

Sources of Growth with Domestic Factor Shift and Foreign Factor Transfer: The Case of Libya

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The analysis of intersectoral relationships in dualistic economies to provide an explanation of growth has received increasing attention from economists in the last three decades. However, the mainstream of literature on economic dualism has focused almost totally on two sectors, agriculture (traditional) and manufacturing (modern), contending that the main aspects of dualism are concerned with differences in production functions between both sectors and that structural changes are a major factor in explaining growth.¹ No attention has been given to examining relationships between the domestic (less developed or indigenous) sector and its growth inducing and rapidly rising foreign (more developed or enclave) sector.² These relationships characterize most oil exporting countries and other primary oriented countries that have a strong exports sector. For these countries differences between the indigenous economy and its enclave sector seem to predominate over other aspects of dualism not only in terms of production conditions but also in their effects on growth.³

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1 See, for example, R. Eckaus; D. Jorgenson; A. Kelley, G. Williamson, and R. Cheetham; W. Lewis; and J. Fei and G. Ranis.

2 To be certain, there has been plenty of literature on the role of primary exports in growth, but this role has been examined within the framework of international trade and the principle of comparative advantage. Few attempts have been made to examine the role of the foreign sector in growth from the standpoint of dualistic conditions. See, for example, F. Baldwin.

3 We are referring here to the less developed countries that have a major export sector

In this paper, we attempt to fill in some of the gaps in the literature by constructing a growth model which emphasizes the role of the enclave sector in growth. We shall retain the rural-urban dichotomy by constructing a two-subsector growth model consisting of agriculture and manufacturing and by examining the effects of structural change on growth. We then shall incorporate into the model the foreign sector and examine the nature of interactions between the two subsectors and the foreign sector and their influence on growth. The structure of this model is basically similar to that of the S. Robinson model developed in 1971.⁴

Libya is chosen for this study because of the relative availability of data (especially with respect to data on wage rates which are absent in other OPEC type economies) and since it represents an ideal case study of a country whose growth in domestic output is significantly influenced by these intersectoral relationships (between oil, agriculture, and manufacturing in the case of Libya).⁵ Growth of the Libyan economy is estimated by focusing on three main sources of growth: rate of increase of domestic capital and labor; rate of transfer of domestic labor from the agricultural to the manufacturing sector; and rate of inflow of foreign capital and labor to the domestic economy. The estimates of sources of growth for Libya are compared with time series and cross-section estimates for a number of developed and developing countries. The data are in real terms and are collected from various UN and Libyan official publications for the period 1964-74.

The Model

The simple model starts with an aggregate production function

and specialize in the export of a single primary commodity. For those specializing in some agricultural products (coffee, rice, etc.), production techniques are highly labor intensive, while for those specializing in mineral resources (oil, copper, etc.) production techniques are highly capital intensive.

4 Although the structure of the model constructed here is similar to that of S. Robinson's, there are two basic differences between the two models that need to be mentioned here. First, the interaction effect between the foreign and domestic sector is explicitly introduced in our model, while it is absent in Robinson's. Secondly, the parameters of our model are estimated directly from time series data of the Libyan economy, whereas in Robinson's they are estimated from regression equations on the basis of cross-section data of 39 less developed countries. See S. Robinson.

5 The Libyan economy is viewed from a dual perspective, since there is a dominant highly capital intensive oil sector and a traditional labor intensive non-oil sector. Hence, the level and type of technology differ between the oil and non-oil sectors.

which can be written as follows:

$$(1) Y_t = F(X_t, K_t, L_t)$$

where Y is output produced in the non-oil sector, X is technical level, while K and L are the amounts of capital and labor employed in Y , and t indicates time. Differentiating (1) with t and dividing through by Y , we obtain:

$$\frac{dY}{Y} = \frac{\partial F}{\partial X} \frac{dX}{Y} + \frac{\partial F}{\partial K} \frac{dK}{Y} + \frac{\partial F}{\partial L} \frac{dL}{Y} \quad \text{or:}$$

$$(2) \frac{dY}{Y} = \frac{\partial F}{\partial X} \frac{X}{Y} \frac{dX}{X} + \frac{\partial F}{\partial K} \frac{K}{Y} \frac{dK}{K} + \frac{\partial F}{\partial L} \frac{L}{Y} \frac{dL}{L}$$

where $\frac{\partial F}{\partial K} \frac{K}{Y}$ and $\frac{\partial F}{\partial L} \frac{L}{Y}$ are growth elasticities of capital and labor, respectively, while $\frac{\partial F}{\partial X} \frac{X}{Y} \frac{dX}{X}$ measures technical change.

