

Impact Of Sectoral Growth Rate On The Growth Rate Of The GNP

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Introduction :

As national economies grow, the individual sectors do not expand at the same rate as the overall rate of growth of gross national product. As early as 1940, it was observed by Colin Clark¹ that in the initial stages of economic development, the primary sectors (agriculture and mining) contribute the largest part of the gross national product, in the second stage the secondary sectors (manufacturing and industrial) dominate and in the final state services account for the largest part of the gross national product. A general survey will show that the above sequence of stages has been, by and large, true secularly.

However, in the wake of the planning of economic development in almost all countries, particularly in the socialist and underdeveloped countries, a great debate has ensued regarding the impact of individual sectoral expansion upon the overall growth of the economy. In the socialist countries, the issue has been more or less settled in favor of the expansion of the 'heavy', 'key', or 'leading' industrial sectors. But this overemphasis on heavy industrial sectors has involved extreme suffering and sacrifices especially on the part of rural sectors. The imposition of such sacrifices was possible in the totalitarian regimes of the socialist countries. This option is neither feasible nor desirable in most of the underdeveloped countries. Moreover, although the socialist countries have achieved notable economic growth, it is not certain that the route they took was the efficient one.

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1. Colin Clark, The Conditions of Economic progress. 1940, second edition, London, McMillan Ltd., 1951.

In the underdeveloped countries, there has been a good deal of debate on the issue of balanced versus unbalanced growth.

The discussion has been fuzzy and at times ideological in overtones. The latter may have been partly responsible for the failure in reaching any broad consensus over the issue. Over the years the intensity of the arguments for and against balanced growth has been greatly reduced. However, the importance of individual sectors in the planning of economic development has by no means diminished. The allocational priorities in Indian planning and the shifts between agriculture and industry in the successive five year plans indicate the great emphasis that was placed on the relative expansion of individual sectors. The Indian experiment was not expected to and it did not resolve the issue of which individual sectors to favor for the overall economic growth of a country. Planned investment allocations in India have vacillated between agriculture and industry in their attempt to foster economic growth.

II. The Present Study

In this paper an econometric model is set up to study the relationship between the rates of growth of major sectors and the rate of growth of the GNP. These sectors include agriculture, mining, manufacturing, trade, construction, electricity, transportation, and public administration and defense. The United Nations statistical bulletin gives data for the values of outputs of these sectors and for the GNP. From these data the rates of growth of the above mentioned sectors and the GNP for 61 underdeveloped countries were derived. Table I lists these countries and the corresponding rates of growth. The table does not include countries for which data for less than ten years were available. The rate represents the compound rate of growth between the initial year and the final year.

We start with a linear regression model that sets the rate of growth of GNP as the dependent variable and the rates of growth of sectors as the independent variables. The results of the regression analysis are given in section III.

The 61 countries in the study include countries in which only one industry, petroleum, accounts for the bulk of their manufacturing and most of their GNP. These countries present a special phenomena and affect the results of the study unduly in favor of industry. Section IV studies the impact of sectoral rates of growth on the rate of growth of GNP after the exclusion of these countries.

III. The Model

We first run a multiple linear regression of the rate of growth of GNP on the rates of growth of the eight sectors for all the six countries for which data is listed in Table I.

The estimated model is stated as :

$$G_i = b_1 + b_2 G_{2i} + b_3 G_{3i} + b_4 G_{4i} + b_5 G_{5i} + b_6 G_{6i} + b_7 G_{7i} + b_8 G_{8i} + b_9 G_{9i} + e_i$$

Here all the variables represent compound rates of growth over ten years mainly from 1967 to 1977. Suffixes 1 to 9 represent respectively: 1. GNP; 2. agriculture; 3. mining; 4. manufacturing; 5. trade; 6. construction; 7. electricity; 8. transportation; 9, public administration and defense. Of these, G_1 is the dependent variable and the remaining variables are explanatory variables. The multiple linear regression solution gives the following result:

Var Label	Coefficient	Std-Err	F-Ratio
2	0.332548	0.0724	21.07
3	0.086716	0.0228	14.45
4	0.054950	0.0493	1.24
5	0.311488	0.0819	14.45
6	0.190693	0.0511	13.91
7	0.044812	0.0519	0.74
8	0.053594	0.0454	1.40
9	0.036595	0.0618	0.35
Cons	0.000175		

The regression coefficients indicate that the rate of growth of GNP is significantly affected by (or associated with) the rates of growth of agriculture, mining, trade and construction. It is rather surprising to note that the rate of growth of GNP is not correlated significantly with manufacturing, transportation, and public administration sector increases. This result is likely to have a somber effect on the planners and policy makers in most of the underdeveloped countries. Planning and policy-making in these countries have generally tended to emphasize the development of industry and manufacturing. Moreover, in India and in some other underdeveloped countries, transportation has often been considered a bottleneck. Furthermore the general suspicion that the rate of growth of GNP in underdeveloped nations is greatly related to rapid expansion of public administration and defense spending is also refuted.

