land were developed or reclaimed.

The population of Libya was estimated in 1978 to be a total of 3,014,000, including 416,500 aliens. A large majority of the foreigners were workers brought in to alleviate a critical manpower shortage. For the 1976-80 period it was forecasted that an annual growth rate of

3.9% for the indigenous population and--in an anticipation of further worker immigration--about 12% for aliens. The population growth rate at the time of independence is believed to have been only slightly more than 1%. It's rapid increase to one of the world's highest in the span of a single generation had resulted from impressive improvements in public health, sanitation, and nutrition.

Under the influence of heavy and sustained country-to-town migration, the urban sector was growing rapidly. Most estimates for the middle and late 1970's showed it to represent 30 to 35% of the total, as compared with 27% in 1964.

During the decade after the discovery of petroleum Libya became a classic example of the dual economy, in which two separate economies (petroleum and non-petroleum) operated side by side. For practical purposes no connection existed between them except the petroleum sector employed limited quantities of local labor and paid a portion of their profits to the government in royalties and taxes. The laissez-faire arrangement came to an end with the change of government in 1969. The oil companies were put on notice that they were overdue on large payments for unpaid taxes and royalties. In mid-1970 the government stated a program of progressive nationalization and socialization (state ownership). In the petroleum sector by the end of

1974 the government had either nationalized the oil companies or had become a participant in their concessions and their production and transportation facilities. Thus, it had a larger share of the profits than under the previous royalty and tax arrangements.

By 1972 the nationalization program was supplemented by a policy of economic modernization and independence. With given superabundant capital resources, the problem was how to use these resources to create the nonpetroleum physical resources, human resources, and domestic production and distribution apparatus.

The First Five-Year Plan (1963-1968) was introduced in 1963 and represented the beginning of Libya's formal development planning efforts. About half of the expenditures of that plan were spent on infrastructure projects. Actual total expenditures of about LD* 290 million were well below planned levels, however, as the shortage of qualified personnel and the lack of data hindered completion of many of the projects.

The Second Five-Year Plan (1969-73) was prepared, but was not implemented because the first year was used to complete the unfinished business of the first plan. Then, it was suspended by the new government which made its own ad hoc investments according to its own priorities. These priorities were issued as the 1973-75 Development

* LD = Libyan Dinar (1LD = $3.3)

Plan. Total investments were LD 2.57 billion. Best achievements were made in the fields of agriculture, manufacturing, and construction.

The Five-Year Economic and Social Transformation Plan (1976-80) was designed to increase total production in all sectors in such a way as to realize an over-all compound growth rate of the Real Gross Domestic Product of 10.7% per annum.[2] (Table A.2) The non-petroleum sectors were planned to grow at a rate of 14.1% per annum while the growth rate of the activity in the extraction of crude petroleum and natural gas was kept at 7.8% per annum.

Per capita income was planned to grow at an annual compound rate of 5.6% from LD 1360.4 in 1975 to LD 1786.5 in 1980. Private final consumption was planned to grow at a compound rate of 9.4% per annum while the growth rate of public final consumption was set a 9.6% per annum.

The plan was also designed to raise the balance of payments surplus from LD 393.8 million in 1975 to the level of LD 727.7 million in 1980, in 1974 prices. This was reckoned to be achieved through the growth of commodity exports at 7.9% per annum and the growth of commodity

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[2] The plan of Economic and Social Transformation (1976-80): Libyan Arab Republic, Ministry of Planning and Scientific Research, March 1976.

imports at 5.2% per annum, and this in turn would imply the tendency towards greater diversification of production and hence of export expansion and import restraint.

In order to achieve such goals, total volume of expenditure allocation to fixed capital formation over the five year period would amount to LD 7840 million (Table A.3) in 1974 prices. This would result in an annual rate of investment of LD 1568 million which is more than double the rate allocated to the Three Year Plan (1973-1975), and nearly double the investment actually made. Priorities in this plan were given to agriculture, industry, electricity, education, municipalities, and housing.

The industrial sector was allocated a large share of total investment amounting to LD. 1506.7 million over the five years. Agricultural sector was allocated LD 939.1 million over the plan period.

The geographical distribution of investment and the location of projects were made in accordance with the principles of spatial planning. It was hoped that this would help in population redistribution in such a way as to relieve the congestion in the coastal belt, and particularly ease the pressure on Tripoli and Benghazi.[3]

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[3]The (1976-80) Plan, previously cited.

In 1978, the 1976-80 plan was revised upward to LD 9.25 billion from an original level of just over LD 7 billion.[4] Despite the increased allocations, not all of the funds could be spent. In 1977, for example, about 15% of the year's allocation was not spent. Projects were sometimes delayed because of internal administrative problems and lack of adequate feasibility studies. Other projects have resulted in a waste of time and resources. It was also feared that the educational system could not provide the more than 4,000 new technicians that would be required annually to operate the new factories, and the Secretariat of Industry was given the responsibility of providing industrial education through industrial institutes.