Assuming that there exists equilibrium in factor markets, the growth elasticities of factor inputs become equal to their relative shares in total income. Assuming further that the sum of the relative shares of capital and labor in income is unity and that their respective values are not affected by changes in X , Equation (2) becomes:

$$(3) rY = rX + aK + bL$$

where r is the annual rate of growth, while a and b are the relative shares of capital and labor in income.

It is obvious by now that growth in non-oil output is used to measure economic performance in Libya. This is justified on the ground that the most important feature of Libyan economic growth is not its ability to produce oil but rather its capacity to transform oil resources into real growth. Also, determinants of growth in oil output are influenced by complex policy decisions that involve technical, domestic, and international factors and can for all practical purposes be considered as external to the factors of growth in the indigenous economy. Hence, the oil and non-oil sectors can be treated as if they are two distinct economies interacting with each other in response to the rapid acceleration of foreign exchange earnings generated in the oil sector. To be sure, there are other intersectoral flows that exist between both sectors, but they

are ignored simply because their effect on growth is considered to be unimportant in comparison to that of oil revenue flows. Thus, despite the high final demand linkage effect generated from oil revenue flows, both sectors are considered to be nearly isolated from each other, with weak externalities and small backward and forward linkage effects.⁶

The simple model ignores the effects of structural change on growth. We shall incorporate these effects into the basic model by constructing a two-factor two-subsector model. Divide the indigenous sector into two subsectors, advanced (manufacturing) and backward (agriculture). There are two factors of production, labor, and capital, employed in both subsectors. The supply of each factor of production grows at a natural exponential rate due to population growth and rate of investment. Technical progress (rX) is assumed to be of the disembodied type and is independent of the growth rates of inputs. It is estimated as the residual component of total growth in factor inputs multiplied by their relative share in income. Factor transfer of labor from agriculture to manufacturing is explicitly introduced into the model on the premise that labor input shifts from the less to the more productive sector is not only verified empirically as accompanying growth but also is considered as a major factor in influencing economic growth.

For simplicity, the time subscript (t) will not be added to the variables of the model, taking into consideration that any d that appears in the equations identifies a time derivative. Subscripts 1 and 2 will be used to denote agriculture and manufacturing. For example Y_1 and Y_2 identify output produced in agriculture and manufacturing, respectively. Besides Y_1 and Y_2 , the following variables need to be identified: P_1 and P_2 are average prices of goods produced; K_1 and K_2 are the amounts of capital employed; while L_1 and L_2 are the amounts of labor employed. By definition

6 See A. Kader. It should be pointed out here that as the industrial base of the indigenous sector expands and becomes more diversified, the nature of interaction between the oil sector and the rest of the economy becomes more complex since it would include not only the flows of oil revenue from the oil to the non-oil sector but also the movement of resources between both sectors. For an elaborate analysis of the effect of this on the growth of the indigenous economy see A. Fekrat, "Growth of OPEC-Type Economies: A Preliminary Theoretical Inquiry." Paper presented at the 4th Annual Conference of the Eastern Economic Association, April 1978, Washington, D.C.

7 See, for example, L. Bean; C. Clark; S. Kuznets.

$K = K_1 + K_2$; $L = L_1 + L_2$; $Y = Y_1 + Y_2$; and l_1 and l_2 are shares of L_1 and L_2 in L ; MPK_1 , MPK_2 , MPL_1 and MPL_2 are marginal products of capital and labor; and tL is the rate of transfer of L between the two subsectors and is equal to $\frac{TL}{L_1} \cdot \frac{L_1}{L} = \frac{TL}{L}$ where

TL is the amount of transfer of labor while rK_1 , rK_2 , rL_1 , and rL_2 are the natural rates of growth of K_1 , K_2 , L_1 and L_2 , respectively.

The two subsectors exhibit the following production functions:

$$(4) \quad Y_1 = F_1(X_1, K_1, L_1)$$

$$(5) \quad Y_2 = F_2(X_2, K_2, L_2).$$

Output in each subsector is produced by two homogenous factors (capital and labor) and output and input markets are perfectly competitive in both subsectors.