Most surprising result however is the negative coefficient of electricity sector. This contradicts the well-known dictum of Lenin that socialism is soviet plus electricity. The rate of growth of electricity capacity does not seem to have been positively associated with the rate of growth of GNP in the underdeveloped countries in the past decade. It is understandable, however, that energy may have been provided by sources other than electricity in the present pattern of development of the underdeveloped countries.

IV. Analysis Excluding Major Oil Producing Countries

The data includes some countries where almost all GNP arises in one sector, namely petroleum. The above results, surprising as they are, may be further sharpened by excluding these countries from the analysis. The countries thus excluded are: Iraq, Iran, Kuwait, Libya, Nigeria, and Mexico.

The following table gives the result of this multiple linear regression.

Var Label	Coefficient	Std-Err	F-Ratio
2	0.390862	0.0549	50.77
3	0.035263	0.0176	3.99
4	0.081401	0.0352	5.36
5	0.212242	0.0606	12.26
6	0.125056	0.0410	9.32
7	-0.051518	0.0382	1.82
8	0.118468	0.0343	11.95
9	0.105591	0.0457	5.33
Cons	0.000627		

It is seen that the coefficient of agriculture increases from 0.332548 to 0.390862, that of mining decreases from 0.086716 to 0.035263, but that of manufacturing increases from 0.054950 to 0.081401. The coefficients of trade and construction decline and the coefficient of electricity becomes still more negative, but the coefficients of transportation and public administration move up along with improvement in their F-ratios.

However the overall importance of the sectors remains intact.

V. Some Broad Conclusions

The econometric study presented here cannot be expected to yield foolproof results applicable to all countries. However the study yields some broad conclusions which are summarized below.

1. The general outlook that a rapid growth of the manufacturing sector is sine qua non for economic development and growth is not borne out by the regression of the rate of growth of GNP on the rates of growth of selected individual sectors. The rate of growth of agriculture is much more closely related to the rate of growth of GNP than the rate of growth of the manufacturing sector. The general emphasis on the growth of the manufacturing sector as compared to agriculture in underdeveloped countries may perhaps be misplaced.
2. Rates of growth in the trade and construction sectors turn out to be more important than the rate of growth of the manufacturing sector. This may be partly due to the fact that the underdeveloped countries lag in providing adequate physical infrastructure and the movement from barter to exchange economy is a prerequisite to economic development and growth.
3. Most surprising of all is the coefficient of electricity. It seems that the rate of growth of GNP is not closely dependent on the rate of growth of electricity sector. While the negative coefficient in this sector will have to be taken with a grain of salt, the result is a little cheery, all the same, in view of the growing energy shortage worldwide. It is comforting to note that the growth of the underdeveloped countries, at least, can be sustained without commensurate growth of availability of electricity.
4. Lastly, it has been often remarked that the rate of economic growth of underdeveloped countries is mostly a function of the rate of growth of the bureaucracy and rate of expansion of the defense. The figures do not support this impression. The rate of growth of the GNP of underdeveloped nations is not significantly related to the rate of growth of the government bureaucracy and defense.
5. Colin Clark's sequence of stages appears to hold true in most cases. However, in the case of many underdeveloped countries, agriculture may remain the predominant sector even after they have attained a fairly high degree of economic progress. In case of some developing countries, the agricultural sector may not be overtaken by the non-agricultural sector for a long, long time to come.

Table I

RATES OF GROWTH OF GNP AND SECTORS

	1	2	3	4	5	6	7	8	9
COUNTRY	GNP	A gr	Mining	Manuf	Trade	Const	Elect	Trans	Public Admin & Defense
Algeria	.068	-.009	.212	.074	.048	.129	.055	.048	.097
Bangladesh	.086	.078	.196	.111	.081	.169	.166	.078	.100
Bolivia	.125	.100	.176	.101	.108	.140	.152	.147	.155
Brazil	.462	.434	.431	.477	.474	.459	.507	.451	.465
Cambodia	.036	.019	-.101	.069	.031	.066	.085	.022	.060
Central African Republic	.052	.026	.165	.035	.035	.101	.113	.179	.067
Chile	.588	.525	.532	.601	.609	.619	.551	.596	.639
Republic of China	.139	.076	.064	.191	.154	.153	.175	.164	.135
Colombia	.184	.171	.097	.195	.193	.218	.229	.178	.210
Republic of Congo	.094	.100	.374	.117	.073	.077	.135	.062	.142
Cyprus	.090	.063	.049	.099	.099	.109	.088	.092	.110
Dominican Republic	.098	.075	.135	.101	.092	.169	.093	.137	.076
Ecuador	.131	.077	.236	.132	.114	.159	.144	.120	.134
El Salvador	.065	.053	.040	.085	.068	.064	.087	.061	.064
Ethiopia	.064	.050	.103	.106	.092	.063	.084	.080	.091
Fiji	.094	.045	.031	.054	.189	.156	.151	.128	.176
Gabon	.113	.034	.175	.133	.109	.148	.173	.100	.071
Gambia	.071	.074	.032	.101	.078	.022	.032	.070	.034
Ghana	.103	.118	.093	.109	.099	.059	.172	.099	.101