In 1962, gross domestic product (GDP) was estimated to be LD 155.5 million at current prices (Table A.4). By 1966 it reached LD 634.9 million and by 1969 to LD 1.223 billion. It jumped to LD 2.1823 billion in 1973 and to LD 3.792 billion in 1974, but it declined to LD 3.6743 billion in 1975. In 1976 it moved upward again to LD 4.7681 billion and to LD 5.6164 billion in 1977.

Per capita income has witnessed a remarkable increase along with the increase in the GDP. "According to World Bank data, it rose from about US $40 before independence

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[4] Libya: a country study, previously cited.

(1951) to about US $6,310 in 1976, the eleventh highest in the world at that time. Other sources cited a lower figure of about US $6,000 in 1977, which was still ahead of the government's goal of reaching a level of US $6,000 by 1980."[5]

Even though petroleum exports commenced only in 1961, in 1962 they already accounted for over 24% of the GDP (Table A.5), displacing agriculture as the primary contributor. Agriculture, which in the pre-petroleum period had contributed 25% to 30% of the GDP, was in 1962 reduced to about 10% of the total.

By 1968 petroleum contributed 60.5% to the GDP. All other sectors except construction decreased in relative terms between 1962 and 1968. In 1970 the contrast between the petroleum sector and the rest of the economy had become even greater. Petroleum contributed 63.1% to the GDP, construction 6.8%, agriculture 2.6%, and manufacturing 1.8%. The other sectors taken together contributed only 25.7% of the GDP. What these percentages reflected was not, however, an absolute decline in the non-petroleum sectors as a whole but rather the extraordinary relative growth of the petroleum sector.

The share of petroleum in the GDP began to fall by 1971 as a result of the government's decision to limit

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[5]Libya: a country study, previously cited.

oil production, while the relative shares of other sectors such as construction and transportation increased because of the increased government investment in these areas (Table A.5). The relatively large percentages for construction and transportation were not considered uncommon for a country attempting to develop its infrastructure. Because of the rise in oil prices in 1974, the petroleum sector has increased its share of the GDP. In 1975, however, the petroleum share was found to fall to the 1972-73 level, because of price weakness and lower production. In 1976 and 1977 the oil sector's share of the GDP again rose in response to increased production.

During the mid-1970's almost one-half of the economically active population was employed in either public administration or the construction industry (Table A.6). Farming, which occupied more than half of the country's workers prior to the achievement of independence, had dropped to less than 20% of the total. Manufacturing sector employed less than 5% of the total. The petroleum industry was highly capital intensive and provided employment for only a few thousand.

Purpose of this study

With the fast pace of economic development in Libya in recent years, the scarcity of labor of various skill categories has been the most binding bottleneck in modernizing the nation's industrial base. This shortfall has resulted in the importation of thousands of managers, professionals, technicians and workers of different skills from many parts of the world.

The study will be an attempt, by utilizing the quantitative information available on the Libyan economy, to formulate a model picturing the working of the economy at a sectoral level. The study will develop a multi-period, multi-sector programming model for the terminal years of the Development Plans: (1973-75), (1976-80), and (1981-85). Our model will give explicit consideration of labor by skill classifications.

We realize that such a model could be a powerful tool for analysis and policy making in the hands of the policy maker only if it is based on reliable statistical information and with the work and specialized knowledge of many people. Due to the lack of the desired quality of statistical information representing the actual working of the economy, however, we cannot claim that this model's findings can reliably be used for policy recommendations, but it is a good start for further research. In particular, it shows to a considerable extent the potential value of improved

data collection, for the nation. It is hoped that quite soon work in this direction will be possible, when a detailed table of interindustry relations of the economy becomes available.

The model will be developed through linear programming techniques and will have the following general form:

$$\begin{array}{ll} \text{Maximize objective} & CX \\ \text{subject to} & AX \leq b \\ \text{and} & X \geq 0 \end{array}$$

The problem is, with a given unit value (C) of each output (X) in the objective function, a given upper limit on the availability of each input (b), and certain unit requirements in production (A), how much of each output should be produced in order to maximize the value of total output?

Now by varying parametrically the supply of one input, say input b_1 , while holding the supply of all other inputs constant, we can observe the effect of additional input availabilities on their marginal products. I.e., by parametric linear programming we can construct the marginal productivity curve of that particular input.

The major problems which we will attempt to solve are: (1) the optimal allocation of scarce resources of the Libyan economy; (2) the determination of the extent