Defining rY_1 , rY_2 , and rY as rates of growth of Y_1 , Y_2 and Y with factor mobility, and r^*Y_1 , r^*Y_2 , r^*Y as rates of growth with no factor mobility within the non-oil sector, then the following relationships hold:

$$(6) \quad Y = P_1 Y_1 + P_2 Y_2$$

$$(7) \quad rY = y_1 \cdot rY_1 + y_2 \cdot rY_2, \text{ where } y_1 = (P_1 \cdot Y_1)/Y \text{ and } y_2 = (P_2 \cdot Y_2)/Y$$

$$(8) \quad dY_1 = MPK_1 \cdot dK_1 + MPL_1 \cdot dL_1$$

$$(9) \quad dY_2 = MPK_2 \cdot dK_2 + MPL_2 \cdot dL_2$$

$$(10) \quad dL_1 = rL_1 \cdot L_1 - tL \cdot L$$

$$(11) \quad dL_2 = rL_2 \cdot L_2 + tL \cdot L.$$

Equations (10) and (11) show the effect of reallocation of labor from agriculture to manufacturing.⁸

Substituting (10) and (11) into (8) and (9), respectively, we have:

$$(12) \quad dY_1 = MPK_1 \cdot dK_1 + MPL_1(rL_1 \cdot L_1 - tL \cdot L)$$

$$(13) \quad dY_2 = MPK_2 \cdot dK_2 + MPL_2(rL_2 \cdot L_2 + tL \cdot L)$$

If there were no factor mobility, then:

$$(14) \quad r^*y_1 = (MPK_1 \cdot dK_1 + MPL_1 \cdot dL_1)/Y_1$$

$$(15) \quad r^*y_2 = (MPK_2 \cdot dK_2 + MPL_2 \cdot dL_2)/Y_2.$$

⁸ It should be noted that with no labor transfer, $dL_1 = rL_1 \cdot L_1$ and $dL_2 = rL_2 \cdot L_2$.

Substituting (14) and (15) into (12) and (13) after dividing by Y_1 and Y_2 yields:

$$(16) \quad rY_1 = r^*Y_1 - (\text{MPL}_1 \cdot tL \cdot L) / Y_1$$

$$(17) \quad rY_2 = r^*Y_2 + (\text{MPL}_2 \cdot tL \cdot L) / Y_2.$$

Substituting (16) and (17) into (7) gives the following expression for Y :

$$(18) \quad rY = r^*Y + (\text{MPL}_2 \cdot P_2 - \text{MPL}_1 \cdot P_1) tL \cdot L / Y.$$

The term $(\text{MPL}_2 \cdot P_2 - \text{MPL}_1 \cdot P_1)$, which represents the difference in the value of marginal products of labor between the two subsectors, shows the contribution to growth of the labor shift from agriculture to manufacturing. Thus, the contribution of the labor shift to growth is reflected in the differences in productivity of labor and in the relative prices of output between the backward and the advanced subsectors.

From equation (18), tL can be estimated, but the expression $(\text{MPL}_2 \cdot P_2 - \text{MPL}_1 \cdot P_1)L/Y$ needs to be reformulated in order to become estimable. Defining the weighted wage rate of labor as PL , then total payments to labor of non-oil income are $PL \cdot L = PL_1 \cdot L_1 + PL_2 \cdot L_2$, where PL_1 and PL_2 are the average wage rates in both subsectors. The above equation becomes:

$$(19) \quad PL = PL_1 \cdot l_1 + PL_2 \cdot l_2.$$

Assuming that labor is paid the value of its marginal product in each subsector and that productivity differential exists between both subsectors, Equation (18) becomes:

$$(20) \quad rY = r^*Y \left(\frac{PL_2 - PL_1}{PL} \right) tL \cdot PL \cdot L / Y$$

where $\frac{PL \cdot L}{Y}$ is the labor share of incomes, which can be

estimated while $\frac{PL_2 - PL_1}{PL}$ represents the difference in average

wage rates between the two subsectors expressed in a per unit weighted average wage rate, which can be approximated. The contribution of labor transfer to growth obviously influences productivity growth of factor inputs and is part of the residual element. Therefore, we have: $rX = r^*X + ctL$ where c is equal to

$\left(\frac{PL_2 - PL_1}{PL} \right) PL \cdot L/Y$ and r^*X is the adjusted residual value, or:

$$(21) \quad rY = r^*X + ctL + arK + brL.$$

So far, sources of growth of the domestic economy are examined without accounting for the interaction effects between the oil and non-oil sectors. We shall restrict our analysis of interactions to the inflow of foreign exchange. In examining growth in an open economy, foreign exchange normally replaces domestic savings as the key variable in limiting growth. In the case of Libya, oil exports provide a substantial inflow of financial capital to remove both domestic savings and foreign exchange gaps.⁹ Oil exports permit a higher rate of domestic capital formation, a rate for which the country has the capability to absorb (removing savings gaps). Oil exports also induce an expansion of capital imports, an expansion that is sufficient to bring the economy to full employment (removing the trade gap). If the economy suffers from a scarcity of skilled labor, as in the case of Libya, then a higher rate of capital formation can be made possible only through the importation of skilled labor (which becomes the most limiting factor of production) in order to remove the constraint on absorptive capacity. Thus, the effects of intersectoral relationships are measured in the production function in terms of quantities of imported capital and labor and that part of domestic capital that is directly influenced by oil exports. Because of measurement problems, we shall examine only the effects of imported capital and labor on growth.