	1	2	3	4	5	6	7	8	9
COUNTRY	GNP	Agr	Mining	Manuf	Trade	Const	Elect	Trans	Public Admin & Defense
Greece	.120	.103	.133	.137	.129	.143	.144	.121	.120
Guatemala	.058	.052	-.001	.075	.065	.053	.110	.077	.035
Honduras	.078	.073	.119	.094	.080	.094	.147	.069	.067
India	.094	.088	.087	.090	.110	.112	.155	.109	.117
Indonesia	1.09	1.13	1.34	1.20	.124	1.29	1.25	1.20	1.23
Iran	.151	.076	.237	.158	.143	.144	.206	.058	.165
Iraq	.094	.095	.081	.101	.118	.070	.168	.078	.117
Ivory Coast	.114	.076	.040	.187	.093	.133	.092	.128	.144
Jamaica	.102	.070	.128	.099	.094	.089	.137	.089	.176
Kenya	.083	.067	.036	.118	.089	.063	.119	.076	.110
Republic of									
Korea	.260	.226	.186	.329	.314	.297	.341	.284	.213
Kuwait	.161	.137	.162	.138	.158	.064	.142	.097	.093
Liberia	.060	.022	.122	.124	.053	-.006	.080	.081	.075
Libyan Arab									
Republc	.265	.131	.360	.175	.198	.280	.217	.210	.182
Malaysia	.071	.049	.078	.118	.066	.100	.124	.071	.081
Mauritania	.082	.027	.319	.113	.091	-.009	.132	.328	.059
Mauritius	.082	.104	.055	.097	.076	.044	.103	.065	.080
Mexico	.115	.079	.088	.125	.111	.144	.141	.097	.149
Nicaragua	.064	.062	.020	.099	.068	.115	.090	.069	.039
Nigeria	.119	.070	.427	.138	.094	.149	.146	.105	.173
Pakistan	.098	.077	.133	.119	.122	.132	.195	.114	.200
Panama	.109	.073	.075	.128	.147	.123	.105	.126	.098
Paraguay	.104	.107	.130	.100	.104	.120	.164	.097	.097

	1	2	3	4	5	6	7	8	9
COUNTRY	GNP	Agr	Mining	Manuf	Trade	Const	Elect	Trans	Public Admin & Defense
Peru	.055	.016	.045	.078	.059	.061	.115	.063	.067
Philippines	.139	.144	.220	.144	.120	.121	.091	.104	.123
Portugal	.104	.062	.088	.118	.114	.134	.098	.118	.116
Rhodesia	.073	.059	.068	.105	.080	.064	.061	.033	.081
Rwanda	.146	.095	.107	.285	.182	.121	.061	.166	.163
Senegal	.058	.072	.159	.083	.044	.104	.109	.044	.033
Sierra Leone	1060	.037	.046	.068	.082	.091	.096	.113	.063
Spain	.144	.090	.082	.144	.178	.166	.143	.150	.154
Sri Lanka	.064	.053	.134	.080	.064	.075	.082	.067	.069
Sudan	.052	.020	.166	.096	.120	.018	.015	.059	.104
Tanzania	.125	.130	.068	.207	.127	.194	.254	.144	.059
Tanzania	.084	.054	.020	.149	.076	.156	.117	.105	.093
Thailand	.107	.086	.156	.144	.144	-.112	.225	.082	.096
Togo	.092	.065	.157	.129	.137	.098	.123	.129	.071
Trinidad Tobago	.082	.012	.025	-.083	.116	.121	.045	.197	.128
Tunisia	.093	.074	.193	.122	.083	.102	.134	.095	.094
Uganda	.083	.084	.117	.080	.090	.028	.095	.067	.059
Zaire	.268	.195	.367	.233	.289	.269	.187	.267	.267
Zambia	.080	.050	.035	.185	.138	.110	.118	.101	.128