Treat the oil sector as exogenous. Define rY_1 , rY_2 , and rY as the rates of growth of Y_1 , Y_2 , and Y with interaction effects of the oil and non-oil sectors and $r'Y_1$, $r'Y_2$, $r'Y$ as rates of growth with no sectoral interaction. Dealing first with capital and labor inflows into manufacturing which represent net rather than gross addition to capital and labor, we have:

$$(22) \quad dK_2 = rK_2 \cdot K_2 + iK \cdot K$$

$$(23) \quad dL_2 = rL_2 \cdot L_2 + iL \cdot L$$

where iK and iL are rates of capital and labor inflows from the rest of the world to manufacturing. Substituting (22) and (23) into (9) we have:

9 For a discussion of the concept of foreign exchange earnings constraint and the two gap approach, see H. Chenery and A. Strout.

$$(24) \quad dY_2 = MPK_2(rK_2 \cdot K_2 + iK \cdot K) + MPL_2(rL_2 \cdot L_2 + iL \cdot L).$$

With no interaction effects we have:

$$(25) \quad r'Y_2 = (MPK_2 \cdot dK_2 + MPL_2 \cdot dL_2)/Y_2.$$

Substituting (25) into (24) after dividing by Y_2 , yields:

$$(26) \quad rY_2 = r'Y_2 + (MPK_2 \cdot iK)/Y_2 + (MPL_2 \cdot iL \cdot L)/Y_2.$$

A similar expression can be derived for rY_1 with capital and labor inflows into agriculture. Substituting both into (7) gives the following relationship for Y :

$$(27) \quad rY = r'Y + (MPK_2 \cdot P_2) iK \cdot K/Y + (MPL_2 \cdot P_2) iL \cdot L/Y + \\ (MRK_1 \cdot P_1) jK \cdot K/Y + (MPL_1 \cdot P_1) jL \cdot L/Y$$

where jK and jL represent capital and labor inflows into agriculture.

The terms $MPK_2 \cdot P_2$, $MPL_2 \cdot P_2$, etc. show the value of marginal products of factor inflows and their contribution to growth in both subsectors. The terms $(MPK_2 \cdot P_2)K/Y$, $(MPL_2 \cdot P_2)L/Y$ etc., need to be expressed in input price per unit so they can be measured. Defining the weighted average price of capital per unit as PK , then total payments of capital in the economy are $PK \cdot K = PK_1 \cdot K_1 + PK_2 \cdot K_2$ where PK_1 and PK_2 are the average prices of capital in both subsectors, or:

(28) $PK = PK_1 \cdot k_1 + PK_2 \cdot k_2$ where k_1 and k_2 are the relative shares of K_1 and K_2 in K . A similar expression can be derived for PL . Assuming that capital and labor are paid the value of their marginal products, Equation (27) becomes:

$$(29) \quad rY = r'Y + \frac{PK_2}{PK} \cdot iK \cdot PK \cdot K/Y + \frac{PL_2}{PL} \cdot iL \cdot PL \cdot L/Y + \\ \frac{PK_1}{PK} \cdot jK \cdot PK \cdot K/Y + \frac{PL_1}{PL} \cdot jL \cdot PL \cdot L/Y$$

Where $PK \cdot L/Y$ and $PL \cdot L/Y$ are relative shares of capital and labor in income which can be estimated. Factor input inflows are measurable and are expressed as follows: $iK = \frac{IK_2}{IK} \cdot \frac{IK}{K} = \frac{IK_2}{K}$ where IK is the total amount of capital inflow from the rest of the world to be two-subsectors, while IK_2 is the total amount of

capital inflow to manufacturing. Also, $iL = \frac{IL_2}{IL} \cdot \frac{IL}{L} = \frac{IL_2}{L}$

where IL is the total amount of labor inflow to the two-sub-sectors, while IL_2 is the amount of labor inflow to manufacturing. The terms jK and jL can be interpreted in the same way. The

ratios $\frac{PK_2}{PK}$, $\frac{PL_2}{PL}$ etc., also can be roughly estimated. Obviously,

inflows of capital and labor to the indigenous sector augment growth in factor inputs and expand the rate of growth of non-oil income but do not directly influence the residual component. De-

fining $\frac{PK_2}{PK} \cdot PK \cdot K/Y$, $\frac{PL_2}{PL} \cdot PL \cdot L/Y$, $\frac{PK_1}{PK} \cdot PK \cdot K/Y$, and $\frac{PL_1}{PL} \cdot$

$PL \cdot L/Y$ as e, f, g, and h, we have the following equation:

$$(30) \quad rY = r^*X + ark + brL + ctL + eiK + fiL + gjK + hjL.$$

Thus, Equation (30) is the one that will be used to estimate sources of growth of the Libyan economy.

Measurement of Parameters in the Model and Background

Table I presents estimates of parameters included in the model. The rate of growth of non-oil output was 16.47 percent during this period. This high rate of growth was due mainly to the impact of the rapidly rising oil sector which enabled Libya to enjoy an unlimited supply of foreign exchange earnings and transformed her into a capital surplus economy.¹⁰ The acceleration of per capita income of the indigenous population, due to the oil boom, permitted a significant expansion of private saving and investment without any sacrifice in consumption. Also, the rapid increase of foreign exchange earnings played the major role in financing government investment. Domestic investment in fixed capital formation (total capital formation less imported capital) grew at a rate of 13.80 percent annually during the period. On the average only 14.60 percent of imported capital was allocated to agriculture and the rest to other industries. The values of iK and jK are

10 It should be mentioned here that in the case of Libya, oil exports account for almost all of the total export receipts, for a large portion of GDP, and are the major source of financing government spending.

estimated at 11.85 and 2.03 percent, respectively.

The 2.16 percent annual growth of the Libyan labor force was well below the 3.65 percent population growth. This slow rate of growth is due to two factors: The very young population and the non-participation of women in employment. However, although the labor force participation rate (estimated at 26.00 percent) is very low, it has been rising in recent years due to an increase in the level of education of women and hence their entry into the labor market and in the age structure of population in favor of employable age groups of 15 years and above. This will bring the growth rate of the economically active population upward (projected at 2.74 percent for the period 1975-85), and it will eventually approach the rate of population growth.¹¹

The rapid expansion of oil exports has also converted Libya into a skilled labor deficient country. Scarcity of skilled labor has become the major constraint facing her economic development. To alleviate this problem the country has encouraged a large influx of foreign workers, mostly from other Arab countries. The number of foreign laborers increased from 17,100 workers (4.49 percent of the total labor) in 1974.¹² The largest concentration of non-Libyan workers were in the construction, manufacturing, and mining sectors. On the average only 11 percent of non-Libyans were employed in agriculture. The values of iL and jL are estimated at 2.61 and 0.29 percent, respectively.

Besides the inflow of foreign workers to the country, there was the transfer of labor from rural to urban areas due to a structural change of the economy in the process of growth. In the 1950's, the average wage rate for unskilled workers in agriculture was very depressed and was certainly lower than that prevailing in industry.¹³ In the meantime, agriculture was stagnant while industry was growing. Those two factors have induced migration of agricultural workers to the cities of Tripoli, Benghazi and others. However, workers displaced from agriculture did not necessarily and probably not immediately find employment in the cities. Reports of slums in Libyan cities were confirmed by writers and

11 See L. Berouti.

12 It should be mentioned here that approximately 30 percent of foreign nationals employed in Libya are unskilled workers. See A. Farrag.

13 See J. Allan, K. MacLachlan, and E. Penrose.

journalists during that period.

When oil was discovered in Libya in 1961, the companies were already paying their unskilled workers wages that were considerably higher than those in industry or agriculture. This apparently put pressure on the government and domestic producers to raise wages in the non-oil sectors. The wage gap of unskilled workers in the oil and non-oil sectors continued until 1964 when it disappeared completely. Stability of employment in the oil industry and the spectacular growth of the modern domestic sector contributed significantly to closing this wage gap.

The government became not only a major employer but also played an important role in influencing the trends of wages in the country. In 1964, the government established a wage rate of 0.70-0.80 Libyan dinars as the daily minimum payment for unskilled labor. This has encouraged further the drift of agricultural workers to the cities in the hope of finding relatively secure and comfortable jobs with the government or jobs of permanent nature in industry.

Although there were many agricultural workers available during the entire year, they were fully employed only during the planting and harvesting seasons. The rapid shift of those workers to the urban areas (in particular during the early period of the oil boom) created shortages of unskilled workers, especially during the peak seasons. This, plus the difficult nature of rural jobs, has bid up wages in agriculture above those prevailing in other sectors of the economy. Reliable data gathered from surveys made in 1968 show that the average wage rate of unskilled workers in agriculture was about 1.00 Libyan dinars a day, while in the manufacturing, government, and oil sectors it was about 0.75 Libyan dinars.¹⁴ Only in construction did the average wage rate, 1.20 Libyan dinars, of unskilled workers exceed that in agriculture.

From an economic standpoint, reallocation of labor from agriculture to other sectors, excepting construction, has retarded growth since workers have been moving from higher to lower paying jobs. This may put Libya in a rather different category from most developing countries. In other countries urban wage rates are normally about 30-50 percent higher than rural wages.¹⁵ In con-

¹⁴ See J. Allan, K. MacLanchlan, and E. Penrose, *Ibid.*

¹⁵ See C. Kindleberger and B. Hernick.

trast, in Libya wage rates are about 33 percent higher in agriculture than in manufacturing. Because of the favorable wage differential in agriculture, transfer of workers has slowed down recently but has not stopped completely, or reversed itself. Statistical data are not available to show the adverse effect of labor shift on productivity in agriculture. However, the exodus of workers from agriculture, with rising rural wages, has certainly applied pressure to introduce machinery and other capital intensive techniques, as is evidenced by the large amount of investment in capital formation committed by the government to agriculture in recent years. The t value is estimated at 1.47 percent.

The relative shares of capital and labor in income are not available for Libya so the same estimate made for Iraq was applied here with 45 and 55 percent for a and b.¹⁶ The justification for this is that the two countries have strong similarities in opportunities for trade and comparative advantage, and their economies are propelled by one leading export sector. Thus, using the same estimates for both countries is reasonable.

With no sectoral interaction, 29 percent of domestic labor (excluding oil workers) would be employed in agriculture and only 11 percent of non-agricultural workers (excluding oil workers) would be employed in construction. Therefore, $\frac{PL_2 - PL_1}{PL}$ is estimated

$$\text{at } \frac{(1.20 \times 0.11) + (0.75 \times 0.89) - 1.00}{(1.00 \times 0.29) + (0.80 \times 0.71)} = \frac{0.80 - 1.00}{0.86} = -0.23.$$

With sectoral interaction, 24 percent (excluding oil workers) of labor would be employed in agriculture while 22 percent (excluding oil workers) of non-agriculture workers would be employed in construction. Therefore, $\frac{PL_1}{PL}$ ratio is estimated at

$$\frac{1.00}{(1.00 \times 0.24) + (0.85 \times 0.76)} = \frac{1.00}{0.89} = 1.12, \text{ while } PL_2 =$$

$(0.22 \times 1.2) + (0.78 \times 0.75) = 0.85$. The $\frac{PL_2}{PL}$ ratio is estimated at

$$\frac{(1.20 \times 0.22) + (0.75 \times 0.78)}{0.89} = \frac{0.85}{0.89} = 0.96.¹⁷ Finally the$$

16 The relative shares of capital and labor in income for Iraq are approximated from the data provided by Haseeb. See K. Haseeb.

17 Data on wage rates for skilled labor are not available. Therefore, the contribution of

ratios $\frac{PK_1}{PK}$ and $\frac{PK_2}{PK}$ are both estimated at $\frac{1.00}{1.00} = 1.00$ on the assumption that capital per unit yields the same rate of return throughout the economy and therefore the average price of capital per unit which is equal to its marginal product would be the same in both subsectors. Thus we have $PK_2 = PK_1 = 1.00$.

Estimation of Sources of Growth and Comparative Analysis

Table 2 shows the contribution to the rates of growth of the variables included in Equation (30). The results clearly indicate that capital is the major source of growth of the Libyan economy, with indigenous capital formation accounting for 36 percent of total growth and with capital imports for 38 percent. Capital inflows from the rest of the world to manufacturing give a contribution of 32 percent while capital imports to agriculture account for only 6 percent of total growth. The contribution of total capital (74 percent) to Libyan economic growth is substantially higher than that found for developed countries and is certainly in the top range of estimates for developing countries (see Table 3).

Indigenous labor makes a rather low contribution to growth in Libya, representing only 7 percent of total growth, while labor inflows contribute 9 percent. Foreign labor employed in manufacturing gives an 8 percent contribution, while that employed in agriculture shows only a 1 percent contribution. The total contribution of labor to growth in Libya (16 percent) is comparable to that in developed countries but is somewhat below that in developing countries.

Comparative statistics show that capital labor ratio is greater for Libya than for most other countries. This is expected, however, since for Libya, as well as for other major oil exporting countries, the supply of capital is provided at little cost as measured by the opportunity cost of obtaining foreign exchange and hence capital, which is small in terms of domestic factor inputs being used in oil production. This is especially true since 1973 when the additions to

labor inflow to growth is underestimated in this study by using $\frac{PL_1}{PL}$ and $\frac{PL_2}{PL}$ ratios and since 70 percent of non-Libyan workers are skilled labor.

foreign exchange have been coming almost entirely from price rises rather than from increased production of crude oil.

Hence, growth of capital has been much higher than that of labor, reflecting the tendency in Libya to emphasize capital intensive projects and to economize on labor on the premise of being already abundantly endowed with financial capital. The rapid rate of growth of capital relative to labor has tended to lower the marginal productivity of capital and consequently has raised the capital output ratio in the non-oil sector. Statistics show that the capital output ratio has reached a 16 to 1 ratio for some projects undertaken by the government in recent years.¹⁸ If the ratio of capital to labor continues to grow disproportionately then the rate of return on additional investment in capital formation may soon reach the zero if not the negative mark. Obviously, capital has been the engine of growth of the Libyan economy not because of its high marginal productivity but rather because of the large rate of investment.

The estimated contribution of labor transfer to growth in Libya is found to be negative but very small (-1 percent). This is in contrast to the results obtained in the other studies which show a positive contribution to growth for almost all countries examined.¹⁹ From the comparative data given in Table 3, it would seem reasonable to argue that the contribution of factor transfer to growth, although comparable, varies widely among countries and that any generalization to be made from the experience of these countries regarding the role of labor shift in growth should be taken with caution. This may bring into question the absolute reliance on surplus theories of labor and the use of transfer of labor indiscriminately as a means of fostering rapid economic growth in developing countries.

The data given in Table 3 show that with the exceptions of a few Latin American Countries, (LAC), the contribution of total factor inputs to growth is greater for developing rather than developed countries. Thus, developing countries in general rely more on factor inputs in their growth performance, while

¹⁸ *Economic Bulletin*.

¹⁹ Correa reports a negative figure for Ecuador which is due to a transfer of labor from other sectors to agriculture and is thus caused by entirely different forces than those in Libya. See H. Correa.

developed countries place more emphasis on technical progress.

The role of factor inputs is more important in total growth in developing countries largely due to the high rate of capital formation. Correa, for example, finds that the contribution of capital in LAC is higher than in Northwestern European Countries (NEC) and the U.S. because of large investment rates in dwellings and equipment in LAC.²⁰ Bruton goes further than that by maintaining that the contribution of capital is high in LAC relative to NEC and U.S. due to rapid rate of capital formation and to a high marginal productivity of capital. Bruton also gives persuasive evidence that total factor productivity growth is lower in LAC than in more advanced countries mainly due to their high degree of utilization of capital and labor.²¹ Williamson shows that the Phillipines have not been able to generate a rapid productivity growth of capital, and hence larger per worker output growth, despite the high rate of capital formation due to resource misallocation, underutilization of factor inputs, and excessive import substitution policy.²²

Libya is no different from other developing countries in that growth in total factor inputs, accounts for a large share of total growth, larger than productivity growth of factor inputs. In an oil economy such as Libya's, domestic labor costs tend to be relatively high by international standards. This occurs largely because of transferring oil revenues from the government to the Libyan workers, which is made possible only through higher wages. Also, the accelerated increase in the supply of foreign exchange and the resulting appreciation of the value of Libyan currency relative to other currencies has enhanced the country's ability to import. Export expansion of commodities other than oil is hampered due to the high cost of domestic production. Furthermore, the slow process of import substitution (due to the high capacity for imports) does not provide opportunities for profitable investment in manufacturing. Domestic entrepreneurs find it to their advantage to invest mostly in the areas of housing and distribution, which both have experienced a substantial increase in demand in recent years due to rising urban incomes.

20 Ibid.

21 See H. Bruton.

22 See J. Williamson.

Furthermore, the sudden entry into wealth has pushed the government into investing in areas that are not necessarily useful. A large proportion of government spending is channeled into activities (such as housing, government buildings, harbors, roads, dams, etc.) which either are not directly productive or have long gestation periods. Thus, more emphasis is placed on infrastructure where investments tend to have a very slight and long delayed impact on output. Moreover, even when government revenues are channeled into directly productive activities, they are normally biased in favor of capital-intensive projects which tend to raise the capital-output ratio and eventually lower the rate of growth. Furthermore these funds have been spent on forms of capital that are not complementary to labor. Thus, the development climate in Libya has made it increasingly difficult for improvements in total factor productivity growth to take place. It is not surprising that growth productivity of capital and labor is low in Libya, as is shown by the small value of the residual.

One important variable omitted in the model is the role of education in growth. Many studies have shown that education gives a positive contribution, although at varying degrees, to growth.²³ If this variable is included in the model one would expect the residual variable to be near the zero mark for Libya. This is especially true since the government has put an increasing emphasis on education, at all levels, in the last two decades.

Finally, the contribution of oil exports to the growth of the non-oil sector in Libya is estimated here by combining the contribution of capital and labor inflows to growth, which accounts for 47 percent. Assuming the 50 percent of domestic capital formation is induced by oil exports, then the total contribution of oil exports to growth (excluding the residual) is about 69 percent, while non-oil sector alone provides only 20 percent of growth of the Libyan economy.

23 See M. Selowski. See also J. Williamson, *op. cit.*, and H. Correa, *op. cit.*

Table 1
ESTIMATES OF PARAMETERS IN EQUATION (30)
FOR LIBYA DURING 1964-74.

rN = 3.66	jL = 0.29
rL = 2.16	iK = 11.85
rK = 13.30	jK = 2.03
rY = 16.47	$\frac{PL_2 - PL_1}{PL} = \frac{0.80 - 1.00}{0.86} = -0.23$
a = 0.45	$\frac{PL_1}{PL} = \frac{1.00}{0.89} = 1.12$; $\frac{PL_2}{PL} = \frac{0.85}{0.89} = 0.95$
b = 0.55	
tL = 1.47	$\frac{PK_2}{PK} = \frac{1.00}{1.00} = 1.00$; $\frac{PK_1}{PK} = \frac{1.00}{1.00} = 1.00$
iL = 2.61	

All figures are computed as averages (geometric averages for growth rates).

- rN = population growth rate
- rL = rate of increase of labor
- rK = capital formation
- rY = rate of growth of non-oil income
- a = relative share of capital in income
- b = relative share of labor in income
- tL = rate of transfer of labor from agriculture to manufacturing
- iL = rate of labor inflow to manufacturing
- jL = rate of labor inflow to agriculture
- iK = rate of capital inflow to manufacturing
- jK = rate of capital inflow to agriculture
- PL₂ = average wage rate in manufacturing which is equal to 0.80 Libyan Dinars with no sectoral interaction and to 0.85 Libyan Dinars with sectoral interaction
- PL₁ = average wage rate in agriculture
- PL = weighted average wage rate which is equal to 0.86 Libyan Dinars with no sectoral interaction and to 0.89 Libyan Dinars with sectoral interaction
- PK₁ = average price of capital per unit in agriculture
- PK₂ = average price of capital per unit in manufacturing
- PK = weighted average price of capital in both subsectors

Table 2

ESTIMATES OF SOURCES OF GROWTH OF THE LIBYAN ECONOMY

Sources of Growth	Contributions	Shares of
	to growth	Contributions
	%	%
Indigenous Labor	1.19	7
Indigenous Capital	5.99	36
Factor Transfer	-0.19	-1
Factor Import	7.78	47
a. Labor-Manufacturing	1.36	8
b. Labor-Agriculture	0.18	1
c. Capital-Manufacturing	5.33	32
d. Capital-Agriculture	0.91	6
Total Growth	16.47	100
Residual	1.70	11

Table 3

SOURCES OF GROWTH OF COUNTRIES & GROUPS OF COUNTRIES

Countries or groups	DC ¹	LAC ²	NEC ³	U.S. ⁴	Egypt ⁵	Libya
Periods	1958-60	1950-62	1950-62	1950-62	1961-65	1964-74
Contributions to growth (%)						
Capital ⁶	52	8-47 ⁷	12-29	25	66	74
Labor ⁸	20	20-33	2-13	33	20	16
Labor transfer	12	(-7)-13	3-17	7	-	-1
Residual	16	6-65	42-60	35	10	11

1 Refers to a sample of thirty-nine developing countries examined by Robinson. See S. Robinson, "Sources of Growth in Less Developed Countries," op. cit.,: 405.

2 Refers to nine Latin American Countries examined by Correa. See H. Correa, "Sources of Growth in Latin America," op. cit.,: 17-32.

3 Refers to eight Northwestern European Countries examined by Denison. See E. Denison, *Why Growth Rates Differ*, Washington, D.C.: The Brookings Institution, 1967: 296-333.

4 Ibid.

5 See B. Hansen, "Economic Development of Egypt" in *Economic Development and Population Growth in the Middle East*, C. Cooper and S. Alexander (ed.), New York: American Elsevier Co., 1972: 51-53 and 113.

6 It should be pointed out here that Denisons' and Correass' estimates include also the contribution of reallocations of capital to growth.

⁷ The figures represent the low and high range of estimates for countries within each group.

⁸ It should be noted here that the contribution of labor in growth in other countries is estimated on the basis of the rate of employment only and it excludes the effects of other factors such as education. This is done to make the estimates of the contribution comparable between these countries and Libya.

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